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THE

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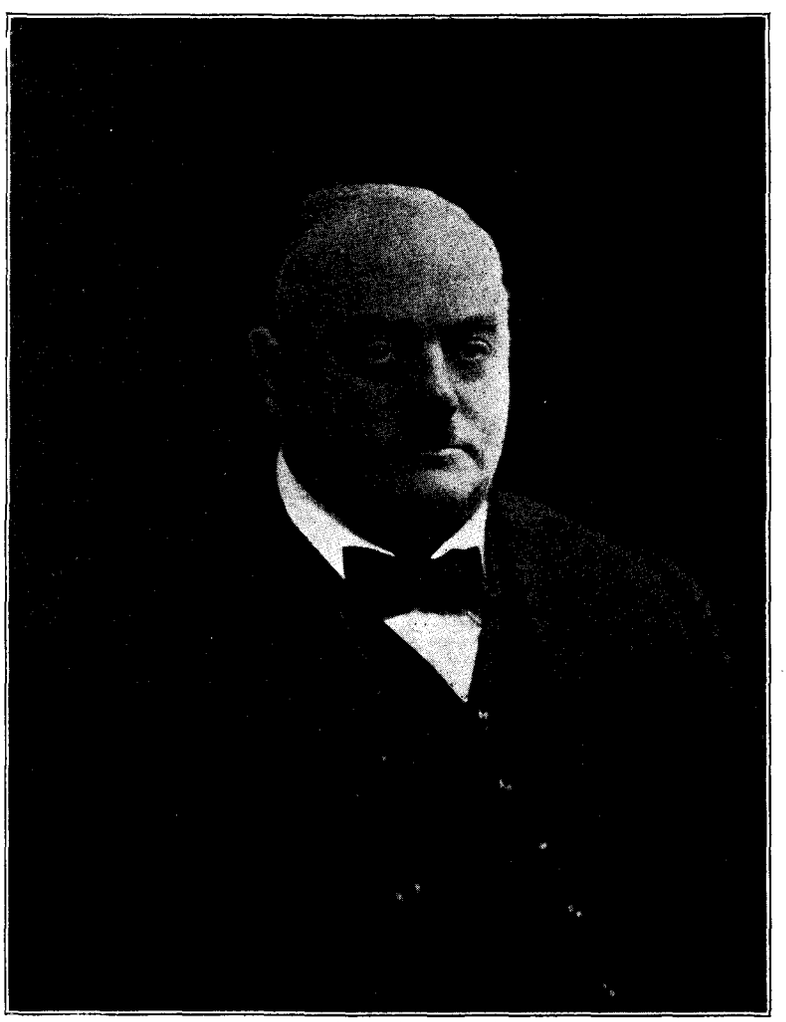
TELEGRAPH AND TELEPHONE MEN.

IX.—MR. WILLIAM MCCONCHIE



Photograph by Richard Brown, 35 Bold Street, Liverpool.

MR. WILLIAM MCCONCHIE Chief Superintendent, Telegraphs, Liverpool, was born on Jan. 19, 1866. His established appointment dates from 1880 at Liverpool, and most of his service has been spent in the telegraphs at that office. In addition to becoming highly skilled in all phases of the telegraph work at an early age, Mr. McConchie displayed a keen interest in the young and now flourishing sister of the telegraphs, with the result that for some years he was associated with the Trunk telephones at his office. The possessor of a sound and shrewd judgment, Mr. McConchie has handled many a difficult situation with a method and in a manner which commanded respect for his organising abilities, and no man knows better how to "carry" his staff with him. Affectionately known as "Mac" by his colleagues, Mr. McConchie's genial and youthful disposition has made him one of the most respected and popular of the "Chiefs" at LV. For many years Mr. McConchie was a familiar figure on the bowling green and on the cricket and football fields, and although probably he has the distinction of being the heaviest man in the telegraph service, his skill and ability in these and other forms of sport were delightful to behold, and put to shame many other more youthful and lighter men. He has more than a fair share of dry and penetrating humour.

THE GERMAN PRESS AT THE LONDON CONFERENCE.

AN APPRECIATION OF THE BRITISH POST OFFICE AND ITS SERVICES.

THE *Deutsche Presse*, the organ of the Telegraphen Union News Agency, has paid an almost unique tribute to the telegraph service between London and Berlin during the historic London Conference. In an article entitled "The London Conference and the German Press," by Heinrich Gesell, the editor in chief, the latter says :—

"We on the German side gratefully acknowledge the credit which falls to the share of the London C.T.O. for the essentially smoother working from London than has been our lot elsewhere.

We had at our disposal four practicable channels for the transmission of our news :—

(1) The Relayed telephone route.
(2) The Telegraph cables.
(3) The Wireless services.
(4) The Air-mail.

Fruitful use of all four services was made during the Conference.

Being regularly available during the most important hours of the day, and at the same time being within our financial reach, the TELEGRAPH CABLE proved itself the most trustworthy channel, and in this connexion it must be remarked that the Siemens high-speed telegraph apparatus was highly successful.

Relayed telephoning was also a regularly successful channel for the few (barely one dozen) German newspaper correspondents present in London outside the Conference time.

But by no means whatever could these relayed telephonic connexions be considered for the day service, because of the danger of futile calls which would have made the service too expensive, whilst the TELEGRAPH CABLE remained open as a safe and quick means of transmission at a cost exactly calculable in advance. Great credit is due to the German telegraph administration and, as already mentioned, to the C.T.O., London, for the removal, before the Conference was actually held, of obstacles and hindrances of divers sorts even in relation to prices so that one could reckon upon short transmission times for telegrams scarcely altering from day to day. To lessen the work of the English Post Office, which normally works the Siemens high-speed telegraph apparatus between London and Berlin, correspondents had previously proposed to hand in all telegrams beforehand with Siemens slip already punched instead of the typed or written text. The English authorities could not, however, consent to this for reasons of accountancy, but they nevertheless kept with astonishing punctuality their promise that no sort of delay should occur in punching the slip at the C.T.O. The number of mutilations, too, was so small that one must accord the highest testimony to the linguistic knowledge of the English telegraphists. From our own observations transmission during the whole day took place so regularly that the special editions of Berlin's morning papers (hampered by present-day organisation and other difficulties in German journalism notwithstanding) could, nevertheless, during the time the German delegation were in London, publish quite late in the evening the latest telegrams from London with good regularity.

Certain news enterprises which had collected information prior to the Conference also availed themselves of the wireless service between the two countries. This latter certainly has some important advantages compared with the cable and great possibilities for future development, but our experience at the London Conference was that a great disadvantage of utilising this system of telegraphy, appeared to be the great risk of theft by rival agencies and journals. As is known, Press telegrams in cipher are only very hesitatingly admitted in international wireless working, and those telegraphed in plain language are a strong temptation to rival organisations. Certain English correspondents of the great American papers, indeed, have emphatically declared their inability to continue much longer their free collaboration with the whole of the European Press, on account of the persistent theft of their wireless reports.

The official wireless reports broadcasted from the C.T.O. through Leafield naturally played a great part together with our own. This time, as hitherto, it was proved that, as regards speed and sure political view, these communications can scarcely be surpassed by anyone. This London service, now known throughout the world, is compiled and broadcast by a few people in London with a breeziness and freedom, from which many an authority in Germany might well take example.

The Air-Mail also proved a reliable and convenient means of transmission for the less urgent copy."

NEW SWEDISH TELEPHONE RATES.

NEW rates came into force in Sweden on July 1 last. They are divided into two classes : (1) those applicable to exchanges with less than 50 subscribers ; and (2) those applicable to exchanges with 50 subscribers and upwards.

EXCHANGES WITH LESS THAN 50 SUBSCRIBERS.

In the first case the subscribers bear in equal shares the cost of the premises and of the staff. They also bear the cost of the erection of their individual circuit and telephone apparatus. No arrangement comparable with this exists, of course, in Great Britain. The rates are :—

(A)—NORMAL AREA.

	£	*s.*	*d.*
Up to 900 calls	2	15	0
,, 2,000 ,, ...	5	10	0
,, 4,000 ,, ...	8	5	0
Above 4,000 ,, ...	11	11	0

(B)—EXTENDED AREA, *e.g.* EXCHANGES CONNECTED WITH STOCKHOLM.

	£	*s.*	*d.*
Up to 900 calls	3	6	0
,, 2,000 ,, ...	6	12	0
,, 4,000 ,, ...	10	9	0
Above 4,000 ,, ...	14	6	0

Calls to subscribers on the local exchange are not charged for, but only those to subscribers on other exchanges in the area.

EXCHANGES WITH 50 SUBSCRIBERS AND UPWARDS.

In the second case, the State provides all plant and staff in the usual way if the subscribers' premises lie within a given zone, but the subscriber has to pay an entrance fee of £1 7*s.* 6*d.* and a supplementary charge of £1 7*s.* 6*d.* or 16*s.* 6*d.* for apparatus according to the type selected. The annual charges are :—

	A.—Normal Area. £	*s.*	*d.*	B.—Extended Area (except Stockholm and Gothenberg). £	*s.*	*d.*	C.—Stockholm and Gothenberg. £	*s.*	*d.*
Up to 1,200 calls ...	3	17	0	4	8	0	4	8	0
,, 2,500 ,, ...	6	1	0	7	3	0	7	3	0
,, 5,000 ,, ...	9	18	0	11	11	0	12	13	0
,, 8,000 ,, ...	13	4	0	16	10	0	17	12	0
Above 8,000 ,, ...	15	8	0	18	14	0	19	16	0

Additional line, £2 15*s.* 0*d.* per annum.

The line is provided by the Administration within a radius of 500 metres in small places, and within the limits of the town or municipality in the larger places. Outside the free zone, again, the line is provided at the subscriber's cost. Where a pole line exists this is reckoned at £1 2*s.* 0*d.* per kilometre per year, plus an initial charge of £5 10*s.* 0*d.* Where a pole line has to be built the charges are £1 2*s.* 0*d.* and £13 15*s.* 0*d.* respectively.

British telephone rates, as our readers know, fall into three groups : (1) for London ; (2) for Birmingham, Glasgow, Liverpool,

and Manchester; and (3) for other places. In comparing them with Swedish rates it should be remembered that Sweden possesses no city which, in point of size, would fall within the first two categories; even Stockholm is not so large as Leeds, Sheffield or Edinburgh, which fall into group (3).

MEUCCI AND THE TELEPHONE.

WE have received the following from a correspondent :—

In the August number of the TELEGRAPH AND TELEPHONE JOURNAL, page 190, there is an article on "Who Invented the Telephone?" and a reference is given to the Italian story, ascribing this right to Antonio Meucci. I assume that the statements made are taken from an Italian source, and I think you may care to have some particulars of the case, as decided in the American Courts. The relevant court decision was given in the Circuit Court of the United States Southern District of New York, in a suit brought by the American Bell Telephone Co., against the Globe Telephone Co. The case was tried by Judge Wallace, and the opinion of the court was filed on July 21, 1887. The judgment is a fairly long one, but the following quotations from the judgment, I think, bring out the essential points :

Page 2. . . . "The answer of the defendant Beckwith consists of a general denial of the averments of the bill, and sets up the priority of the invention of Meucci." . . .

Page 6. . . . "But the proofs failed to show that he (Meucci) had reached any practical result beyond that of conveying speech mechanically by means of a wire telephone. He doubtless employed a metallic conductor as a medium for conveying sound, and supposed that by electrifying the apparatus or the operator he could obtain a better result." . . .

Page 7. . . . "Meucci states that he employs 'the well-known conducting effects of continuous metallic conductors as a medium for sound, and increases the effect by electrically insulating both the conductor and the parties who are communicating.' As originally expressed by Mr. Stetson (a patent expert and solicitor consulted by Meucci) it contained this statement—'The system on which I propose to operate consists in isolating two persons, separated at considerable distances from each other, by placing them upon glass insulators, employing glass for example at the feet of the chair or bench on which each sits, and putting them in communication by means of a telegraph wire.' As amended pursuant to Meucci's instructions, this statement was qualified as follows :

"It may be found practicable to work with the person sending the message insulated, and with the person receiving it in free electrical communication with the ground; or these conditions may possibly be reversed and still operate with some success." . . .

Page 8. . . . "It is idle to contend that an inventor having such conceptions could at that time have been the inventor of the Bell telephone. The application does, however, describe a mechanical telephone consisting of a mouthpiece and earpiece connected by a wire. A letter written by Mr. Stetson of the date of Jan. 13, 1872, is in evidence and is important as confirmatory of the conclusion that beyond this the invention was only inchoate. This letter was written to Meucci when the latter was in communication with Mr. Stetson in reference to obtaining a patent for the invention. In this letter Mr. Stetson in substance advised Meucci that his invention was not in a condition to patent, telling him that it was 'an idea giving promise of usefulness' and the proper subject of a caveat, but requiring many experiments to prove the reality of the invention.

Without adverting to other evidence tending to indicate that Meucci was merely an experimentalist who had not produced anything new in the art of transmitting speech by electricity, it suffices to say that his pretensions are overthrown by his own description of the invention at a time when he deemed it in a condition to patent, and by the evidence of Mr. Stetson." . . .

THE CONCLUSIONS OF THE PAN-EUROPEAN CONFERENCE IN PARIS.

(A GERMAN VIEW.)

THE question of *speech transmission* formed the most important part of the deliberations. The preliminary conference had based its proposals practically on American-English experience and had not regarded the methods specially developed in Germany for the technical handling of trunk telephone traffic. Since the German technical officers were invited to the Conference to give information on the German system and its results, the earlier conclusions were so altered that American-English and German methods (as also the methods of construction applied with success in other European countries) remain side by side as equally justified. An attempt of the American Western Electric Company by the dissemination of a brochure decrying the German sources of supply to drive the German industry from the field had no success, as it was an easy matter for the German representatives to demonstrate the unsoundness of their conclusions.

Since the meeting opportunity has been given, at their wish, to the representatives of a large number of States (including England and France) to satisfy themselves by their own observation of the working of factories in Germany of their ability to supply.

The regulation of *Traffic Questions* has not progressed far as views on this question are very divergent. One must limit oneself, therefore, to putting together the points of view on which the standing sub-committee will first work out proposals which will be considered at the next meeting of the Comité Consultatif International.

The main principles of *Maintenance of Lines* were adopted almost unaltered according to the decisions of the preliminary conference. These views are generally held and correspond to the principles applied generally in well ordered systems.

The *Construction programme* of the Preliminary Conference was limited to connections between the West European countries represented at its meetings. The new Conference had the task of extending this programme to an all-European system. The representatives of each country agreed what connections were necessary between their respective networks and in what order of necessity. These proposals were combined by the Permanent Secretary in a complete list, printed at the end of the General Principles. From this list it results straight away that the great majority of these connections will only be practicable if trunk cables are available for the sections concerned. The first and most important task will consist in connecting up the trunk telephone networks of the European countries (both those existing or in hand) on sound and sure traffic lines. Only when the lines are laid can the train service be arranged.

A notable step forward could be taken if the trunk cables planned long since by the German Administration in the Rhineland, whose construction is hitherto hindered by the Occupation officials, could at length be completed. With one stroke the West European telephone system—England, Holland, Belgium, France, Switzerland, and Germany—would be united and the kernel of a European system created, to which soon also the northern lands and Italy, as well as Czecho-Slovakia and Austria would be joined. We know that this question was dealt with at the Paris meeting. May it finally succeed in overcoming resistance.

(From *Das Fernkabel*, abridged.)

TELEGRAPHIC MEMORABILIA.

"WHEN all men speak well of thee, beware!" so says the proverb; and really both the London telegraph and telephone services need to hide their blushes just now, seeing the complete satisfaction which appears to have been given on the occasion of the historic London Conference, especially as regards the prompt and courteous service rendered by every official concerned during that period of extreme pressure, special arrangements, and no little anxiety. The German Delegation very particularly emphasised this in a communication to the Postmaster-General which tendered their "sincerest thanks for the facilities granted by the G.P.O. to the Delegation with respect to the telegraph and telephone services. The excellent working of all branches of communications," the letter goes on to say, "and especially the willingness of all the officers of the Central Telegraph Office have done much to facilitate the labours of the Delegation and to shorten the time for the result to be reached."

From the French and Belgians have also come appreciations, but more was to follow, for a few days after the German Press syndicate in their recognised organ, *Deutsche Presse*, paid a very generous tribute to London efficiency. A translation of this appears in another column of our present issue.

Then, to subdue our conceit as a Government organisation, there came a column or two in the London daily Press severely calling the department to account regarding certain wireless services, and directing attention to the fact that high-speed wireless was not secret, and that, given the necessary apparatus, telegrams could be picked up very easily. The "discovery" was made in the article in question by the critic that, in the case of high-speed (it is presumed the writer alluded to high-speed Wheatstone or Morse signals), someone had brought the dictaphone into use in connexion with fast-speed reception.

For the information of our friend it may be very definitely stated that the use of the dictaphone in connexion with wireless reception was known before the war, to be exact in 1911.

The remainder of the article does not really come within the scope of this journal's policy, but one cannot refrain from remarking that one's repeated experience with the lay press in these and kindred subjects is that the modern daily newspaper is ill-informed, and not infrequently out of date.

It was a blow to many of his associates, and perhaps more particularly to those in the telegraph service who knew him in the strenuous later years of the last century and the very early years of the present, to hear of the death of McKinney. As I write I can see him at conferences, rising to points of order, his arresting voice announcing in a tone and accent ever afterwards recognisable and never to be denied, "McKinney, Liverpool." The very writing of those two words brings back the ring of that voice and re-constructs one's vision of a man with a purpose, and that an unselfish one. My own tribute best vocalises itself in the recent words of William Davis when writing of our esteemed and—may we not truly say it?—our beloved colleague:—"The men and women for whom he laboured will not lightly pass over the record of McKinney, nor fail in the years to come to remember this warm-hearted colleague, unselfish advocate, and faithful servant."

The following interesting error occurred during the transmission of a telegram over the telephone, and with due humility I would beg to submit the same to our acoustic experts of the sister service as to whether the mistake was likely to have been caused by line distortion or by an all too strong accent from the North.

The telegram in question was received in the C.T.O. as follows:—"Aldwayne Achithbuie Garve Russia," but the destination could not be traced throughout the whole of that rather expansive country. Reference to the office of origin brought the quick reply, "for Russia, please read Ross-shire."

The development of keyboard perforators owing to the mechanical ingenuity and inventive genius of many brains in the telegraph world is beginning to pall, and many are longing for either a lull in the intensity of the brain storms in this particular quarter, with something approaching uniformity of touch and mechanism,—or some nearer proximity to standardisation. Matters are not made easier by the number of different codes now in use with the various multiplex or high-speed telegraph systems. The maintenance staff, a highly skilful and experienced body of mechanics in the C.T.O., must have been hard put to it of late to keep up with repairs, and by no means their lightest task, the modifications to exlsting apparatus.

Our C.T.O. readers are everyone interested in Bart's Hospital, and the following item published by the *Electrical Review* shows that our friend and close neighbour should now easily be capable of beating us on our own ground and of "showing us sparks," but we hope the worst they may do will be to show us some of their "iontoquantimeters"—and to explain their use!

A 1,000-V battery was recently presented by the Chloride Electrical Storage Company to St. Bartholomew's Hospital, London, and installed in the Physicists' Laboratory. The installation consists of 42 batteries of 12 cells of the BK type, mounted on glass insulators, and connected to a switchboard designed by the company's engineering staff. Highly insulated overhead leads connect the battery to different parts of the laboratory. The main use of such a battery is to provide a steady potential for the calibration and use of the various instruments used in measurement of X-ray and radium dosage. Such instruments, *e.g.*, electroscopes, radium balances, iontoquantimeters, &c., depend almost invariably on the ionisation of a gas by the various radiations, the precise measurement of which is essential in modern technique. A reliable battery is indispensable for this purpose. Other purposes for which the battery is designed include its employment with thermionic valves for the amplification of heart and breathing sounds of hospital patients.

The following is extracted from the speech of Senatore Marconi at the Annual Meeting of the Marconi's Wireless Telegraph Coy., Ltd., held on Aug. 15, and refers to the "beam" system:—

"Not only had they been able to establish satisfactory communication with South America by the system, but for the first time in history the human voice speaking in England was easily and distinctly heard in Australia. By reason of its directional characteristics it increased the secrecy of wireless communication; it eliminated to a large extent the atmospheric disturbances which had always been the bugbear of the wireless engineer; in capital cost and in operating charges it was far more favourable than the old system of super stations working on long wave-lengths; and in addition it gave a rapidity of communication which the old h.p. station could never do. Using a power of about one-fortieth of that necessary for a super station, steady and reliable communication could be secured over great distances at a speed of several hundred words per minute. The speed of transmission was limited in practice only by the mechanical devices which it was necessary to employ, and these as at present constructed were capable of working up to two or three hundred words per minute. That, however, would not necessarily represent the limit of the capacity of a station constructed under the new system, since it was possible to transmit several messages simultaneously from the same aerial. The new system offered a prospect of reductions in telegraph rate far in excess of anything which had been previously contemplated, but which would nevertheless secure to the company a substantial margin of profit. Under the agreements which they had made through their associated companies with the Dominion Governments, and by the agreement which they had entered into with the General Post Office, provision was made for a reduction of at least one-third in the cable rates at present charged."

Known methods of steering ships radio electrically are claimed to have been improved upon by an Italian engineer, Mr. Ermanno Fiamma, who a month ago is declared to have carried out satisfactory tests at Spezia in the presence of representatives of the Ministry of Marine. According to the inventor's statement, his chief improvement is that the instruments devised by him are not affected by atmospheric disturbances or radio-electric interference. He made satisfactory experiments last year at Spezia, says the *Daily Telegraph*, whereupon the Minister of Marine delegated a special commission to make new observations. The third and final series of experiments were made last month in the presence of this commission. A submarine chaser was placed at his disposal, and a destroyer manœuvred at a distance of ten miles, sixty different commands being given and satisfactorily executed in heavy weather. The chaser was made to leave port and proceed in various directions, at a speed of 20 to 30 knots, being absolutely under the control of the engineer in charge of the operations on board the destroyer.

An experiment on similar lines was carried out recently at the Wembley Exhibition. This had for its object the starting and stopping of a 500-kW sub-station equipment exhibited by the Metropolitan-Vickers Electrical Co., Ltd. By the use of valve relay apparatus the machine was set in operation and stopped by radio signals transmitted from the company's Trafford Park works, 170 miles distant. The signals were made audible through a loud speaker on the stand at Wembley.

Do it Electrically! According to the *Irish Times*, Dublin, and the *London Daily Telegraph*, electrical signalling and automatic train control is developing well on both sides of St. George's Channel as the following two paragraphs will indicate.

Within the last few weeks the outlying junction near Charleville, Irish Free State, where trains for Limerick leave the main Cork and Dublin line, has been fitted with apparatus which enables the signalman at Charleville to set the points at the junction for either the main or branch line electrically. Electricity for moving the points and for operating the signals is generated by the signalmen and transmitted by overhead wires to electric motors at the junction points. Each motor moves its own set of points to the desired position, and indicates back to the signal cabin when its function is completed.

The Metropolitan Railway Co. has brought into use at Baker Street Station, London, a new signal-box operated entirely by electric pwer. It will control the movement of 1,774 trains daily, permit of greater flexibility of traffic, and materially increase the handling capacity of this important station. An illuminated diagram in the signal-box informs the signalman of the position and movement of every train within a three-mile zone. The power frame comprises forty-five levers, operating twenty-one sets of points, thirty-five signals, and eleven route indicators. The power-worked points have also been reorganised; whereas three sets took seven and a half seconds to operate in the past, they can now be operated in two and a half seconds. Each point and signal lever is fitted with electric locks controlled by passing trains. A spacious relay and fuse room has been provided, containing track indicating relays, and three-position point indicating relays.

The Department of Overseas Trade has published a report entitled *Economic Conditions in France*, and may be purchased from H.M. Stationery Office, London, at the price of six shillings net. It is thoroughly up to date,

IRISH FREE STATE.—The Free State Department of Posts and Telegraphs has undertaken to introduce the automatic telephone system into the Dublin metropolitan area, and also the suburbs to a distance of five miles. The complete installation will take five years, but the first section will be in use in one year, viz., in the south-west area. The complete installation will cost £500,000, and will allow for an extension of 100,000 lines. At the outset provision will be made for 15,000 subscribers. The money will be obtained by a loan system, and automatic telephone users will not pay any additional charges.

JAPAN.—It is to the *Financial Times* we are indebted for the report that plans are under way for the formation by the Mitsui, Takata, and other interests of a Metropolitan Broadcasting Co., which will be licensed by the Department of Officials for broadcasting in the Tokyo area. The new company will be capitalised at 2,000,000 yen, one quarter paid up, and is expected to start operations early next year. Subscribers to its service may either purchase or lease their receiving sets. The company's radius will be 100 miles only, it being the intention of the authorities to licence other concerns for broadcasting in other areas.

MADEIRA.—RADIO STATION SHUT DOWN.—It is reported that the Funchal radio station is not working owing to a machine having burnt out, and that a date cannot be given for the re-opening.

NEW ZEALAND.— The Happy Land ! In the last fiscal year the New Zealand Post and Telegraph Department had a surplus of revenue over expenditure of £568,000.

SOUTH AMERICA.—The adoption of a new programme for the promotion of radio-broadcasting in Latin America by American interests following the abrogation of an agreement under which the American companies had jointly participated in South American radio business for the past three years with England, France, and Germany, was announced on July 24 by General J. G. Harbord, president of the Radio Corporation of America, who said the new plans gave the United States its first unrestricted opportunity to utilise fully its resources in developing radio in South America, and five of the principal countries of the continent, Argentina, Uruguay, Chile, Venezuela, and Brazil will benefit. The plans not only include a change in the system of distributing merchandise, but involve the introduction of a practical method for supporting broadcasting, which will be first applied as a trial to the station at Buenos Aires.

SWEDEN.—It is expected that the Grimeton radio station will be completed early in October. Four masts out of six are now finished and the station will be opened for traffic by the end of the same month.

U.S.A.—The Association of Radio Broadcasters has issued a statement, says the *Evening News*, stating that broadcasting cannot continue on the present basis and announcing a plan to stabilise programmes by paying the artistes. This Association, which includes practically all the important stations in the United States, would compel the stamping of all radio parts based on ½ per cent. of the retail price. It is estimated that this would yield £300,000 per annum with which to pay the artistes.

While this controversy is raging, however, the first municipal radio station has been installed in the Municipal Building, New York, at a cost of approximately £10,000. It is proposed to send out popular concerts and to attract a regular audience which can be informed of civic news and events. The city of Durban, South Africa, is also going to have a municipal station.

VENEZUELA.—According to *Commerce Reports* one of the States of Venezuela has been granted permission to construct a telephone line, approximately 340 km. in length, to connect neighbouring territory.

WEST INDIES.—The laying of an "all red" cable between Georgetown (British Guiana), Barbados, Trinidad, and Turks Island has been completed. According to *The Times* the shore stations are being equipped and within the next two months the service will be opened, thus bringing Jamaica, Bermuda, and Halifax (Nova Scotia) in direct communication with three of the Eastern Caribbean colonies.

ZULULAND.—The Johannesburg radio broadcasting station—commonly known as "J.B.," has been distinctly heard in central Zululand.

I hope I am not occupying too much space, but just to close this month's Memorabilia, here are some extremely interesting particulars regarding "*Wired* Radio" Broadcasting, a summary of the two years' experiments which appeared in the July number of the *Electrical World*. A two-channel service has been developed, and the indications are that it will be possible to broadcast at least three programmes simultaneously over any electric lighting system. The transmitting apparatus is connected to the three-phase, 60-cycle, 2,300-volt power line through protective tuning condensers at a sub- or generation station ; the receiving set is connected to the consumers' 110-volt lighting mains through a pair of wires and plug. A fundamental idea of the scheme is the renting, instead of selling, of the receiving equipment.

Frequencies varying from 100,000 to 30,000 cycles per second (wave length 3,000 m. to 10,000 m.) were employed, of which those in the neighbourhood of 60,000 cycles (5,000 m.) apparently yielded the best reception results. The radiation from the lines, or "radio effect," decreases rapidly as the frequency is decreased. The effect of the presence in the lines of induction voltage regulators is that the series winding exercises an appreciable choking effect upon the high-frequency current at all frequencies. This could be eliminated, however, by connecting in parallel with this winding a series circuit comprising an inductance and capacity tuned to the transmitting high frequency. A condenser alone was found to be ineffective. With the transmitting apparatus connected to the line side of the regulator the choking action was used to advantage to prevent absorption of high-frequency energy in the switchboard wiring and connected power apparatus.

Two types of receivers have been developed ; the crystal detector has only a single adjustment, while the loud speaker contains two steps of audio-frequency amplification. The plate and filament energy are obtained from the 110-V. a.c. or d.c. source. The extreme simplicity of the receiving apparatus, the fact that it can be plugged into any light socket in any room, requiring no aerial, that no storage batteries are required, that there is no interference from static or other stations, and that the apparatus is "serviced," operated greatly in favour of wired radio. There is a tendency toward unequal distribution of the high-frequency current over the primary feeders and a diminution of signal strength at night, which has been overcome by controlling the amount of high-frequency power admitted per feeder at the command of the operator and by raising the entire power level at night. Within a few weeks it is expected that three-programme operation will be commenced on Staten Island and subsequently on other lighting systems. Connecting fan motors, vacuum cleaners, flat irons or similar apparatus to the 110-volt. line does not diminish the signal strength or produce undesirable noise, provided that, in the case of rotary apparatus, there is no sparking at the commutator. Connexion of a heater unit or other type of low-resistance, non-inductive load reduces the strength of the incoming signals.

An Easy Job.—It's easy finding reasons why other folks should be patient.—GEORGE ELIOT.

J. J. T.

FROM AN OLD PRESS CUTTING BOOK.

I.—THE LONDON—BIRMINGHAM TRUNK LINE.

IT is hard to realise that 35 years ago there was no telephonic communication between London and the North. A fairly extensive network reached from Birmingham to Manchester, Liverpool, Leeds, Preston, and other northern towns, but the connecting link with London was not then completed. Two cuttings from local newspapers of Jan. 24 and 25, 1890, record an interesting stage in the progress of that important trunk line.

"A meeting practically unique in its way and one which 20 years ago would never have been dreamed of," says the *Hendon & Finchley Times*, "took place at the Chandos Arms, Edgware, about eight miles from London, on Wednesday afternoon. . . . Until Mr. Bell invented the celebrated instrument in 1875 which bears his name, the idea of connecting London with Liverpool and to ask a question in that town, 250 miles away, and to get an answer direct into one's ear in the space of one second, would then have been deemed incredible. At the demonstration in question, which took place in the large room at the above-mentioned hostelry, the circuit, as it is called, was opened throughout its whole length."

This was not quite correct, and we now take up the tale from the *Edgware Reporter* :—

"The proposed line from the North to London is now perfect as far as Edgware, and the Company is only awaiting the permission of the Hendon Local Board to erect the poles and carry the wires throughout their district, to thus enter the great metropolis. We feel sure that after Wednesday's display of the wonderful merits of the invention, and the great boon it must of necessity become to mankind generally, the Board will no longer withhold that permission, which will bring London and Liverpool within speaking distance of each other. The wires had been temporarily connected with a room at the hotel, and on the invitation of the Company a number of gentlemen of the neighbourhood assembled to observe

the mode of working, and to correspond with places in the Midlands and north of England, through the medium of the telephone. During the afternoon the wire was connected with one of the Manchester theatres, and those present at this end, some 200 miles away, were gratified by being able to hear distinctly the pantomime being produced there. A cornet solo was played into the instrument at Sheffield, and was heard with perfect ease, as was also a solo from "Dorothy" whistled at the same place. A gentleman at Birmingham gave a capital rendering of the well-known comic song, "Hauled me back again." This could be heard quite clearly, so clearly, indeed, that it seemed almost incredible that the performer was at the very moment upwards of a hundred miles away. Ordinary conversation was equally distinct. Nottingham, Derby, Leeds, Bradford, Liverpool, and other towns were also spoken with, one gentleman near Liverpool replying from his private residence. At the conclusion of the experiments, all the visitors expressed themselves thoroughly convinced as to the great utility of the telephone. For our part, we sincerely hope that the time is not far distant when the line will be completed, and London thus placed in direct telephonic communication with all parts of England."

We do not remember whether the Hendon Board, moved by this performance, relented, and accorded the necessary wayleave powers to enable the line to be carried to Cricklewood, but we do know that such insuperable difficulties were placed in the way of carrying the line through the parish of Hampstead that the Company was forced to adopt the more costly expedient of obtaining an "easement" over the Great Northern Railway Company's route from Edgware to Finsbury Park, and that the Birmingham line was ultimately brought to London some months later by this means.

One of the difficulties invariably encountered by historians in their search for truth is some trifling discrepancy between precious records which he finds hard to reconcile. Such a discrepancy was not wanting in this instance, for, while the Edgware reporter (who was present) says that the Birmingham gentleman rendered "the well-known comic song 'Hauled me back again,'" the Hendon journalist, who was also present, heard "the strains of the celebrated comic song 'I was fairly in it,'" At any rate, however much the Muse of History may deplore the fact, it seems fairly well established that the new era was ushered in with cornet and comic songs.

W. H. G.

THE LATE MR. GEORGE R. ADAMS.

IT is with the deepest regret that we record the death of Mr. George R. Adams, late Superintendent, telegraphs, who retired from service in the C.T.O. only last year on account of ill-health.

His activities in religious and social work were constant and thorough, for whatever G. R. A. did, he did with all his heart and soul, and spared not himself. No one possibly will ever know how much of the work he gave for others contributed to his, humanly speaking, premature departure.

His was a practical life. Connected with Sunday School work for well over half a century he was an active member of Library, Temperance, School Building Fund and Visitation committees of the Battersea Auxiliary of the N.S.S.U. from 1890 onwards.

As a writer on ancient history, of the Near and Middle East particularly, Mr. Adams was crisp, clear, and always reliable. As a citizen he performed his humble part during the war in the City of London Police Reserve.

To his sorrowing wife and family is offered the kindliest and tenderest expression of sympathy from his colleagues combined with their keen appreciation of a life well and truly lived.

J. J. T.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE number of new stations added to the telephone system during July (18,177) was almost up to the high average of recent months, but, as is usually the case in the first month of the quarter under the present system of accounting, the cessations also were heavy, and the net growth for the month was reduced to 7,941. This increase was an improvement as compared with July, 1923, and brought the total number of stations at the end of the month up to 1,197,201, of which 423,697 were in London, and 773,504 in the Provinces.

The rapid development in Residence Rate lines continues, and during July there was a net addition of 2,407 circuits, the total at the end of the month being 197,369. The number of these circuits increased during the 12 months ended July by 33,961, or 21 per cent., whilst in the same period the number of Business Rate circuits increased by 41,202 or 9 per cent.

A further 24 exchanges in rural areas were opened in July, and at the end of July 527 of the 649 exchanges which have been authorised since the inception—two years ago—of the Rural Exchange development scheme were working.

The number of public call offices working on July 31 was 18,137, or 96 more than the June total. Call offices installed in kiosks in public thoroughfares numbered 726, the net addition of 319 in July being above the average.

So far as can be seen at present the reduction in the charges for local calls on July 1 led to no immediate increase in traffic. The average calling rate per line at the larger exchanges in July shewed some improvement as compared with July, 1923, but the increase was no larger than that indicated by similar comparisons for the earlier months of the year. The full effect of the reduction in charges, however, will not be known until later in the year.

The trunk traffic continues to grow, and the number of inland calls dealt with in May was easily the best on record, exceeding the previous highest monthly total, that for January, 1924, by over 200,000, and the total for May, 1923, by over 900,000, or 16 per cent. There has also been a substantial increase this year in Anglo-Continental traffic, and in May the number of outgoing calls was 23 per cent. higher than in the corresponding month of 1923.

Further progress was made during the month of August with the development of the local exchange system. New exchanges opened included the following :—

PROVINCES—Swansea (Automatic).
Sketty (Automatic).

And among the more important exchanges extended were :—

LONDON—Enfield, Hornsey, Latchmere, Palmers Green.

PROVINCES—Birmingham Central). Gravesend.
Birmingham (Midland). Higher Broughton.
Beauchief. Sheffield (W).
Cardiff. Urmston.
Folkestone.

During the month the following additions to the main underground system were completed and brought into use :—

Glasgow—Stirling, section of Glasgow—Stirling—Falkirk cable.
Burnley—Colne.
Hanley—Stafford, section of Birmingham—Manchester cable.
Wakefield—Barnsley—Sheffield.
London—Romford.

While 57 new overhead trunk circuits were completed, and 73 additional circuits were provided by means of spare wires in underground cables.

The
Telegraph and Telephone Journal.

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Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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THE TELEPHONE DEVELOPMENT OF EUROPE.

THERE were at the end of 1923, according to the latest official returns, 5,500,000 telephones in that part of Europe comprised in an area reaching from the North Cape to Styria, and from the east of Germany to the western boundaries of France and England, and thus embracing Sweden, Norway, Denmark, Germany, Austria, Holland, Belgium, Switzerland, France, and Great Britain. The population of these states is 179 millions; that of the whole of Europe is 475 millions. It is not generally realised that if the telephone development of the rest of Europe were proportionate to that of these western and northern states it would reach a total of upwards of 15 millions, and very nearly equal the total number of telephones in North America.

There are, of course, many reasons why the progress of the telephone in parts of Europe is backward. The four years lost in the Great War meant to many states not merely a standing still, but a positive retrogression. The unsettled economic conditions which have prevailed ever since the Armistice have rendered it impossible for the poorer countries to develop their industries, and the social upheaval in Russia seems to have resulted, as a report which we print elsewhere would indicate, in a declension of the telephone system to the small total of 112,000 stations. In 1915, in a larger area, it is true, there were 325,000 telephones in the Russian Empire. These figures speak for themselves. The American States have suffered from none of these setbacks, and there are no regions over there where the conditions of life are so primitive as in parts of the south and east of Europe. Nevertheless, there are some consoling features in the statistics for last year, and there are evidences of reorganisation in some of the more poorly developed countries which may be expected to yield good returns in the near future. It is, moreover, satisfactory to note that, in the ten states within the boundary we have indicated, the total number of telephones has risen from 4,250,000 in 1919 to 5,500,000 in 1923.

THE TELEGRAPHS, THE TELEPHONES, AND THE LONDON CONFERENCE.

AUGUST, 1924, will go down to posterity as the month in which an historical milestone was reached in the story of Europe. It was the month in which *the* London Conference was held.

Never before, probably, at any international conference held in this country have the international telegraph and telephone systems been so intensively used as during this momentous gathering. Certainly it is the first conference at which England and Germany have been able to confer by telephone between their respective capitals. There were defects in the "relayed" service no doubt. The arrangements were of a makeshift character, and the communication could not be described as direct, but it was none the less useful.

We have been thanked for services willingly rendered, and help freely and unreservedly given, and some of us marvel why we should be thanked at all.

Yet the sensation is a pleasant and gratifying one, and if as we believe so many of the delegates were really well satisfied with our efforts, all we would add as British officials would be to return thanks to those who, in the midst of heavy responsibilities and the weight of the destinies of nations upon them, yet found time to write appreciative words to us and about us.

HIC ET UBIQUE.

WE read in the *Morning Post* that the administration of the Moscow Soviet telephones has officially warned all subscribers and users of the telephone, according to the Moscow *Isvestia*, that in future anyone who addresses one of the telephone girls at the Exchange as "Miss" will not have his call put through and will be fined. In future, says their Russian Correspondent, all telephone girls, when applied to for a number or on other business, are to be addressed either as "comrade" or as "citizeness"—"in order," says the official announcement, "to put an end to an undesirable survival of the bourgeois age."

"AN official of the London telephone service called on me yesterday," says a writer in the *Daily Express*. "He desired, said he, to bring to my notice my paragraph about suggested exhibits

in post office windows. He wanted to know at which tube station I had discovered the out-of-date telephone directory. I said, very humbly and apologetically, that I was merely trying to be funny. 'You see,' said I, 'this column is not always entirely serious.' He said, 'I see,' and took his departure."

Unfortunately, so many of our critics, who support their diatribes with "inexactitudes" are not usually "trying to be funny."

THE London correspondent of the *Liverpool Post* pays the following tribute to the present state of the service:

In fairness, should it not be said that the service has improved greatly of late? If you write to the telephone powers you receive almost as prompt and polite a reply as from any tradesman; if telephone workmen come to your house they are so courteous and engaging that one forgives them even when they promise that which they do not immediately perform. Not for many a month have I come in conversational contact with male or female official at the exchanges who has been anything but agreeable, not to say patient, even when I have insisted on calling up "Central" when it was "Regent" that was wanted, or "Western" only to discover it was "Park." I meant, the endurance and civility of the unseen presence at the other end of the wire did not fail.

As a matter of fact, users of the telephone are not altogether blameless always. They are rather apt to ignore the instructions with which their book of numbers is generously supplied, and some of us are not above the weakness of speaking sharply to the operator who fails to give instant satisfaction. More rudeness is met with from people who ring one up and find they are on the wrong number than from officials, and in the case of such wrong numbers rudeness is insult added to injury.

Taking it all round, delays in receiving an answer, in being put through, abuse at the tongues of those who find us "wrong numbers," irritation at being told numbers are engaged when we know they are not, indignation at being overcharged, these, and other things notwithstanding—the telephone is a boon and a blessing much more than it is a curse, and will become more valuable when it is supplied at a rate reasonable enough to make its use more general. Even as it is, the indignant subscriber who has it removed is cutting off his nose to spite his face.

THE *Gaceta*, of Madrid, publishes a decree transferring the control of telephone services throughout Spain to the National Telephone Company, formed with Spanish capital and employing United States experts of the International Telephone and Telegraph Corporation. Automatic exchanges are to be installed at all important centres as soon as this can conveniently be done.

Large extensions of internal and external communications are planned, and a royalty of 10 per cent. in the profits will be paid to the State.

IT is reported, says the *Electrical Review*, that an English firm has signed a contract for the installation of automatic telephone systems in Athens, The Piraeus, Salonica, and Patras.

WE learn from the *Irish Independent* that the Department of Posts and Telegraphs has undertaken to introduce the automatic telephone system into the Dublin Metropolitan area, and also the suburbs, to a distance of five miles. The complete installation will take five years, but the first section will be in use in one year, viz., in the South-West area. The complete installation will cost £500,000, and will allow for an extension of 100,000 lines. At the outset provision will be made for 15,000 subscribers. The £500,000 will be obtained by a loan system. Automatic telephone users will not pay any additional charges.

THE increased use of automatics goes steadily onward. Amongst recent Government contracts given out to British firms we note that the Relay Automatic Telephone Coy. has been commissioned to deliver one 50-line "Relay" exchange for the Army and Navy Air Force Hospital, Chatham, and one 550-line automatic telephone installation at H.M. Dockyard, Chatham.

THE following report appears in the *Telephone Engineer* of Chicago. The source is not indicated, but we assume it is an American Consular report.

"Russia has only 112,000 telephones to serve a population of 131,000,000 people, according to the latest figures available. In other words, there is one telephone for every 1,169 people in the Soviet republic, as against one telephone for every eight people in the United States at the same date. The Russian Government telephone system showed an actual net decrease during a single recent year of about 58,000 telephones, and the mileage of telephone wire in service also dropped substantially.

During 1922 the population of Petrograd increased from about 700,000 to over 1,000,000; but the number of telephones in operation in that city decreased in the same period from about 40,000 to 8,966. Even in Moscow, the capital and centre of Soviet activity, the number of telephones fell during 1922 from over 54,000 to about 25,000, although the population grew in the same period from 1,028, 218 to 1,511, 025."

WE have received from Messrs. Rentell & Co. a useful little book compiled by Mr. Alec B. Eason, entitled *Where to Seek for Scientific Facts*. It is a short list, with notes of books, periodicals, catalogues, and bibliographies, dealing with scientific subjects and is provided with an index. The price is 1*s*.

LONGEST THROUGH TELEPHONE CIRCUIT IN THE WORLD—CHICAGO TO LOS ANGELES.

THE longest through telephone circuit in the world, from Chicago to Los Angeles, is now serving the growing telephonic needs of the great Southwest.

It is the fact that this is a "through circuit" instead of a "built-up circuit" that makes this new development important from the service standpoint. A "through circuit," as its name implies, gives a permanent, through connexion between the two cities at which it terminates. A "built-up circuit," on the other hand, has to be "built" for each call by switching or connecting together a number of shorter circuits between intermediate cities along the line.

When the New York—San Francisco Transcontinental Line was opened in 1915 it was operated for several months as a through circuit, 3,400 miles in length, but it was later cut in two, for operating reasons, the division being made at Chicago. Los Angeles and its surrounding territory have hitherto been reached by switching the circuit over this original Transcontinental Line to San Francisco and thence down the coast.

New facilities, recently put in service, provide a direct circuit, without the necessity of switching, from Chicago to Denver and thence to El Paso, Tucson and Phoenix to Los Angeles. The circuit is 2,937 miles long—more than 500 miles longer than the Chicago—San Francisco circuit, more than 1,200 miles longer than the New York—Havana circuit, and more than 1,500 miles longer than the New York—New Orleans circuit, which have hitherto held the record for through circuit length among the "speech highways" of the world. The longest through circuits in any country of Europe are the Berlin—Essen circuit, 342 miles, and the London—Glasgow circuit, 418 miles.

The use of telephone repeaters along the line gives a normal transmission equivalent of twelve miles—that is, it is possible to talk from Chicago to Los Angeles, over this circuit, as efficiently as one could over a standard Number 19 gauge cable circuit, without loading or repeaters, twelve miles in length.

Thirteen through line repeaters are used. The use of these repeaters, an essential feature of which is a vacuum tube amplifier somewhat similar to that which is familiar to all radio enthusiasts, has aided materially in making long distance transmission possible. The farther a telephone current travels unaided, the weaker it becomes. The effect of a repeater is to catch this weakened current, amplify it many times and speed it on its way with renewed strength.

At night, when traffic is heaviest, an additional through circuit from Chicago to Los Angeles is obtained by connecting together a Chicago—Denver, a Denver—El Paso, and an El Paso—Los Angeles circuit.

Although long distance lines had been built along the route of the new "Southern Transcontinental," the existing pole lines at some points were already carrying capacity loads or were otherwise unsuitable, and it was necessary to construct additional pole lines to carry the new through circuits. This new construction includes a stretch of some seventy-five miles between Denver and Colorado Springs and another in New Mexico, between San Antonio and Rincon, where about ninety miles of new pole line was built.

The tourist bent on getting a comprehensive view of the varied geographic, topographic, and climatic conditions in America might well follow the line of this longest through telephone circuit. He would find rough mountain country from Denver south, with the highest point of the line reached at Raton Pass, near the Colorado—New Mexico boundary, where the altitude is 7,600 feet. He would pass through long stretches of desert sand, lava beds, cactus country, arid lands reclaimed by irrigation, orange groves and cotton plantations. At Salton, just over the California border from Arizona, he would find that the line dips into a depression of 200 feet below the sea level.

Thus, from the heights to the depths, from rugged mountain lands to a perennial summer Paradise, this continent-spanning circuit winds its way, playing its important part in uniting a nation in the bonds of speech.

The circuit was put in service on Dec. 22, 1923.

(R. T. BARRETT, in the *Telegraph and Telephone Age.*)

LONDON ENGINEERING DISTRICT NOTES.

London Engineering District (Headquarters) Football Club.

THOSE who are interested in sport, and football in particular, will no doubt remember the interest and enthusiasm aroused early this year by the revival of the C.B. Clay Challenge Cup Competition. So far as the Headquarter staff is concerned it had a most beneficial effect in bringing closer together, as nothing else has done, a staff drawn largely from all quarters of the Kingdom. It is the firm conviction of many of the staff that this good work should continue, and to further this end a regular football club has now been formed.

Finance, as usual in service sports organisation, has been the big stumbling block, but this question has been tackled with laudable initiative and resource. If the progress already made may be taken as a guide the success of the venture from both the athletic and social point of view seems to be assured.

The club is affiliated to the Civil Service Football Association and the London Football Association. The use of a good private ground near the Toll Gate, Dulwich, has been secured and an excellent list of fixtures has already been arranged for the two elevens (a senior and a junior) that will be run during the season. Also, the ambitious step has been taken of entering for the Civil Service Athletic Association Championship Cup (better known as the "Lewis Cup"). The club drew a bye in the preliminary round and meets the Ministry of Labour (Kew) in the first round.

A strong side will be required if the Club is to go far in the Lewis Cup Competition, but it is hoped to build up a team representative of the London Engineering District, and one able to give an excellent account of itself against other Service teams.

The social side is not being neglected and, as an example, a series of monthly dances has been arranged. The first of these was held at Denman Street on Sept. 12, and it proved to be a very enjoyable affair.

Membership is open for Honorary and Playing members, the minimum subscription for Honorary members being 2*s.* 6*d.* per annum, and for Playing members 2*s.* per month during the season.

Forms of application may be obtained from the Honorary Treasurer, P. E. Rapps, Denman Street.

It is hoped that all those who wish to see a vast organisation like the London Engineering District take its proper place in the realm of sport among other branches of the Service, will accord the new club their enthusiastic support.

THE CONCERTINA.

I FEEL sure that there is something to be said on behalf of the Concertina. To begin with it is portable; you can throw it out of the window if you are so disposed. Then it affords physical exercise to those of us who find that dumb-bells are (as might be supposed) grimly silent things. As an article of furniture it has its demerits, but that is not its central purpose. It will play any tune if only the performer knows how. It is so full of expression that you can throw yourself into it—body, soul, and spirit. It is beloved in the fo'c'sle of ships and in other quires and places where they sing, and though gramophones and broadcasting devices have attempted to thrust it out of favour, the true lover of the Concertina can say quite confidently that there is nothing like it. People who are apt to tinker at inventions with a view to improving them have devised what they are pleased to call the "Melodeon," or the "Accordion," but the Concertina holds its own in a firm grasp.

I should not have thought of writing in this place about the Concertina if it had not been for the generosity of an American publisher. He has sent me a beautiful book bound in red (two dollars) bearing the title *Modern Inventions and Their Influence on Civilization.* He has asked me, in a charming letter, to draw the attention of the British public to the merits of the publication, and I gladly do so. At once, let me confess, I find it full of astonishing information. It seems that the Concertina (including its "Influence on Civilization") was invented by Sir Charles Wheatstone. It was an invention which was calculated to "economise human effort." You could play it while you read the evening paper, or while you looked out at the scenery, and it left your feet free for walking or for football or even for playing a gentle accompaniment on the drum. In its complete form it included flats and sharps, and "any composition by a great master" was thus within its compass. It brought music "into the humblest home" and opened up a new vista for the spending of leisure moments. Thus it is that Sir Charles Wheatstone was a benefactor. He saw the human need and set out to fulfil it. He might have spent his time inventing other things, but with high and holy endeavour he devoted himself to the Concertina.

One learns one's ignorance in various ways. Over forty years ago I became acquainted with the name Wheatstone. It has been a familiar name to me all these years. Day by day I have heard of it. I have heard it discussed in America, in Continental cities, in the far East. Men who seemed to know something about it have said that his contribution to civilization was the greatest contribution in our line. They have pointed out the significant fact that for more than half a century one of his inventions has been in the foreground. But none of them ever mentioned the Concertina. And so the name Wheatstone takes on a new connotation. Always honoured, it is henceforward revered.

I once knew a telegraphist who played the Concertina. I regarded him with awe. Now I realize the singular fitness of his devotion. Wheatstone was his idol by day, and then, when he came to cast off the cares of his tumultuous calling, Wheatstone was his idol by night. He could spend his Sundays at it, for did it not include "any composition by a great master"? I know some of our brethren who are expert organists and brilliant pianists, and I confess I have envied them. Now I realize the insufficiency of their devotion. They have not grasped the merit of portability; they have not seen the precious advantages which accrue from leaving their feet free. So, I have done my duty. I have drawn the attention of what, to me, is the most important section of the British public to this revolutionary invention. Henceforward there is only one leisure pursuit for us. There will be joy in Farringdon Road, and in those little shops in dock roads up and down the country of which Kipling writes.

As for those who sit for technical examinations, let them take heed. The kindly examiner may ask them for some information about the inventions of Sir Charles Wheatstone. I beg them not to forget the Concertina.

J. L.

By kind permission of *The Sphere*. (*Photograph by "Topical."*)

The New Telephone Cable Between Holland and England Being Hauled Ashore at Aldeburgh.

THE NEW ANGLO-DUTCH TELEPHONE CABLE.

The successful designing, construction, and laying of this cable marks a new era in telephony, which cannot but quicken the rate of progress and development of long-distance speech between this country and the continent of Europe. It may eventually show the way to sub-ocean speech under the Atlantic. As readers of the T. and T. Journal are aware, cables of this type have been actually laid, and are at present working under the Baltic, but the new Anglo-Dutch cable is the first lead-covered paper-insulated submarine telephone cable to be laid in tidal waters, which are also subject to strong and varied under-currents.

It is to the thermionic valve we must look for the key to the problem now solved. The valve made radical changes in telephone transmission, making good much of the line loss and reducing the need for heavy conductors to a figure which at one time would have appeared ridiculous.

This advantage is somewhat discounted, for while line losses are made good by the valve repeaters, the necessity for raising the standard of non-interference thereby becomes more clamant. The net result has, however, been a very definite reduction in the weight of the conductor.

Prior to the manufacture of the present telephone cable no Anglo-continental telephone cable has contained more than four conductors. The present cable contains four times this number, arranged in four groups, so that by superimposing it may ultimately prove possible to produce more than one dozen phantom circuits.

The contractors, Messrs. Siemens Bros., Ltd., of Woolwich, appear to have provided for every contingency and to have spared neither money nor exacting care in the manufacture. New work-shops and machinery were a necessity, even the iron wire used for the continuous loading of each conductor had to be "diamond-drawn" by special methods and a special form of heating had to be applied to ensure uniform permeability.

Paper-insulated and lead-covered cable has the distinct advantage of low electrostatic capacity plus a low leakance, a combination distinctly favourable to efficient speech transmission. The fact that the manufacturers were able to apply the lead coverings in unbroken lengths of ten nautical miles and to ship, lay, and land the total 82.3 nautical miles of cable without making a joint on board, was a very unusual performance. The total cable of 2,150 tons was carried and laid by the C.S. *Faraday*, the work commencing from Domburg, Walcheren, on the Dutch coast, and terminating at Aldeburgh, Suffolk, on Aug. 29 under good weather conditions.

Here are some of the principal features of the cable as laid down by the P.O. Engineering Department :—

(*a*) Length 82.242 nautical miles.

(*b*) Number of conductors=16, in four sets of quadruple cores.

(*c*) Each conductor to be continuously loaded with iron wire.

(*d*) Dry paper insulation.

(*e*) Two separate lead coverings, with bituminous compound between them.

(*f*) Armouring of galvanised steel wires.

(*g*) Interference between circuits as measured on the standard cross-talk meter, using actual speech, cross-talk between physical circuits, not to exceed 400 millionths (equivalent to 75 miles of standard cable).

(*h*) Overhearing between a physical circuit and its associated phantom circuit not to exceed 4,000 millionths (equivalent to 52 miles of standard cable).

Of the tests taken after the entire cable was transferred to the cable steamer, the following should give some clear and definite indications of the high standard of efficiency reached :—

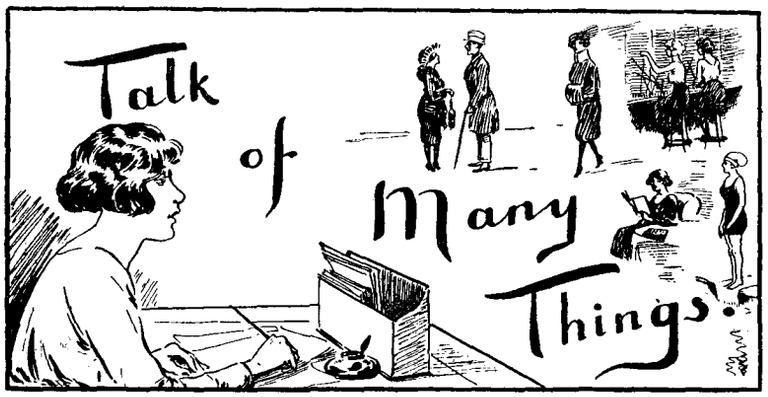
In the same quad, maximum cross-talk, 200 millionths (equivalent to about 80 miles of standard cable).

Maximum overhearing, 2,000 millionths (equivalent to about 60 miles of standard cable).

Between quads, phantom to phantom, maximum 70 millionths (equivalent to 90 miles of standard cable).

J. J. T.

WE TELEPHONISTS



A Peep into our Correspondence.

9 a.m. strikes and we sit down not feeling a scrap livelier than 5 p.m. the previous day. (Yes, I'll suggest it to the girls. Enough to cover a sixpence, isn't it ?) We survey the scene in front of us. Papers and letters everywhere. What's this ? "Confidential." What wouldn't we give for a look inside ! A weary one stretches across for a pen and somehow or other an inkpot "goes west." *Then* we are lively moving out of the way of the incoming stream. "What a mess ! Hope the Manager's papers are not in it," we say as we frantically mop up with our nice new pieces of blotting paper. Then we settle down to read and enter the letters. Some folks, we decide, have missed their vocations. They should have been novelists, not fishmongers and bookmakers. What reams they write about our methods of recording calls and our unbusinesslike way of sending final notices for outstanding accounts. This gentleman has "misled" his account and wants a copy. Some subscribers have a very quaint idea of the operator's sense of humour. One lady actually writes to tell us that the telephonist dislikes her and, to prove that dislike, rings her bell a dozen times a day to bring her from the basement to the second floor, for no reason whatever. However, some really do praise the operators and rightly so, too. Recently a subscriber wrote about her telephone being out of order and said that she did not think that she could get half the calls through she did get but for the operator who was always very kind and helpful. Another gentleman expressed the opinion that slow answering by the exchange was due to him possessing an overworked operator. An agreeable change to the usual novelette and chocolate myth. Some letters bring in very strange requests. The latest are applications for permission to fix wireless to our poles. Others complain that poles are unsightly and want them removed. Wires over housetops make loud buzzing noises keeping the children awake, and must be speedily removed in view of the danger of nervous breakdowns. Still another, in which the subscriber, with Oriental leanings, apparently, writes : Your motto seems to be, in the words of the Persian poet, "Ah, take the cash in hand and waive the rest !"

The engineers seem to be very unfortunate. "Your man came here and bored through the wall into the mirror of a sideboard next door !" "The engineers came and drove a nail through the blind, and when it is let down there is a series of holes down one side." The number of roof slates broken are beyond count, and numerous complaints are made about flags not properly reset. One lady, pushing a perambulator, walked into an open manhole recently, but fortunately was not much hurt.

These are only a few examples of the letters we receive every day. Some are very funny, and others are just as sarcastic, but we are not without our letters of thanks and appreciations, also.

E.A.

What Cheer ?

There was once a small boy who, while playing with a chisel, cut his finger rather deeply. His mother dressed the wound and commiserated with him. "Oh," said he, "it's not really so bad, I might have cut my finger right off if I'd been using both hands." I like to think that the boy's cheery optimism lighted him safely through many a shadow in after life.

It is indeed a valuable asset to have a nature which can find, "sermons in stones, books in running brooks and good in everything." So many sharp corners can be made to appear smooth, gritty bearings can be oiled, things that rile can be turned into things that smile, and harsh discord can be resolved into soothing harmony.

Think of the lady who went to a sale and secured a pair of linen tablecloths at a bargain price. When she reached home she examined the purchase, and found that one cloth was smaller than the other. The natural resentment and indignation which began to blaze up died suddenly, however, when her attention was directed to the fact that actually she had a greater bargain than she thought, for one cloth was larger than the other.

But the danger with this cheery optimism is that it so often exceeds the bounds of tolerance, and generally the cheery optimist is a most aggravating fellow. He *will* insist upon showing us the silver lining which we know is there, but which we are determined to ignore. He is really a person of morbid imagination who creates a gloomy background to lessen the darkness of our troubles. He is a kill-joy, who continually interrupts us in the enjoyment of our sorrows.

May-be, that while holiday-making at the seaside we have fallen over a cliff. We are in consequence confined to a hospital bed, swathed in bandages and encased in splints, we have nothing to do but to groan at the thought that our railway ticket will have expired before we can travel home, and to wish we had only taken a single. Then comes the cheery optimist on a visit, looking brown and disgustingly healthy and happy. He sympathises and says feelingly "How fortunate the tide wasn't up, or you might have been drowned." How comforting, how glad we feel, how pleased we are to think that he has noticed and commends our foresight in timing our fall at low-tide! When he has gone we sigh, and, turning painfully, we give ourselves up to the pleasurable task of planning his untimely end.

PERCY FLAGE.

We congratulate Miss Lucy Morton, Telephonist, St. Annes on Sea, who is a member of the Blackpool Swimming Club, on winning an Olympic event, the 200 meter breast stroke race at Paris.

MISS LUCY MORTON.

London Telephonist's Society.

The second meeting of the Session will be held on Friday, November 7th, when Mr. F. W. Thwaites of the Lines Section, Traffic Branch, will deliver a lecture on the "Advent of Automatics." This will be quite an informal talk, in which Mr. Thwaites will unfold some of the mysteries of one of the greatest achievements of those wizards the engineers. By the way, in spite of the first word of the title of the lecture, there is no truth in the rumour that the more fearsome diagrams will be exhibited to the musical accompaniment of the "*Dies Irae*"—"Day of Wrath, O Day of Mourning !" To the question "Are we downhearted ?" the Manual system still answers "NO !"

The following contribution has been received from a correspondent whose experience of Telephone Managership goes back to the early eighties :—

Boy Operators.

There are no doubt many things of great interest that would be appropriate to this column, but presumably "things" concerning operating would be especially interesting. The first telephone operators were men, but they were not a great success because they could not stand abuse from subscribers without answering somewhat in the same strain, with the result of numerous reports to head office and much trouble for everybody. Then boys were tried, and they gave much trouble for various reasons. Only one exchange with boy operators as far as I can remember was satisfactory, and that one was in charge of a very good *man*. I often wondered why that one was so much better than the others ; the control was better. Once on visiting this exchange as I opened the door I heard a curious noise something like that of shutting a book violently, followed by a howl. The superintendent was standing near a boy who was crying ; one side of the boy's face was very red, as were both sides of the superintendent's. As I have said, the discipline was very good in this exchange. As I did not *see* anything wrong I completed the business I had come for and merely asked if the boy was not well.

One incident in connection with a boy operator exchange is interesting. Various exchanges reported that they could get no reply from this particular exchange. On going round (the distance was only a few hundred yards) the "clerk-in-charge," a boy, was found outside the exchange trying to get in. There was much noise inside. He reported that the boys had pushed him out and locked the door because he had tried to stop two boys fighting. On getting the door open there was ample confirmation of the fight. A more muscular clerk-in-charge was forthwith appointed. About 1881 girls were tried first in Liverpool and with such success that a lady superintendent for London was engaged and sent to Liverpool for training. Then girls were engaged in London and trained by the superintendent and one or two specially selected boys, one of whom is, I believe, still a district manager. If he sees this, possibly he might be induced to send you some reminiscences. I think I know one that he won't send you, so I can't either !

"CORNHILL"

Contributions to this column should be addressed : THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

HIGH-SPEED MARINE CABLE.

LINE LAID FROM NEW YORK TO AZORES.

THE world's biggest cable ship, the *Colonia*, has just completed the laying between New York and the Azores of 2,400 miles of a new type of submarine cable for the Western Union Telegraph Company. The new cable, in the opinion of Mr. Newcomb Carlton, president of the Western Union Telegraph Company, marks an era in the history of submarine cables. It represents the first alteration in type since the laying of the first cable by the *Great Eastern*. What is described as the "magic band" wrapped round the core of the cable makes it possible to send messages six times as quickly as through a cable with a similar core without the band. It is expected that the new cable will enable something like 1,500 letters a minute to be transmitted. The whole of the cable industry is watching the experiment with great interest ; upon its success further developments depend.

The *Colonia* shipped the cable at Greenwich and sailed for New York on Aug. 15. The task of laying the cable began about a fortnight ago, and last Saturday the Azores were reached and the work was completed at Horta, where a Western Union station has been established. The new cable is to be used in connexion with a cable of the ordinary type which an Italian company is laying between Italy and the Azores. When the Italian cable is completed there will be established for the first time submarine cable communication between Southern Europe and North America.

The new cable has been manufactured and laid by the Telegraph Construction and Maintenance Company, of London, which laid the original Atlantic cable. The weight of the cable carried in the *Colonia* was between 8,000 and 9,000 tons.

The method of sending a cable message is thus explained :—Signalling currents in an ordinary submarine cable reach the far end gradually, taking time to rise to their full strength, the speed of signalling being retarded by this slow rise of current. In order to record the signal it is necessary to wait until the current has risen to the value required to work the receiving instruments, and the sending must be timed to allow one signal to be recorded before the next comes in. In the case of an ordinary Atlantic cable the interval between two consecutive signals is about one-tenth of a second. If the cable is "loaded," as in the case of the new cable, by wrapping the conductor with a material highly permeable to magnetism, the current rises much more rapidly to the required strength ; the time interval may be reduced to about one-sixtieth of a second, and the speed of signalling is proportionately increased.

THE "LEYDEN JAR EFFECT."

One may represent the electric current in a cable as starting out full of vigour, but without help it would reach the distant end quite exhausted. This diminuendo is caused by the arch-enemy of the electric current, the "Leyden jar effect." A cable message coming, say, from Australia to England passes through ten re-transmitting points, so that the current is supplied with new impulses of vigour. On a long cable at each end is a very sensitive instrument called a "magnifier" which magnifies the incoming currents and increases the working speed about one-third.

Oliver Heaviside, the great English mathematician, pointed out as long ago as 1885 that the "Leyden jar effect" might be overcome by the addition of inductance. In 1892 the late Dr. Silvanus Thompson worked out a scheme, which he patented, for utilizing in a practical manner Heaviside's ideas ; and later still Dr. Malcolm, another Englishman, in his work on *The Theory of the Submarine Telegraph and Telephone Cable*, advocated the "loaded" type for long-distance submarine telegraph cables. It is due to Mr. Newcomb Carlton that the investigations, conclusions, and tests of Heaviside and Malcolm are now to be tried out. Credit is also due to the Western Electric Company for having produced the metal alloy of nickel and iron, "Permalloy," which, wrapped round the conductor in the form of tape, enables the speed of signalling to be so greatly increased, and to the Telegraph Construction and Maintenance Company for manufacturing the cable and having built and equipped with special machinery a new wing to one of their factories for the purpose.—(From *The Times*, Sept. 26, 1924.)

THE POST OFFICE TELEPHONE AND TELEGRAPH SOCIETY OF LONDON.

THIS Society has a most interesting program for the coming session 1924-25, and the attention of our London readers is especially directed to the activities of this organisation.

The membership subscription is only 2*s*. 6*d*. per session, and entitles the holder not only to attendance at each meeting of the Society, but also to the meetings of the P.O. Engineers' Society, and the London Telephone Society.

Members are also entitled to introduce a friend at any of the meetings who, however, is not permitted to take part in any debate without the acquiescence of the Chairman.

A small but very useful lending library (chiefly technical) is gradually being built up, of which members may avail themselves, and among the latest additions of books are the following :—

"*Wireless Telephony and Broadcasting*," 2 Vols. H. M. Dowsett.

"*An Introduction to the Strowger System of Automatic Telephony*." H. H. Harrison.

The latter should need no introduction, and also that really splendid American production issued by the Superintendent of Documents, U.S.A. Government Printing, known as "*The Circular of the Bureau of Standards*," Washington, a volume which should not be left unread by any officer interested in telegraphy and telephony.

THE PRESS SECTION, CENTRAL TELEGRAPH OFFICE.

The program will be opened by A. R. Kidner, Esq., of the Secretary's Office, president for the session, at the Institute of Electrical Engineers, Victoria Embankment.

SESSION 1924-25.

PROGRAMME.

1924.

Oct. 20 "Housing of Telephone Exchanges," by Mr. A. R. Kidner.

Nov. 17 "Post Office Engineering Research Work," by Capt. B. S. Cohen, A.M.I.E.E.

Dec. 15 "Wireless Telephony," by Capt. P. P. Eckersley, M.I.E.E.

1925.

Jan. 19 "The Cost of an Inland Telegram." by Sir Henry N. Bunbury, K.C.B.

Feb. 16 "Main Underground Construction—Telegraphs and Telephones," by Mr. W. E. Twells, M.I.E.E.

1925.

March 16 "The Post Office and Automatic Telephones," by "A Post Office Engineer."

April 20 "Machine Telegraphs," by Mr. Donald Murray.

Representatives of the Society authorised to take subscriptions will be found in almost every P.O. Department, but in the event of any difficulty an inquiry addressed The Hon. Secy., P.O. Telephone and Telegraph Society, G.P.O. North, E.C.1, will bring a prompt reply to any inquiry on the subject.

PRESENTATION TO MR. COCKREM.

Mr. P. R. Cockrem, having been promoted and transferred to Leeds after 30 years' service at Nottingham, was presented by his colleagues with a Gladstone travelling bag. The presentation was made by the District Manager, Mr. A. M. Kidd, who referred in eulogistic terms to Mr. Cockrem's work at Nottingham.

"THEY ALWAYS STICK."

AN American journal, the *New Republic*, records an instructive story of two imaginative telephone girls and sundry unimaginative newspaper men, and of a reporter.

The story was that two girls, each about twenty years of age, remained at their post of duty in the Nixonville telephone exchange until the building collapsed under the pounding of a flood. By telephoning to every farmhouse and cross roads community in the valley they saved about twelve hundred lives; also a considerable amount of property.

Both girls had previously experienced floods in that valley so they knew, when they determined to remain as long as the wires were open, that they were risking their lives. By the time the last wire was dead they couldn't leave. The water was too deep. Before the building went down, however, they took four doors off their hinges, fastened them together with wire and were whirled away on this raft to comparative safety among the overhanging branches of a tree. There they were rescued several hours later.

On the following day a young reporter, representing the morning newspaper of a city about two hundred miles distant, got the story in detail and—as he would have said—hung it on the wire. It would have filled about one column. The story, as it appeared, follows:—

"There was no loss of life at Cartersville, Landers City, Polktown, Hendersonville, Valley View, or intervening points, warning having been received in time. At Nixonville, Watson's Drug Store, above which is the telephone exchange, went down when a cotton shed floated against it. No lives lost."

The story of the two telephone girls had to be cut that day because there was more pressing news. Sixty-eight persons drowned in the flood elsewhere had been identified. Communication with several towns was still cut off; and a river ordinarily about one hundred yards wide was roaring towards salt water any where from ten to forty miles wide. The first news would necessarily relate to the various fates of whole communities—also lists of the dead. Heroes and heroines could wait. This was the view of the news editor, and his opinion prevailed. The young reporter made inquiry about his story on returning to the office and listened with interest to the explanation; he was still learning the business. Then he stowed away a carbon copy of his story in the top drawer of his desk and went forth after more flood news. It was not difficult to find: he was busy for a week.

When the floods of water and news had subsided so that the farms and front pages were again rather dry he spread before the city editor four sheets of carbon paper and said:

"Perkins couldn't use this when I wired it in but no one has printed it. I think it's still a good story. If you wish I'll rewrite it."

The young reporter had seen those two telephone girls while their clothes were still wet, and hanging on the wash lines in their several back yards. When he interviewed them they were in bed digesting heavy doses of quinine. He couldn't free his mind of a sense of responsibility; their adventure impressed him as news. The city editor had formerly edited a newspaper right in the flood district. After reading the four sheets of carbon copy the city editor said:

"No, I don't see much to this. The telephone girls always stick. If we printed this we'd get a dozen more like it. You might take it up with the Sunday editor and write a feature story about it some day."

So the four sheets of carbon paper were again relegated to the top drawer and the young reporter went out to cover a murder trial.

At the end of ten days he had more or less forgotten the telephone girls but the Sunday editor summoned him and said:

"I'm using a page feature about the men who went out in boats and rescued people from trees during the flood. If you have anything along that line I could use it,"

The young reporter furnished two paragraphs, then seized the opportunity to offer his treasured carbon copy. The Sunday editor glanced at the pages, returned them, and said:

"If you can get their pictures."

At first pictures couldn't be obtained: the young ladies had none to spare; moreover they were fearful lest Nixonville laugh. One couldn't be sure what a newspaper might say. Later they sent snapshots of two groups of young men and women. Arrows indicated which were the heroines. Meanwhile one of the men who went out in boats had been nominated for a hero medal. But for the fact that young reporter might not have bothered to write his story. He hadn't thought of medals; now, however, he coveted a brace of them for the telephone girls.

Five days after the story of the telephone girls had been placed upon the Sunday editor's desk the young reporter was summoned by the managing editor and the following conversation took place:

"Did you write this?"

"Yes, sir."

"Do you know Charlie Abbot?"

"Yes, sir. I think he's press agent for the telephone company."

"Does he know you wrote this?"

"No, sir."

"That's all."

"Aren't you going to use it?"

"Not now. Maybe some time later."

"If you don't mind my asking, what's the telephone company got to do with it?"

"There's some legislation pending and I thought they might be trying to put over a little sob stuff."

"Oh. I hadn't thought of that."

"It's all right, young man. We may use it some time later but not now."

"Yes, sir."

Two months later the Sunday editor said to the young reporter in answer to inquiry:

"I threw it away. That's stale stuff now. Anyway, Perkins tells me the girls always stick. Well, if they do it isn't news. You know the old rule: If a dog bites a man it isn't news, if a man bites a dog it's big news."

The young reporter said: "Yes, sir," but it wasn't entirely clear to him.

Later when he had become a staff correspondent at the state capital—and mildly important to lobbyists—he dined one evening with one of the numerous vice-presidents of the telephone company and told him about the two telephone girls at Nixonville. The vice-president was not quite bored but he evidently had heard more thrilling stories.

"*They always do that,*" was his comment.

"Do you ever print anything in the house organ about such happenings?"

"Sometimes."

"I'd like to write that story for you."

The vice-president's eyes narrowed ever so slightly. Was the young man looking for something? Eyes often narrow in just that way at the seats of government. The young staff correspondent felt embarrassed and changed the subject, nor did he ever mention it again.

The story has an epilogue—if you care for it. Both of the telephone girls married heroes. Mabel is now the wife of a young farmer who received a medal for rescuing three persons from a tree. Mary, the other telephone girl, is the wife of a young man who received a war decoration. They are very proud of their husbands.

CHESTER T. CROWELL.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

The opening meeting of the Sessions will be held on Friday, Oct. 3, at 6.30 p.m. in the drawing room at the Central London Y.M.C.A., when the year's President, Mr. P. W. H. Maycock, will read his address. The subject is "Random Reflections, or What Can You Expect." It sounds very interesting and we expect quite a lot. As usual the business will be preceded by half an hour's music, provided on this occasion by the staff of Streatham Exchange.

* * * *

Swimming Gala.

The Imperial and Renown Swimming Clubs (Trunk and Toll Exchanges) combined to hold their fourth annual gala at the Holborn Baths on Sept. 9, There was a large and enthusiastic audience and an excellent program was provided by the organisers. The chief event of the evening, the L.T.S. Individual Championship, was won by Miss E. Williams of Regent Exchange.

The results of the principal events were as follows:—

LEARNERS' RACE.

Miss Hawkins (Toll)	1
Miss Medcalf (Trunks)	2

L.T.S. CHAMPIONSHIP.

Miss Williams (Regent)	1
Miss Amos (Victoria)	2
Miss McBirney (Trunks)	3

TEAM RACE MATCH. TRUNKS *v.* TOLL.

Misses Cowper, Marshall, Salter, Lawrence, won for Toll.

DIVING CHAMPIONSHIPS.

Trunks, Miss Hodder	1
Toll, Miss Lawrence	1

SUPERVISORS HANDICAP (Open.)

Miss Mason (Avenue), 12 sec.	1
Miss L. K. Davies (Trunks), scr.	2

TRUNKS CHAMPIONSHIP.

Miss McBirney	1
Miss Porter	2

TOLL CHAMPIONSHIP.

Miss Lawrence	1
Miss Wilson	2

INVITATION TEAM RACE.

Gerrard Exchange	1
Misses Davies, Burt, Wilson, Hayter.	
Regent Exchange	2
Misses Amos, Williams, Cole, Bromsgrove.	
Victoria Exchange	3
Misses Hare, Fern, Rolls, Amos,	

Other items included an old clothes race, the respective sections being won by Miss Wilson (Toll) and Miss Miller (Trunks). A prize was awarded for the funniest costume and this was won by Miss Trennery of Trunks, who impersonated the well-known film character, Felix.

There was also a thrilling exhibition of high and fancy diving by members of the A.D.A. It is worthy of mention that one competitor in the diving competition, who made an excellent dive from the high board, had only succeeded in swimming a width of the bath during the previous week. The evening concluded with a polo match between the Penguin and Amateurs Clubs and was won by the former.

* * * *

L.T.S. Lawn Tennis Association.

Members of the L.T.S. will note with pleasure that one of their colleagues, Miss M. L. Hitchcock of Central Exchange won the Ladies' Singles Tennis Championship at Queens Club, beating Miss P. Gardiner (Controller's Office) 4-6, 7-5, 6-4. We congratulate Miss Hitchcock, on repeating her former success in 1921.

* * * *

Culled from the Exchanges.

Dalston.—The Dalstonian Swimming Club are holding a concert at St. Bartholomew's Hall, Dalston Lane, on Thursday, Oct. 23, 1924. Good fare is promised and anyone interested should communicate with the Secretary of the Club.

MISS M. L. HITCHCOCK (CENTRAL EXCHANGE), WINNER OF THE LADIES' SINGLES TENNIS CHAMPIONSHIP, L.T.S. LAWN TENNIS ASSOCIATION.

PERSONALIA.

LONDON TELEPHONE STAFF.

Resignations on account of marriage:—

Miss E. P. CRANE, Telephonist, of Victoria Exchange.
Miss W. CLARKE, Telephonist, of Victoria Exchange.
Miss W. HIND, Telephonist, of Victoria Exchange.
Miss A. K. SARGENT, Telephonist, of Victoria Exchange.
Miss E. W. SANDFIELD, Telephonist, of Hammersmith Exchange.
Miss G. L. FARNDELL, Telephonist, of Hammersmith Exchange.
Miss E. J. BOLTER, Telephonist, of Hornsey Exchange.
Miss I. E. PROUT, Telephonist, of East Exchange.
Miss D. L. ROYLE, Telephonist, of London Wall Exchange.
Miss D. K. CHANDLERS, Telephonist, of Holborn Exchange.
Miss A. E. RANDLE, Telephonist, of Paddington Exchange.
Miss H. M. STEVENS, Telephonist, of Paddington Exchange.
Miss E. V. E. SLOW, Telephonist, of Central Exchange.
Miss C. Drayson, Telephonist, of Central Exchange.
Miss L. R. CONWAY, Telephonist, of Central Exchange.
Miss C. E. JONES, Telephonist, of Central Exchange.
Miss G. E. LUDLAM, Telephonist, of Putney Exchange.
Miss D. M. PRESS, Telephonist, of Putney Exchange.
Miss E. M. SCARLETT, Telephonist, of Regent Exchange.
Miss E. E. KNIGHT, Telephonist, of Regent Exchange.
Miss M. MOORE, Telephonist, of Regent Exchange.
Miss V. FRANCIS, Telephonist, of Regent Exchange.
Miss I. ROSS, Telephonist, of Regent Exchange.
Miss D. L. WELLS, Telephonist, of Trunks Exchange.
Miss W. FRISBY, Telephonist, of Trunks Exchange.
Miss E. M. JESSE, Telephonist, of Trunks Exchange.
Miss E. M. WEBBER, Telephonist, of Trunks Exchange.
Miss E. B. WALTER, Assistant Supervisor, Class II, of Trunks Exchange.

Miss D. M. RUFFEY, Assistant Supervisor, Class II, of Trunks Exchange.
Miss A. M. HARVEY, Assistant Supervisor, Class II, of Avenue Exchange.
Miss E. S. TODD, Assistant Supervisor, Class II, of Clerkwenwell Exchange.
Miss E. ROSE, Assistant Supervisor, Class II, of Park Exchange.
Miss J. PUGH, Telephonist (I), lof Museum Exchange.
Miss E. NEWLING, Telephonist (I), of Museum Exchange.

CENTRAL TELEGRAPH OFFICE.

The following promotions have been made :—

F. S. PARKER, Telegraphist, promoted to Overseer.

A. SANDERSON, Tube Attendant and Night Collector, promoted to Assistant Inspector of Messengers.

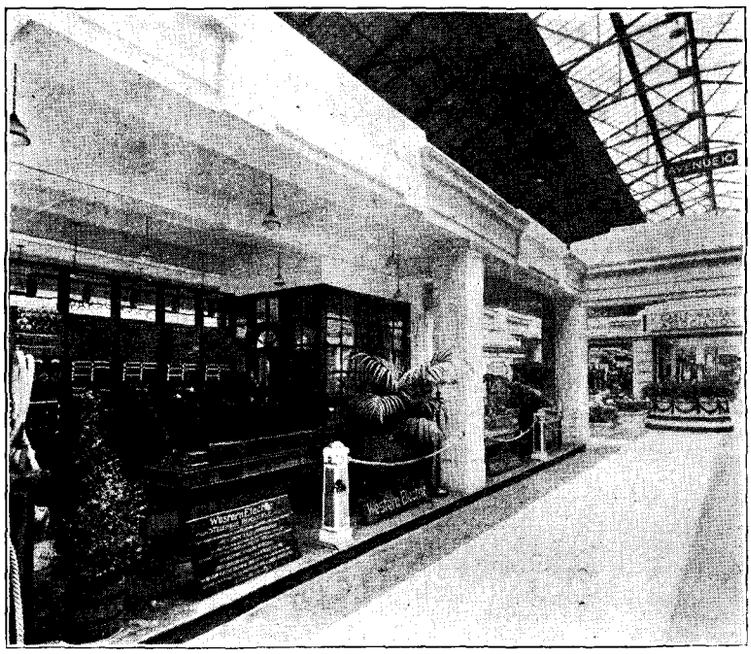
LEICESTER.

Miss F. G. BENTLEY to be Assistant Supervisor.

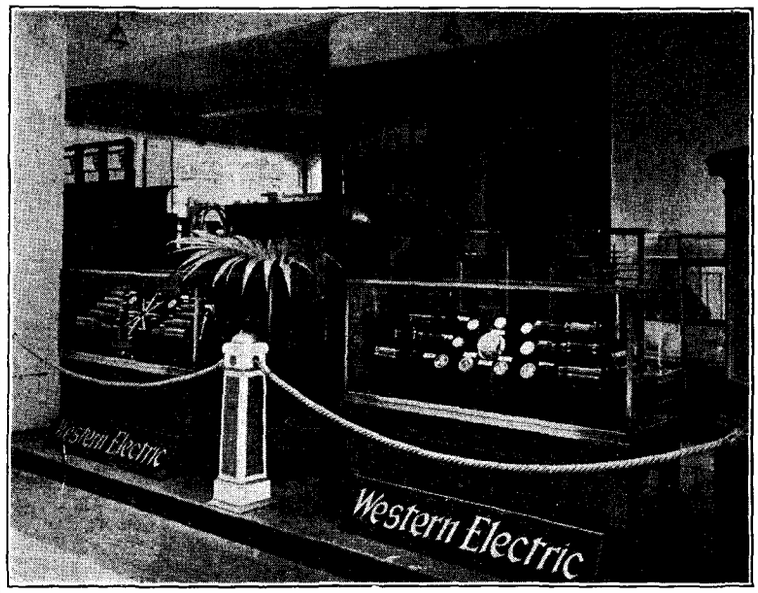
WESTERN ELECTRIC AT THE BRITISH EMPIRE EXHIBITION.

THE educational value of the exhibit of the Western Electric Company is sufficient alone to draw attraction. It is the wide and highly scientific activities of the Company in the telephone field and in the general advancement of electrical communication which enables them to display an exhibit of such extraordinary interest.

Telephone cables and wireless apparatus of all kinds and for all purposes are displayed and in many cases demonstrated. There are telephone instruments, and telephone installations for the smallest and the largest buyer, small office equipments, equipments for the home, mining sets for the mines, automatic systems, intercommunication systems, and manual systems. Many of these are demonstrated for efficiency.

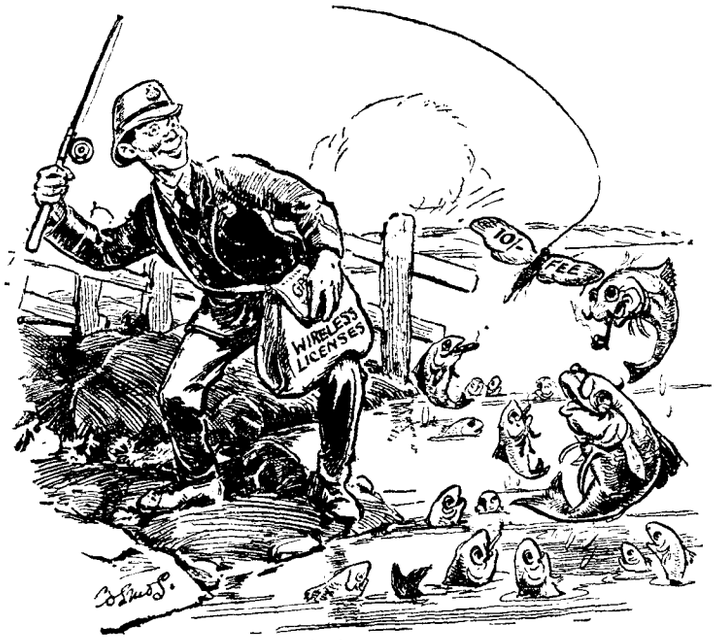


The cable exhibit includes sections of some of the best known telephone trunk cables as well as examples of power cable up to even 33,000 volts. There are loading coils and repeater units in operation exactly as installed on telephone circuit throughout the world, and the wireless apparatus is of extraordinary interest, from the small crystal and valve detectors to the seven valve set with a radius of over 1,000 miles, to the point-to-point transmitting and receiving equipment which bids fair to make wireless intercommunication a commercial possibility.



Then there is a working exhibit of the traffic control system which is in operation on the London County Council tramways and all the chief railways of the world, while the printing telegraph system, which transmits telegrams and messages from a typewriter keyboard to any distant station where the message is received, printed in column form, add further attraction to what is already a feast of educational interest.

The stand forms part of the site occupied by the Cable Makers' Association, Bays 18 to 20, Avenues 9 and 10, in the Palace of Engineering, and there is no doubt but what the exhibit will be visited by thousands.



A BROAD CAST.

I'm licensed and have got a first-rate set;
I'm blest with many friends who're full of zeal;
They come to listen-in, when it is wet,
And nearly always stay to have a meal.
There's nothing of my joint left but the bone,
I wish they'd start broadcasting on their own.

But when the B.B.C. reduce their rate,
And get the P.M.G. to cast their fly,
I trust that all these fish will take the bait,
Just as they used to take my apple pie,
For every catch made by the B.B.C.
Will turn a guest into a host, you see.

—COSMOS.

[*From the News of the World.*

THE

Telegraph and Telephone Journal.

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TELEGRAPH AND TELEPHONE MEN.

X.—MR. WILLIAM HEATHCOTE UNWIN NAPIER.

THE subject of our notice this month, Mr W. H. U. Napier, Deputy Controller of the London Telephone Service, is one of the best-known officials in the telephone service.

Mr. Napier is a Glasgow man and received his early education at those famous Institutions, the Glasgow High School and the Glasgow Academy. He entered the National Telephone Company's Service in the West of Scotland in 1890, and since then has had an extensive experience in telephone matters. In 1893 he became Inspector-in-Charge of a section of the Edinburgh district. Four years later he was transferred to Dublin as Switchroom Inspector and subsequently became Chief Inspector and Traffic Manager. In 1902 he was transferred to Manchester to take charge of the traffic work of that district, and three years later his exceptional merits were recognised by his transfer to the Company's Head Office in London as Head of the Traffic Department, which, in the Company's organisation, was responsible to the Engineer-in-Chief. On the transfer of the National Telephone Company's undertaking to the State in 1921 he was appointed Telephone Traffic Manager, and held that position until 1916; when he became Senior Inspector of the newly-organised Telegraph and Telephone Traffic Section. In February, 1923, he was appointed Deputy Controller of the London Telephone Service.

Photograph by "Photographia," 17, Cheapside.

These movements and responsibilities have given Mr. Napier exceptional opportunities of acquiring a thorough knowledge of telephone practices and policies and he has applied that knowledge to the great advantage of the telephone service. He has had much to do with the standardisation of operating methods the introduction and extension of operating schools, the training of traffic and operating staffs, and with the establishment of the Traffic Departments throughout the country.

Mr. Napier has some years of service before him, and we may expect that, with his wide experience, these years will be fruitful of good to the service which he has so much at heart.

TELEGRAPH AND TELEPHONE STATISTICS, JAN. 1, 1923.

WE have received from Dr. V. M. Berthold a copy of the exhaustive statistics of the telephone and telegraph development of the world prepared in the office of the Chief Statistician of the American Telephone & Telegraph Co.

It is interesting to compare them with the telephone statistics for the same period (viz., the year 1922) published in the March and April issues of the *Journal* this year. Examination shews that between the totals computed by the respective compilers there was a discrepancy of only about 68,000 in a total of upwards of 22,900,000, despite the number of administrations from which data have to be obtained, the varying dates to which these data apply, the adjustments which have to be made, and the numerous cases in which estimates must be resorted to. The practical unanimity attained may, therefore, be taken as a proof of the substantial accuracy of the total arrived at.

The principal discrepancies will be seen from the subjoined table and the notes which follow :—

	A. T. & T. Co. No. of telephones	T. & T. Journal. in thousands.
Europe	5,863	5,900
Asia	724	687
Africa	128	122
N. America	15,423	15,557
S. America	327	325
Oceania	436	—
Australasia	—	389
	22,904	22,973

In *Asia*, the American figures give China 91,770 and Japan 519,630 telephones, as against 52,000 and 490,000 given in the JOURNAL. The American figures are probably drawn from a later source of information. The JOURNAL total includes 38,000 telephones in the Dutch Indies and 14,000 in the Philippines in the total for Asia. The American compiler allots these to Oceania.

North America.—The discrepancy here is due to the fact that the official total for the United States published by the U.S. Census Bureau is given in the American figures. It was not available when the English statistics were drawn up.

Oceania, as above stated, includes the Dutch Indies and the Phillipines, which are not included in *Australasia*. Hence a discrepancy in the totals for these somewhat unofficial "continents."

The statistics under review shew the development per 100 of population of the following States to be :—

U.S.A.	13.1
Canada	10.4
Denmark	8.3
New Zealand	8.1
Sweden	6.6
Norway	5.8
Australia	4.6
Switzerland	4.3
Germany	3.5
Netherlands	2.6
Great Britain	2.3
Finland	2.1
Austria	2.0

No other country has two telephones per 100 inhabitants.

An interesting table shows the telephone and telegraph mileage of the world. The former was 61,427,058 in 1922, of which 39,979,937 miles were in North America, and 17,332,635 in Europe. The countries containing upwards of half a million miles of telephone wires were as follows :—

	(Thousands)
U.S.A.	37,265
Germany	5,980
Great Britain	4,123
Canada	2,396
France	1,527
Japan	1,030
Australia	966
Sweden	852
Denmark	634
Russia	590

According to a table showing the number of telephones per 100 population in the large cities, Omaha now stands in front of Stockholm :—

Omaha	28.0
Stockholm	25.4
San Francisco	25.2
Minneapolis	24.2
Denver	23.0
Washington	22.8
Los Angeles	22.7
Chicago	22.3
Toronto	19.2
Cincinnati	18.5
New York	18.2
Copenhagen	14.5

Berlin had 9.3 and Paris 6.3. In the London County Council area the number of telephones per 100 inhabitants in 1922 was 7.15.

TELEGRAPHS.

The statistics give the mileage of telegraph wire in the world as 6,286,639, of which 2,599,377 were in Europe, 2,238,115 in North America, 759,433 in Asia, 356,767 in South America, 183,110 in Africa, and 149,837 in Oceania. The mileage development of the principal countries was as follows :—

	(Thousands)
U.S.A.	1,845
France	490
Germany	480
Russia	412
India	357
Great Britain	280
Canada	262
Italy	252
Argentine	174
Japan	152
Poland	103
Australia	95
Brazil	94
China	82
Spain	79

It is interesting to compare this with the statement of telephone mileage and to observe the different order in which the countries included in both statements stand. It will be seen that the telegraphic development of a country has some rough relation to its area—at least to the extent that the larger countries all have a considerable telegraph mileage even when their telephone mileage is low. For example, Russia and India come high on the list, and the states which formed the old Austrian Empire would, taken together, occupy ninth place with 191,000 miles of telegraph wire. Again, many countries with a high telephonic development do not appear at all in the fifteen in the above list, while countries with poor telephonic development like Spain and Italy, occupy a place

there. To obtain an idea of the combined telephone and telegraph development of the various countries as expressed in mileage of wire, it would be necessary to equate the telegraph figures before adding the two together. It will be found that in countries with a high telephonic development, the telephone mileage is more than ten times greater (and often considerably more) than the telegraph mileage; in countries with a lower telephonic development it is correspondingly less. If, therefore, for what the equation may be worth, the telegraph mileage is multiplied by 10 and added to the telephone mileage, the countries which come first in combined mileage of wire are the United States, Germany, Great Britain, France, Canada and Russia, in the order named. If the actual instead of the equated total mileage is taken, Canada comes fourth, France fifth, and Japan sixth.

W. H. GUNSTON.

RANDOM REFLECTIONS; OR, WHAT CAN YOU EXPECT?

BY P. W. H. MAYCOCK.*

AN odd title, some may think; so perhaps I should explain its origin.

Both in its subject and treatment, the first paper of the session of a Society whose intention, though partly technical, is largely social, is, to use the delightful but reckless language of our craft, "a matter which seems to require somewhat serious consideration"—which is our way of saying "it gives one furiously to think." From one point of view the writer should steer his perilous course midway between the rocks of dullness and the whirlpool of frivolity—with a strong preference for the rocks if shipwreck in one form or other seems inevitable. But this seems a little out of harmony with the ideals of this Society, and with its traditions of freedom of speech. So, remembering that "in the multitude of counsellors there is wisdom," I sought the advice of some of my friends. Half of them said, with distressing promptitude, "Whatever you do, you must make them laugh." The rest, though not exactly suggesting an attempt to make them cry, favoured a dominant note of seriousness. Statistically, the correct thing would have been to take an average; but it is not easy to strike a satisfactory average between, say, Mr. Charlie Chaplin and Dean Inge—taking these gentlemen as opposite types of self-expression. "Laugh and the world laughs with you" led me first to the shrine of humour, but prolonged and agonising study of the two leading humorous publications—Punch and the L.T.S. Traffic Instructions—showed that the humorist is born and not made. In this dilemma the first part of the title occurred to me, together with this recipe for a general paper:—

A little bit of sentiment,
A good deal more of fun,
A little bit "between ourselves"
And then the trick is done!

So I tried to follow that recipe. Then there occurred to me a suggestion that, as a natural sequel to previous titles "Where are we going?" and "What are we here for?" the paper should be called "What can you expect?" The two titles harmonise well, and, combined, call for an answer even more insistently than the rising inflection. So now, Ladies and Gentlemen, behold them in the form of a double-barrelled title after the manner of that priceless gem of juvenile Victorian literature, "Eric, or, Little by Little"

But what are we going to reflect upon? As a concession to the note of seriousness we could hardly improve upon work—thinking specially, of course, of the work of a Telephonist and Supervisor. But we must be clear about the light in which work is viewed in this paper, because, from the standpoint of one idea of work, the paper would have no meaning.

We live at a time when, in the minds of men, two great but diametrically opposite conceptions of work are striving for the mastery. Broadly, in one of these conceptions, the relationship between the human agent and the machine or system it serves is that of Servant and Master: while in the other the relationship is that of Co-partnership. Let me say at once that it is the co-partnership idea—the idea of mutual give-and-take that this paper assumes, as being most in harmony with the great central doctrine of Telephone Service—Co-operation. This paper, then, views work as an affair of co-operation between human agent and system, in which the well-being of the system cannot be attained apart from the well-being of those that serve it; and, since Man is greater than the machines or systems he makes, the well-being of Man is the first essential of *enduring* efficiency in work.

And what can you expect from Work—or from Life, from which work cannot be separated? Since we cannot get something for nothing I suppose we may assume that it must depend upon what we bring to it; and whatever these things may be, most will agree that they should include these three:—a trained Imagination, Humour, and Brotherhood. Let us think of them in this order.

(1.) IMAGINATION.

To many, the meaning of the word "Imagination" is expressed in the little girl's definition of faith:—"The ability to believe in what you know is not true;"—Imagination being ability to make mental pictures of what otherwise has no real existence. By Imagination, however, we shall think of "image-making"—the making of mind-pictures, without reference to their "reality" as the word is generally used. Most of us think in pictures, some seen clearly, and some indistinctly.

A little reflection—not random this time— will show that in most things that matter to ourselves we are led by Imagination and sometimes by Intuition rather than by reason. For example, logic will not shake our faith in one whom we like very much, neither will logic alter our opinion of one whom we do not like. In the one case we have formed in our mind an agreeable mental picture: in the other, the reverse. The pictures are *there*. To us they are real, and we listen to arguments to the contrary with about as much patience as we should have if, on an unclouded day, someone set out to prove that the sun was not shining. Frequently, probably usually, reason is used to justify to our intellect conclusions arrived at by other means. It has been claimed that one of the chief causes of the success of British Colonial administration is that the Briton acts first and thinks of his reasons afterwards. Even in the case of the scientist, the "working hypothesis" often comes before the assembly of the facts which support it. Moreover, the Imagination is stronger than the Will. We cannot do what we are unable to picture ourselves as having the power to do. This is the truth behind the splendid motto of one of the Highland clans "Whatever a man dares, he can do." So the chief factor in true efficiency is to get our mind-pictures right.

Everyday experience tells us that it is our mental pictures of things rather than the things themselves that influence us. We go on leave, perhaps, thoroughly "fed up" with our work, but we have not been away long before the scene changes. Viewed from a distance, it doesn't look so bad. We even find redeeming features in our pet aversion Mr. X or Miss Y; we recall our associations with our colleagues, and soon begin to look forward to rejoining them. Yet the work, Mr. X and Miss Y are just the same as we left them, and our reason would tell us so. But, after all, what can you expect? If we look at the finest picture ever painted with our eyes close to the canvas we see little more than crude splashes of colour. It is only when we stand at a distance that the splashes of colour blend into a coherent whole. To make an attractive picture of our work, therefore, we want the ability to detach ourselves from it sometimes and take the distant view—to "dissolve in" from the "close-up" to the "long shot." There is thus a place for the artistic imagination. It must be so if—as some say—each of us is, in our life, writing a book or painting a picture. Harmony, the common principle of all forms of art, is then also an essential principle of work. It is the common desire for the realisation of the principle of Harmony which links the business organiser and the artist.

We know, too, that whether or not our picture of work is attractive depends rather upon ourselves than either the work of the distance from which we view it. In moments of great happiness we see, as the saying goes, through rose-coloured spectacles. The most commonplace things are transfigured, and we sometimes see our picture as it were, through mists of gold. Conversely, when the magic spectacles are taken away, the colours fade; and to us the glowing picture changes to the cheap woodcut. *Yet the colours are there, for others can see them.*

But, you may say, what has all this to do with the telephone service of London? It has this. We are led mainly by mind-pictures and our sub-conscious mind ceaselessly works for their realisation, entirely apart from Reason and Will. We can only have perfect telephone service in so far as perfect telephone service with ourselves as its *willing* creators is pictured in the mind of each of us individually. Each, as far as possible, must see the picture whole: with the little details—the bits of the jig-saw puzzle—fitting into their places; *and it must be a picture that we like to see.* All the paraphernalia of business—Equipment, Organisation, and Supervision—is of little avail without this. We want, then, something which will make it easier for the bits of the puzzle of life and work to slip into their right places in our minds.

But since the Imagination only operates at its best in so far as we, as it were, lose ourselves—a state of mind most often attained in Art—and since Harmony is a common principle both of Art and of permanently successful business, it seems to follow that in a business which is largely technical, the Imagination can best be trained by taking as a hobby some form of Art—Music, Literature or Painting. Especially, perhaps, Music; which, as Carlyle says, is "a kind of inarticulate speech which leads us to the edge of the Infinite and lets us for a moment gaze into it." If Carlyle's definition is right, Music is the most likely form of Art to give that occasional glimpse "behind the scenes" in which we can "lose ourselves" and momentarily bring together the bits of the jig-saw puzzle. The idea is not new, nor is it so fantastic as it may seem. Kepler, the great astronomer, one of the

* Presidential Address delivered to the London Telephonists' Society, Session 1924-1925.

master-minds of Science, saw in Music a probable key to the riddle of the universe and thought that :—

> . . . . . in Music men might find the road,
> To truth at many points where sages grope.
> One day a greater Plato would arise,
> To write a new philosophy, he said,
> Showing how Music is the golden clue.
> To all the windings of this world's dark maze.

and Kepler's reflections were anything but random. All music-lovers will know that there is something in Kepler's theory, and some may have found that music *has* an amazing power of co-ordinating the pictures of the mind. Probably all, at some time or other, have heard the strange call of Music to the deeper depths of the personality, sometimes in the simple melody, and sometimes in the stately progression to a climax. Something within us leaps to answer. For a moment we lose ourselves, and our eyes are opened. Dimly, through the incense-haze of memories, we see part of a picture—sometimes of our life, sometimes of our work. The bits of the jig-saw puzzle are there, *but somehow in their places.* For a moment the mist clears, and there is our lost picture of rose and gold, radiant with all the magic of the old spell but now part of a greater whole. Only for a moment, but enough to show that the artist who paints with the brush of eternal beauty has not destroyed his handiwork. It is we who cannot see. . . .

Does all this talk about getting a result by making a pretty mind-picture of it seem to you just an elaboration of our childhood's game of "let's pretend?" On this point I would quote the beautiful close of one of Sir Arthur Quiller Couch's lecture on English Literature before the University of Cambridge. This is what he says :—

"Gentlemen, on a day early this term I sought the mound which is the old castle of Cambridge. Access to it, as perhaps you know, lies through the precincts of the County Prison. An iron railing encloses the mound, having a small gate, for the key of which a notice-board advised me to ring the prison bell. I rang. A very courteous gaoler answered the bell and opened the gate, which stands just against his wicket. I thanked him, but could not forbear asking 'Why do they keep this gate closed?' 'I don't know sir,' he answered, 'but I suppose if they didn't the children might get in and play.'

"So, with his answer, I went up the hill: and from the top saw Cambridge spread at my feet; Magdalene below me, and the bridge which—poor product as it is of the municipal taste—has given its name to so many bridges all over the world; the river on its long ambit to Chesterton; the tower of of St. John's and beyond it the unpretentious, but more beautiful tower of Jesus College. To my right the magnificent chine of King's College Chapel made its own horizon above the yellowing elms. I looked down on the streets—the narrow streets—the very streets which, a fortnight ago, I tried to people for you with that mediaeval throng which has passed as we shall pass. Still in my ear the gaoler's answer repeated itself—"*I suppose if they didn't keep it locked the children might get in and play*;" and a broken echo seemed to take it up in words that for a while had no more coherence than the scattered jangle of bells in the town below. But, as I turned to leave, they chimed into an articulate sentence, and the voice was the voice of Francis Bacon:

> "*Regnum Scientiæ ut regnum Coeli non nisi sub persona infantis intratur—Into the Kingdom of Knowledge, as into the Kingdom of Heaven, whoso would enter must become as a little child.*"

Through the prison gates . . . lest the children should get in and play . . . Let us then weave and keep our dreams, our dreams of the perfect service, of a world built to Music. Let the Peter Pan in each of us—the boy or girl that will never "grow up"—toy with the magic key, which, some day, may give us entrance to the City of Gold—through the prison gates.

(2.) HUMOUR AND WORK.

After a trained Imagination, surely the next thing necessary to work at its best is a sense of humour; for Humour, no less than Imagination, requires us to stand back, as it were, and view ourselves and our circumstances as from a distance; but this time much as we would view a comedy staged for our benefit.

Humour is, perhaps, mainly a question of contrast between the Expected and the Unexpected. It follows, then, that before we can properly laugh at our work we must have mastered it; for it is only as we know the Expected that we can see the comedy of the Unexpected. This is one of the chief justifications for any attempt deliberately to seek humour in our work, Ability to laugh at one's work has another useful property. Humorous or unusual presentation of facts helps us to remember them. The facts become golden links in the technical chain, or—if this is too fanciful for our present mood—the same idea will do equally well in its Spoonerised form as golden chinks in the technical lane! We all know the tragically forceful appeal of Humour, but Stephen Leacock tells a story which it may not be out of place to relate here. A youth named Henry Hayseed was in New York looking for work. He went up to the foreman of a brickyard. "Have you any work, Sir?" he said. Something in the upturned face of the lad appealed to the foreman, *and he threw a brick at it*! Happily there are no bricks here, for an awkward feature of humour is that what may seem passably humorous to some minds may seem sheer idiocy to others. So jesting is always a risky business, and therefore, Ladies and Gentlemen, in the name of Alexander Graham Bell, I beseech you to look at this section of the paper only through the spectacles of Humour.

Except to the humorist, it is a disquieting thought that there is hardly anything we can say or do that cannot be put to the service of humour; and that even when we most intend to be serious we may be most amusing. Two examples given recently by an acting Schoolmistress are worth recording. A learner was asked the question, "What is the busy-back?" Gravely, and without hesitation came the answer, "The Supervisor!" With a twinkle in her eye the Supervisor in question, who was evidently a humorist, said to me, "I expect she was thinking of busybodies!" Another learner, asked to explain the different procedure in obtaining a private and an official medical certificate, wrote :—"When you go to your own doctor, you tell him what to put down; but when you go to the Medical Officer, he will do the necessary!" Not a bad start for a learner!

But you will look for some evidence in support of the statement that everything said or done can be made the subject of humorous comment; and perhaps the best way to supply this is to take one of those items of our work, which to all appearance is utterly without humour, and see whether we can deal lightly with it. As a brilliant example of an unpromising item the booklet "Operating Procedure and Switchroom Rules" could hardly be excelled. This famous classic no doubt heads the list of books we have read from cover to cover more than a dozen times!

Let us then, in lighter vein, indulge in a little meditation on the work mentioned; always remembering that we are not composing a Traffic Instruction, and that our very random reflections must be interpreted much as we would read "looking-glass writing"—by holding it before a mirror by which apparent reversals of the normal order are "straightened out."

The method is easy. Choose a nice quiet spot where you will be free from interruption, sit down or recline in a comfortable position with muscles relaxed. Then take your booklet and read the rule you wish to study, so as to fix it in your memory. Next, and this is most important, *fix very carefully in your mind the correct technical meaning of the rule.* Now let your mind play with the ideas expressed, with special reference to what you know the rule is *not* intended to mean, but what could be read into the words by variation of accent or definition. For the latter you will require not less than two dictionaries. The more the better, since they sometimes differ, as Doctors do—to them a privilege, to the humorist a joy. But since they are all Doctors, you may select the meaning that you like best from the standpoint of humour.

The method described was—unrealised by the inventor—suggested to me by an unknown humorist some years ago in connection with a Traffic Instruction prepared by an acquaintance known under several aliases, TR/1, TL/1, and T SL1. One of his titles to Fame at the time was a habit of using long words where short ones would do equally well—quite an impressive trick if not overdone! In a moment of special inspiration he put in this Traffic Instruction the expression "logical corollary." At first all seemed well. Then came a shock. It came to his knowledge that some humorist had raised the question why a responsible Traffic Officer should advocate lying! This conclusion, reached after judicious reference to a dictionary, was arrived at as follows :—

Logical	— Reasonable.
Corollary	— A deduction from a truth.
A deduction from a truth	— Something less than a truth.

Therefore, a logical corollary is a Reasonable Lie! To this day I do not know who this ingenious critic was, or even whether he or she is still with us. But I could then understand why Shakespeare held such strong views about Instructions. His language is rather lurid, but the quotation would be spoilt by expurgation, and I suppose you all have read "Macbeth." So, Ladies and Gentlemen, extend just a little the normal scope of the jester's licence that I may quote in full, for :—

> . . . . . in these cases
> We still have judgment here; that we but teach
> Bloody Instructions, which, being taught, return
> To plague the inventor!

Evidently Shakespeare knew all about Traffic Instructions; and let us hope that, when the L.T.S. Traffic Instructions are printed, this quotation may appear on the title-page! But to return to our meditations, which—if well and truly done—will show that the everyday work of the telephonist is full of delightful perplexities.

Let us begin with the booklet cover. It is green. Why green? Since nothing happens by chance, there must be a reason for this. Now green denotes Jealousy—possibly the jealousy of those unhappy folk who are condemned to go through this wicked world minus a book of rules! This, however, we reject as an unlikely reason. Green also denotes guilelessness, as the word is used in the charming effusion *we* sometimes addressed to *our* colleagues at *our* first school :—

> The Rose is red,
> The Violet's blue,
> The grass is green—
> And so are you!

Doubtless, then, green denotes the guilelessness of the telephonist who studies the rules—the average telephonist of course, since it is standard practice to think in averages. But green is also the most restful colour for the eyes; and it is on the cover rather than the contents that the guileless telephonist's

eyes will rest if she carries out too faithfully the rule considered next. So then, we may express the meaning of the colour of the cover thus :—

The book is read—
When moons are blue
The cover's green—
And—so—are—you !

The logic of this may be a little weak, and some may shrink appalled from the spectacle of a grave abstraction—the Telephone Service—in frolicsome mood ; but we shall find that thinking on these lines quite alters the expression of the booklet cover. To quote the last line of a famous Limerick, there will be " a smile on the face of the tiger ! " though, unlike the young lady of Riga, you will be able to see it ! And, if so, surely the end justifies the means !

Let us now turn to the prefatory notice on the first page of the same work :—

> Telephonists should, as a general rule, *keep their rule-books in* their lockers.

" Keep the dog in his kennel and see that it doesn't get out " so to speak ! No doubt it would be very awkward for somebody if it did, as rules are much addicted to biting ! Incidentally you will notice that rule-books have lockers as well as telephonists—unless the lockers belong to the rule-books and not to the telephonists ! But one feels sorry for a rule-book in the hands of a really guileless telephonist, intent on " keeping it in " as instructed. One wonders whether the rule-book is ever taken out for an airing, and what happens when a telephonist who has forgotten to chain up her rule-book incautiously opens the door of its locker. There must be many a desperate struggle between a really determined rule-book and its neglectful custodian !

> " The holder of this book is responsible for its safe custody, and must return it on request or when leaving the service."

So the main point to remember is to keep the book locked up so as to be able to return it when required. This seems odd—unless the locker referred to is the locker of the mind ; and if so, even rules speak in parables :—

Some point to thumb-marked pages as the proofs of " midnight oil "—
Identify by finger-prints e'en intellectual toil.
But the *Rule-book* switchboard maiden—whose efficiency's a fact—
Will keep the pages stainless and return the Book intact.

(To be continued)

TELEGRAPHIC MEMORABILIA.

THE telegraphic and telephonic developments in Germany have been mentioned on more than one occasion in these columns, and the following information, now well-known in electrical circles, will no doubt interest our many readers throughout the world. From a reliable source it is reported that certain directors of the German Atlantic Telegraph Company, and one or more representatives of the Reichspostministerium Berlin, have arranged a contract with the Portuguese Government by which the Company has obtained landing rights at the Azores, for a cable which will be laid from that point to Emden, the American connexion being made by the Commercial Cable Company between the Azores and New York.

The financing of the German section is stated to have been arranged by the Disconto Gesellschaft in such a form that the American money market has been opened without affecting the independence of the company. The firm of W. A. Harriman & Co., for instance, is said to have taken over an obligation loan of the German company for the amount of 3,800,000 dollars, which is to be disposed of in the United States. It is further mentioned that the German company has reached an understanding with the Eastern Telegraph Co. with regard to the South American traffic, and is in course of extending its connexions with the East in association with the Great Northern Telegraph Co.

With regard to the item relating to the understanding between the Eastern Telegraph Company and the German Government, it will be recalled that only within the last few months the Eastern Telegraph Company obtained direct cable communication between their London office and Emden, thus providing a direct link with Germany for the passage of South American traffic exchanged over the company's system, pending the completion of the more exclusive Germano-American submarine cable.

It may be presumed that the establishment of this last-mentioned circuit, will render unnecessary the present Anglo-German route but of this there is at the moment no information available.

Germany's steady persistence with the development of her means of communication is further emphasised by other items of news which have reached me from different sources.

One of these is the fact of the completion, last year, by the Felten and Guilleaume Carlswerk Gesellschaft of Mulheim of the manufacture of a telephone cable destined to connect Germany with Switzerland. This cable has since been laid, and is now working satisfactorily according to the latest reports.

Then again, there has recently been established what are known as " Express " International Telephone calls, between certain German cities and Vienna. The rates for these calls are generally nine times the normal trunk charges, and in some cases as much as thirty times that fee, according to the London *Times*.

This system of abnormal rates is of course in keeping with the policy pursued with regard to Germany's Inland Telegraphs, where the " Blitz " or Lightning Service is available between certain German towns at three times the usual " Urgent " rate, i.e. nine times the ordinary fee.

The fact of the launching of the twin screw cable steamer, *The Cable*, for the service of the Eastern Extension, Australasia and China Telegraph Co., Ltd. gives no credence to the belief that wireless is going to oust the submarine cable, but rather leads to agreement with the financial editor of the *Electrical Review*, who in a recent issue (Oct. 10) wrote as follows :—

" The cable market is better, with rises in Eastern Extensions, Globe preference and Western ordinary. Anglo-American preferred hardened to 104½. The investor's attention is aroused by the yields offered by the cable companies' stocks at the present prices. The news that the All-America Cables Company of New York is laying a new cable between New York and Cuba, and that it has added more than 5,000 miles of submarine cable to its system within the last four years, helps to dispel the idea that the submarine cable is likely to be superseded by wireless," and this at the same moment when *Radio Corporations* Ordinary and Preference had both registered considerable advances on the money market.

The writer is not an angler, and must therefore submit the following electro-piscatorial paragraphs respectively from the London *Times*, *Westminster Gazette*, and *Electrical Review* in all good faith. Thus, the *Times* :—

An " electric eel " from South America, over 4 ft. long and nearly 4 in. in diameter, is now on exhibition in one of the tropical freshwater tanks in the new aquarium at the Zoological Gardens, London. The electric eel is allied to the catfishes, and is able to give a severe electrical shock of from 400 volts upwards, apparently at pleasure. When it is handled, or even lightly touched, almost at once a succession of shocks can be given over a considerable period without exhausting the fish, probably partly for protection and partly to kill the prey.

Four other kinds of fish have electrical organs. The torpedo rays of the Atlantic and Indian oceans, belonging to the genera *Raia* and *Torpedo*, may attain a width of from two to three feet, and can disable a man by a single discharge. *Malapterurus*, with three species, is a catfish of freshwater tropical Africa, one of them inhabiting the Nile. The *Mormyridae* is a family of fresh-water African fishes remotely allied to the herrings, all of which have developed electrical organs.

The electrical organs have been studied both anatomically and physiologically by many investigators. They all consist of a large number of plates arranged in series, and the high voltage, which may be above 450, is obtained by the simultaneous electrical excitement of each of the plates. Except in *Malapterurus*, where the organ is developed from skin glands, the actual battery consists of a number of modified muscle plates arranged along the sides of the body. These are richly supplied with nerves, and the end-plates, or terminations of the nerves in the muscles, are regarded as the active part. But skin papillae are also concerned, and the organ as a whole is more quickly fatigued than nerve fibre, although less so than muscle. The fishes themselves are almost insensible to electrical shocks."

Upon which T. A. in the *Westminster Gazette* elaborates with the glaring head-lines " ELECTROCUTED MEALS," as under :—

" The Zoo Aquarium now boasts five specimens from the Amazon. The electric " cells " which give the shock to other fish and small mammals, and so provide the eel with electrocuted meals, are comprised in two parts of longitudinal structures lying between the skin and muscles—one on the back of the tail and the other along a fin."

Facetiously adding :—

" If ever it became a rule of the deep that eels were to carry a green light in front and a red one behind, this slippery customers could easily provide the necessary power from his own wet batteries, and still have sufficient left to give one a nasty twinge when one touched the water of his tank."

The Review had apparently anticipated this touch of frivolity when dealing with scientific matters, and therefore had previously related in its pages how one, Mr. H. T. Burkey, an engineer of the American General Electric Co., New York, with that beneficent spirit which becomes the genus *Man*, had utilised the power of electricity *not* to destroy, but to preserve the lives of the finny tribe !

This gentleman has invented " an electrical fishstop, a device to save fish from death in irrigation canals, power flumes, and ditches. It is simply the use of electrodes immersed in the canal, with electricity flowing between them. It has been found that the resistance of water to electricity is greater than that of the body of a fish, and that if a fish swims in the vicinity of two or more electrodes it receives a shock which causes it instinctively to dart away. These electrodes are placed there to keep fish from getting into the irrigation canals, where they would die when the water was let out. To prevent this loss numerous mechanical devices have been tried, but have proved ineffectual. Screens of fine mesh have been used, but if the mesh is fine enough to prevent the small fish from passing through, then the drift and waste carried down by the water clog the meshes so that the water carrying

the young fish flows over the top of the screen, and the fish are lost. Another reason why a screen is impracticable is that game fish swim head on to the current and drift slowly down the stream. The tail and fins of the young fish are tender, and large numbers of them become entangled in the screen and die. Other mechanical methods used likewise have met with only partial success."

It has not been remarked apparently—perhaps there is nothing remarkable in it, but the fact remains that while the murderous fish with its death ray of 400 to 500 volts boasts of a home in Southern America the more benign inventor hies from the cooler environment of the North.

While on matters zoological, and for the benefit of our foreign readers who may not have seen the interesting item, it was on the third of last month that the enterprising British Broadcasting Company broadcasted the calls and cries of many of the animals inhabiting the Zoological Garden, London.

A portable microphone on a tripod was carried from one animal's cage to another accompanied by transmitting apparatus on wheels, with a double aerial carried aloft by bamboo poles. By this means the cries of the Walrus, the Sea-lions, the laughing Hyenas, &c., were all reproduced and heard by every station in Great Britain. Transmission was received at a small station in the gardens, which was linked with the London 2 LO station by land lines.

It is well recognised that when working with certain telegraph offices little patience is shown towards any weakness on the part of the telegraphist, at the London end of the wire. On the other hand some of these offices have a neat and witty manner of informing offending telegraphists of their manipulative weakness. One such quite recently thus directed the attention of the unlucky wight who had made one or two erasures in his transmission, that is after the critic had permitted a few feet of the offending slip to run out into the waste-paper basket at the receiving end, "*Ohé mon cher débutant comprenez vous que vous etes en communication dirécte avec le panier ? Recommencez s.v.p.*

To those whose homes are "replete with every convenience," which would of course include electrical devices for heating as well as lighting, the following extract from a leaderette in the *Electrical Review* on "Electricity used dangerously," may prove the value of the proverb of "forewarned is forearmed." There is, says the writer, a possible danger in such a homestead even when broadcasting, for "the wearer of a headphone which happens to be faulty may, in effect, have an earthplate clamped to his head, or hers, and on picking up an electric kettle or other device which is likewise faulty may have a very unpleasant experience."

An amplifier is fitted in each of the two large lighting pendants used in the new cathedral at Liverpool. The amplifiers are operated from the pulpit, and are so fitted as not to mar the harmony of the massive, but beautiful bronze work of the pendants, each of which it may be mentioned weighs approximately one ton.

Sir Oliver Lodge is always interesting and alluring, and his broadcasted address on the Romance of Wireless though freely published in some of the daily press of this country is surely worth repeating, at least in part. Sir Oliver reminded his listeners that the romance of wireless chiefly consisted in the fact that we were for the first time *consciously* using the ether of space as a vehicle for messages. In fact we were like the pupil in Molière's play who had been talking prose all his life and had only just been made aware of the fact, for "We had long unconsciously used it—not when we spoke to each other, for then we only used the air—but when we smiled or winked, or nodded, or, on a larger scale, when we signalled by means of flags or semaphores, or when we flashed Morse signals by the heliograph. We were also employing the ether (though few people knew it) in ordinary telegraphy. The wire did not really convey the message, it only directed it to its destination. The power was transferred, not directly by the electrons, but by their electrostatic fields—that was, by the space intervening between them, a space which like every other space was full of ether, and which in a cable was limited to the annular channel between the metallic core of the cable and its outer sheath. If the voltage applied was too high, it was the insulator that was damaged, not the core; and if the insulator was punctured, the message was stopped.

When a rapidly alternating source was used, however, true waves could be emitted into the space surrounding the wire. Portions of energy were broken off and shot forward by their own momentum, travelling with the velocity of light; not with the velocity of light in free space, but with the velocity appropriate to the insulating material—which might be about half the speed attainable in free space.

It will be recalled that Lodge took an active part in demonstrating the existence of these waves, also their rough measurement in 1887-88 at the top of Brownlow Hill, Liverpool, now occupied by the University of Liverpool, then University College, the theory of these waves having been deduced from Clerk Maxwell's work.

Hertz made the even more striking discovery that the waves could also be generated and detected in free space without any guiding wire at all.

"Electricity," continued Sir Oliver, "had momentum as well as elasticity: and those two requisites sufficed for the transmission of waves. Electric and magnetic effects occurred together; they were inevitably associated. The electric part gave the elasticity, or the recoil; the magnetic part gave the inertia, or the momentum. And combining the two we had all the prerequisites for the propagation of waves.

It was by this means that we saw: it was thus that we received light from the sun. In the sun the ether was set quivering by the vigorous oscillation of its electric charges. The waves travelled out in all directions into space; and a minute fraction of them was utilized to stimulate the sensitive receiving instrument located in our eyes. Thus the human race and animals had all along been utilizing the properties of the ether to convey information. The eye was our etherial receiving instrument; it was unconscious wireless telegraphy, an unconscious utilization of the ether.

But now we had taken a further step, not in any way more remarkable, but with more understanding of what we were doing under conditions, therefore which were more liable to attract our attention and stimulate our surprise. Instead of the eye as detector we constructed artificial instruments, whereby we had to deal with much longer waves, though otherwise of precisely the same character as those with which the eye was competent to deal. We translated those signals into auditory vibrations, that was, vibrations of plates and of the air, and so made them accessible to the ear instead of to the eye. And we had constructed other ingenious artificial arrangements for producing and modifying those waves, in accordance with the vibrations of the human larynx. The sending and receiving stations were different from those that had arisen in the course of evolution; they were artificially constructed and, accordingly, were better understood; but in essentials the process was the same. Waves were generated, and then modulated, in the ether; they travelled out in all directions; and some small fraction of them was utilised to stimulate the receiver and produce what we called a sound. We had in fact made the ether "talk," or, rather, transmit speech. Through the ether we could as it were speak round the world."

The lecture leaves one with the salutary if humiliating conviction that after all Man is not so clever a creature after all. He does but fumble about the secrets of eternal laws. He may discover. He cannot create.

Some idea of the capacity necessary for working a large automatic telephone station may be gained by the new citation of the contracts at present being carried out by the Chloride Electrical Storage Co., Ltd., which has at the moment in hand some very large stationary batteries for telephone operation, including an order from the Automatic Telephone Manufacturing Co. for a battery of four sets each of 25 cells, having a capacity of 10,000 ampere hours (10-hour rate), for the G.P.O. Holborn Exchange. This, it is claimed, will be one of the largest telephone batteries in use in the United Kingdom. A special feature of the design will be the supports for the cells, which will consist of stoneware pedestals in place of the usual wood stillage. This not only gives high insulation, but enables the battery-room to be washed round by a hose pipe, thus affording a greater degree of cleanliness. The company also had in course of manufacture a similar type of battery, comprising two sets of 25 cells, having an initial capacity of 8,000 ampere hours and an ultimate capacity of 10,000 ampere hours, for the Bishopsgate Exchange.

The following paragraph from *The Cable Room Monthly*, is quoted as showing the mingled spirit of optimism and sincere desire to co-operate in the matter of wireless affairs, at present evidenced by the staff, and which it is most sincerely hoped will result in the happiest sequels :—

"The greatest satisfaction is felt on all sides that Central Radio Office affairs are developing so satisfactorily for our Room. A matter that has not hitherto been fully appreciated is the disadvantageous effect the normal expansion of our activities must have upon our hours of attendance. We will become more and more subjected to the exigencies of a 24-hour service in proportion to the breadth of our system. Our staff will, of course, prove its desire for development by promptly shouldering the extra burden. In the meantime there seems to be grounds for the optimism that the whole status of our work must sooner or later be the subject of review."

AUSTRALIA.—The Minister for Education has decided to permit the installation of radio receiving sets in schools by Parents and Citizens Associations, on the understanding that the local bodies bore the cost and installed only receiving instruments approved by the department as suitable for school use. He considered the scheme would bring isolated country centres into contact with Sydney, and the use of the schools as social centres in the evening during the transmission period should do much to remove the isolation of communities; he added that it was not expected that wireless would be used for regular instruction. At the same time supplementary matter of general educational value could be provided. An advisory committee appointed by Mr. Bruntnell is inquiring as to the type of set which should be installed in the schools.

The Industrial Australian states that during the financial year ended June 30, 1924, the Postmaster-General's Department expended £3,274,371 on telegraphs, telephones and post offices under the heading of new capital works. The public demand for services of all descriptions is still so great, that the expenditure in 1923-24, could easily be exceeded during the present year and the amount provided on the present estimates is £4,299,700. Construction and extension of telegraphs, telephones, and conduits and laying wires underground will this year absorb £3,230,000. Telephone arrears are being steadily overtaken; the number of unsatisfied applicants is now about 11,000.

AUSTRIA.—The Vienna broadcasting station was opened on the 1st of last month in the presence of representative members of the government.

A wireless telegraph service has recent been inaugurated between Vienna and Cracow.

CHINA.—*Eastern Engineering* states that the authorities in Changchu (Kirin Province), have started to construct telephone lines at an estimated cost of £40,000. The Nanking Railway announce that they are about to install long-distance telephones in connexion with their express trains, *for reporting accidents &c.* The italicised words are scarcely re-assuring!

CUBA.—The all American Cables, Inc., of New York, says the *Financial Times*, have announced that a new cable will be laid between New York and Cuba, and will be in operation before the end of the year, in order to provide a faster service between the two countries. The company claim that they have added more than 5,000 miles of submarine cable to their system since 1920, in North, Central and South America.

CZECHO-SLOVAKIA.—The British Commercial Secretary at Prague recently reported amongst other things upon the position of wireless and telephones, and his statement is decidedly interesting.

The central wireless station of 100 kW at Podebrady should by now be completed; meantime an apparatus of 5 kW at Podebrady is in communication with England, France, Switzerland, and Rumania. Additional dispatching stations of 5 kW have been built at Bratislava and Kosice, and stations of 1 kW at Kbely aerodrome, Brno and Carlsbad. Receiving stations for Press messages are situated at Prague, Brno, Carlsbad, Aussig, Reichenberg Mahrisch, Ostrau, Bratislava and Kosice. There is also a military station of 10 kW at Prague, which will probably be taken over by the Post Office. A private Czecho-Slovak broadcasting company called the Radio Journal has been established, and this business may be expected to develop considerably. A British automatic telephone company has recently concluded a 10 years' agreement with the Telegraphia Company, representing the Post Office, for the local manufacture of its patents, thus opening up a new field for British electrical enterprise.

DENMARK.—The Commercial Secretary at Copenhagen has informed the Department of Overseas Trade that since the Danish Meteorological Institute again this summer began to issue weather forecasts by wireless for the benefit of farmers, it has been strongly urged that a transmitting station be established for the use of the Institute alone; the total cost of the plant would be about 15,000 kroner. If the weather service is to be extended and modernised, Lyngby Station, the one at present being used for this purpose, would be inadequate.

FRANCE.—A wireless telegraph station has been established by the French government at the observatory, on the summit of the Pic du Midi. It will thus be more than nine thousand four hundred feet above sea-level.

Upon the authority of the *Daily Telegraph* it is stated that the Eiffel Tower is no longer to be used for disseminating entertainments. In future the Eiffel Tower will only be used for broadcasting official statements and propaganda intended primarily for foreign ears. It will, in short, be a Government service.

HUNGARY.—From a fairly reliable source it is understood that it is proposed to make a telephone number, and a name sufficient address for telegrams to be delivered in any city in the country.

IRISH FREE STATE.—An *Irish Independent* representative has learned that a broadcasting scheme for the Saorstat will be submitted to the Ministry for Finance in a few weeks. It is not ambitious, but it is claimed that it will prove adequate for the needs of the country. The control station it is proposed to erect in an open space near Dublin, and Cork is to have a sub-station which will cater specially for that city and the South. The total cost will be about £15,000, and the undertaking will be controlled and managed exclusively by the Post Office. The plans contemplate that the stations will be working in January. It is computed that in a short time the undertaking should prove a paying business proposition.

ITALY.—The Marconi broadcasting station at Rome, which has been subjected to tests for some time, was to begin regular transmission on Oct. 7, and nightly programmes will be given between 7.30 and 9.30 p.m. The wave-lengths is 422 m. (*See also* JUGO-SLAVIA).

JAPAN.—According to the *Evening News* the following is an outline of the conditions laid down by the Japanese Government as regards broadcasting in that country.

People who desire to broadcast or begin a regular broadcasting service must apply to the Minister of Communications, at the same time supplying all constructional details of the proposed station and an estimated profit and loss account of its working. Two kinds of stations will be permitted to broadcast:—(1) High-powered long-distance stations, which must work on a wave-length of from 360 to 385 metres; (2) short-range stations, which must work on a wave-length of from 215 to 235 metres. The licence fee for each high-powered station is £40 yearly, and for the short-range stations £30, while listeners will have to pay 4*s*. yearly on each receiving set.

JUGO-SLAVIA.—*The Electrical Review* gives some very interesting information regarding an "agreement come to between the Italian and Jugo-Slavian governments concerning their respective telephone and telegraph services. Both parties pledge themselves to preserve intact all existing lines, whether working or otherwise. The telegraph lines from Fiume to Zagabria and Fiume to Ceni, as well as the Fiume to Belgrade line will be brought into a working condition. The internal tariff will be used at all telegraph stations communicating with Zara and its neighbourhood. The undersea cable communicating with Pola and Sebenico will be taken up, and the plant used to unite Spalato with an Italian port. There will be set up a telephone line from Lubiana to Zagabria and Belgrade on one side, and from Udine to Gorizia and Trieste on the other. Italy, furthermore, pledges herself to construct a direct telephone line from Milan to Serboslavia."

This if realised should prove yet another step in the stabilisation of telegraphic and telephonic comunicators in Middle Europe.

RHODESIA.—*The British South African Export Gazette* states that two of the principal forthcoming items of expenditure will include £12,000 for a radio station and £8,000 for a new telephone exchange switch board at Salisbury.

RUSSIA.—Mr. O. V. Lossey claims the discovery of a new form of crystal detector which oscillates like a valve, and can not only be used as a detector, but also as an amplifier. Mr. Lossey, says the *Daily Mail*, developed his apparatus in the Russian Government Radio-Electric Laboratory; although at present the results obtained by oscillating crystals can only be repeated under strict laboratory conditions, there is no doubt that reaction is possible using a suitable local battery. This need not be of high voltage (in the Russian experiments only about 12 volts was used), but the circuit arrangements and adjustments are extremely difficult and critical. The crystal used is zincite, with a "cat's-whisker," consisting of a steel point, and to find a suitable sensitive spot some very ingenious devices have been evolved. Low resistance 'phones are used, and the other apparatus includes high resistances, potentiometers, and the more familiar condensers and coils. With his apparatus the inventor claims to have sent out readable signals up to a distance of half a mile.

SOUTH AFRICA.—The erection of a radio broadcasting station at Port Elizabeth in under discussion. According to the *British S.A. Export Gazette*, it is probable that private enterprise will control the undertaking. Receiving sets to the value of approximately £20,000 were sold in and around Johannesburg during the three months ended August 31st.

SWEDEN.—Reuter's Trade Service (Stockholm) announces that tenders for the construction and fitting of five broadcasting stations at Stockholm, Gothenburg, Malmoe, Sundsvall, and Boden will be invited by Telegrafstyrelsen (Telegraph Board) in the immediate future.

THIBET.—It is stated that one of the first touches of modernism will shortly be given to that age-long abode of ultra-conservatism the "Forbidden City," for the first electrical plant is about to be erected at Lhassa and is being supplied by Messrs Crompton & Co. Ltd., Chelmsford. The plant consists of a three-phase, 500-V alternator driven by a water turbine, and it is intended chiefly to supply power to the Government Mint in the city. Tibetan workmen have spent some time at Messrs. Crompton's works studying the erection of such plant, in order to enable outside assistance to be dispensed with.

What is Electricity? This is a question to which many replies have been given, but the more theories are studied and examined in the light of modern knowledge, the more careful does the thoughtful investigator and professor become, when making declarations on the subject. The words, therefore, of H. E. Yerbury, M.I.E.E., M.Inst.C.E., in a paper read before the Sheffield Sub-centre of the I.E.E. some month or two ago, rather strike one as born of that saner spirit of humble, even reverential inquiry which recognises with Newton that the wisest is but a child on the sea-shore who has picked up just a few pretty stones of knowledge. He says:—"We with our limitations are forced to postulate two aspects of the universe. One is the physical, finite, or visible. This carries the *appearance* of reality to our finite senses, but it may be said to have no existence to us apart from those senses. The other is beyond our conception because it transcends space, time and sense perception." Mr. Yerbury expresses the view that the dogmatic assurance that matter is composed of electricity is untenable, but suggests that, "there is a transformation process and that whenever matter is dissociated electricity is manifested. Electricity is, therefore, an intermediary substance between matter and the ether resulting from a disturbance of equilibrium. There is a flow of energy whenever there is a break of equilibrium. Matter is a stable form of energy, and electricity is an unstable form of energy. Electrons radiate whenever there is instability. This phenomenon precedes dissociation.

There can be no manifestation of energy in any form without a disturbance or a vibration in either matter or ether. It is submitted that matter is ether materialised and charged with electricity. By modifying the equilibria of matter ether is also disturbed, and light, heat, and electricity result. The elements which produce these effects have in themselves nothing calorific or electrical. Matter, especially in the etheric state, is highly sensitive to every kind kind of physical impact from without, and forces and influences from within. It is always the *effect* of the ever-present, all permeating ether that we cognise by our senses, and not the ether itself, which is the potent medium for manifesting matter and all forms of energy—especially electricity—which has matter for its expression or body. Ether may be said to be a receiver, transmitter, and recorder of vibrations, and is acted upon by all forces. Light is not seen—we see its effects only. Much confusion of thought has arisen by assuming that a form of energy such as light is immaterial. It may be truly said from a philosophic point of view that the invisible is the real and the visible is only its shadow."

Spiritual Values—"We have to deal with our fellow-countrymen,—our flesh and blood who will give loyal and efficient service, face danger, forgive imagined or real mistakes, but who will not tolerate being treated as mere tools, mere parts of an economic machine. . . . In the drab world of economics moral values do not count, but I contend that comradeship in service unites us all and transforms the drabness of the economic sphere into a variegated world of moral and spiritual values. I have found a comradeship in our collieries capable of dominating all other considerations. It has been evinced in times of trouble and danger from the highest to the lowest, and is present also when trouble is absent."—Dr. John Scott Haldane, F.R.S., on "The Values for which the Institution of Mining Engineers stands."

J. J. T.

The
Telegraph and Telephone Journal.

PUBLISHED MONTHLY IN THE INTERESTS OF THE TELEGRAPH AND TELEPHONE SERVICE, UNDER THE PATRONAGE OF THE POSTMASTER-GENERAL.

Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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THE HOUSING OF EXCHANGES.

THE paper read by Mr. Kidner at the opening meeting of the Telephone and Telegraph Society of London gave rise to one of the most spontaneous and well-sustained discussions which we ever remember to have heard on these occasions. The subject discussed—The Housing of Telephone Exchanges—might not at first blush appear to the layman either inviting or exciting, but it proved, as is so often the case with supposed "dry" subjects, to be most interesting and intriguing immediately its varied aspects were presented and explained. Mr. Kidner's clear and instructive exposition of the procedure adopted in carrying out building schemes, of the problems to be solved in the acquisition of sites, the law's delays, the speeding up of contractors, and all the major and minor difficulties encountered in inducting the telephone service to a new home was enlivened by some concrete instances of the obstructive tactics of local authorities and of dilemmas due to the operation of the Rent Restrictions Act. He described how occasionally a well-laid scheme had been brought to nought when on the eve of completion, and how sometimes, after months and even years of anxiously-conducted negotiation, it became necessary to find fresh sites at the shortest notice. In the ensuing discussion nearly every speaker spoke from the heart, and in the fervour of the pleas for reform which were expressed one noticed a slight tendency to stress and even to exaggerate hard cases. It seemed sometimes to be overlooked that Mr. Kidner, in describing the procedure followed in the housing of exchanges, naturally enough instanced the great difficulties to be contended with. It was, we think, unnecessarily assumed by some critics that these delays and disappointments were normal and not exceptional. Four years of war, followed by depletion of staff, and finally by an Economy Campaign, have been the fruitful causes of many of our recent difficulties, and, though these causes still leave their effects behind, it may be assumed that their influence has waned and that the present organisation dealing with questions of sites and buildings will now have a fairer trial. A representative committee consisting of experts from the different departments, working in all possible harmony with the Office of Works, is in existence, which does much to ensure the expeditious completion of building schemes.

It was perhaps inevitable that some allusions should be made to the greater facility and rapidity with which such firms as Lyons or Boots, or companies like the Underground Railway, can secure commanding sites when they require them; but such bodies have no Treasury Department to control them, and no critics in Parliament and the Press to raise an outcry over the squandering of public money such as would surely arise if the Post Office met the public requirements in a lordly and lavish style, and without due regard to the strictest economy. It is useless to kick against the pricks, and most of the suggestions offered for the restriction of Treasury Control and for emancipation from the Office of Works were impracticable. Some speakers bore testimony to the hearty co-operation of the latter office; and doubtless the disadvantages of Treasury Control are often exaggerated. One suggestion made was that expenditure should be authorised by the Treasury in bulk, and a wider latitude given to the Post Office in matters of detail. As a matter of fact this latitude is already enjoyed as regards the installation of plant. Another suggestion was to the effect that if the period at present adopted for the forecasting of development was insufficient to ensure that the necessary buildings were ready in time, the obvious remedy was to lengthen that period.

The meeting afforded a signal example of the purpose which the Society's discussions is intended to serve. Difficulties were discussed and explained, fresh points of view were gleaned, and helpful suggestions put forward. Few, we imagine, left the hall without a clearer insight into yet another province of the Department's activities.

HIC ET UBIQUE.

A CORRESPONDENT of the *Daily Graphic* writing under the headline "This Comic Country" says:—

"Truly we are a source of comedy to Americans. Some friends from New York nearly went into hysterics when I informed them that telephone users in England had to pay rent for the instruments installed in one's house."

Truly, we may retort, some people are easily amused. The Londoner pays £2 a quarter in rent for his telephone and a penny for each call. The New Yorker pays about 16*s.* 8*d.* a month inclusive of 75 free calls. Whether he chooses to consider any

part of the 16*s.* 8*d.* as rent, or whether he prefers to consider that his calls cost about 3*d.* each and he gets his telephone rent free, is purely a matter of fancy. The latter idea might at a pinch furnish a source of comedy to Englishmen desirous of going into hysterics.

In "Things we want to know" the *London Mail* asks: "What sounds sillier on the telephone than 'five' being called 'fife'"?

The answer is: "Five" being mistaken for "nine"—which is, of course, the reason for the official mispronunciation of five.

The *Yorkshire Herald* referring to interruption to the service in the north due to gales in September says:—

"The incident once more calls attention to the need for drastic reform in the Post Office system. We have asked before and we ask again for any reason why the wires should not be laid underground. Surely common sense suggests that if wires can be laid below the pavement in London and the large towns they can be laid beneath the surface all over the country."

Surely common sense also suggests that the work of placing underground the extensive trunk system of this country is not one which can be carried out in a week or two. The *Yorkshire Herald* is probably not aware that the Post Office has made great progress in placing its long distance wires underground, and that this country has a greater underground trunk mileage than any country in Europe—except perhaps Germany.

A writer in *T.P's and Cassell's Weekly*, writes:—

"Telephones were curiosities in 1878 when I, an undergraduate at Pembroke College, Cambridge, fixed up two between my diggings in St Andrew's Street near the old "Spinning House" (long since pulled down) and a little summer house some fifty yards away at the bottom of the garden adjoining the grounds of Downing College. That little retreat was an excellent place for a quiet game of cards of a nature tabooed by the authorities, and my pair of telephone receivers—somewhat similar in shape to those now used, but made of wood—together with an electric bell formed a means by which my landlord might give warning if anyone called whom we did not particularly wish to see whilst so engaged . . . In fact, word got about at Pembroke that I had telephones, for as far as I know they were absolutely the first seen in Cambridge. 'Mac. and his telephones' were a source of amusement to my friends, who thought it rather weird and funny that any undergraduate should mess about with such things."

He goes on to suggest, however, that there was only one telephone exchange in London in 1884. There were two already in 1879, and we imagine there must have been at least half a dozen in 1884. We know there were 20 in 1888.

"Out of a total of 84,000 telephone subscribers in Tokio," says the *Far Eastern Review*, "there are now in service 28,000 telephones. This number will be increased to 64,000 when the Asakusa, Ginza, Hamacho, and Sumida exchanges are restored. Of the 18 exchanges in the capital 14 were destroyed by fire. Half the new system is to consist of automatic equipment, for which 50,000 instruments have been ordered from England. The entire, system eventually is to be automatic, and it will be extended to Yokohama next year. There were 10,000 telephones in the port city before the earthquake, and 2,500 are operating now."

Four additional circuits are now working between England and Holland, making in all 4 to Amsterdam and 3 to Rotterdam. They are affording a much-needed relief to a heavily-loaded service.

HOUSING OF TELEPHONE EXCHANGES.*

BY A. R. KIDNER.

I AM in the unfortunate position of a layman, called upon to address a society, the members of which are almost all of them—experts in one or other of the technical aspects of the telephone problem. You will therefore appreciate my difficulty in finding a subject upon which I could hope to make any remarks of interest. But it occurred to me that it might be worth while to draw attention to some of the points which call for consideration in connexion with the housing of a telephone exchange, and some of the obstacles which are encountered. The delays which these obstacles interpose only too frequently, expose the telephone administration to much criticism from outside, and cause a great deal of anxiety to the executive officers who are responsible for keeping up the standard for service given to subscribers, as well as to the engineering staff, who are hampered in their business of providing connexions promptly for new applicants. In some instances they necessitate considerable expenditure on make-shift arrangements, while in others they involve the continuance of conditions for the telephonists which are regarded as by no means ideal, and this again reacts on the quality of the service. These considerations are kept constantly in mind at Headquarters and every endeavour is made to co-ordinate the work of the various departments of the Post Office and the Office of Works in such a manner as to expedite the settlement of the questions which arise at each stage in the process of procuring a new telephone exchange.

The case of the small manual exchange such as those which are now being opened in the rural districts at the rate of nearly one a day presents little difficulty as a rule. An area which produces the prescribed minimum of 8 subscribers, usually possesses a sub-post office capable of accommodating the small amount of equipment required. The alternative is to find some person who is willing to provide accommodation for the equipment and to attend to the operating, which is not exacting. The latter is known as the exchange attendant arrangement. The sub-postmaster or exchange attendant is only required to provide for calls to be answered during the day; at night and on Sundays the subscribers are switched through to a larger exchange on a kind of party-line system if they are prepared to pay a small additional fee.

Next above the day-service rural exchange comes the class of exchange, fairly large in numbers, at which it is considered desirable to provide continuous day and night service, although the calls at night may be few and far between. It is usual to take up the question of continuous service as soon as the number of subscribers reaches 20, and in many instances therefore the problem of housing turns not so much on finding adequate accommodation for the board and the associated apparatus, as on inducing the sub-postmaster or some other suitable person to undertake the responsibility of attending to calls at night and on Sundays. Failing this, the alternatives are to provide automatic equipment, including generating plant, or to rent or purchase premises affording residential accommodation for a caretaker-operator, in addition to the exchange equipment.

The former alternative usually involves the erection of a special building, and difficulties may arise of the same character as those associated with the housing of the larger exchanges. As an instance, it may be mentioned that recently, in the north-east of England, about eighteen months were consumed in securing a site and putting up a building for an automatic exchange to serve 60 subscribers, on account of difficulties raised by the principal, and practically the only, landowner in the village. The cost of a special building is also a serious factor in the case of a small exchange, and it has not proved possible so far to devise a standard building which would be reasonably cheap.

The caretaker-operator arrangement has been found the most satisfactory in practice for all exchanges where the night traffic is light. The day work is given wholly or in part to directly-employed telephonists as soon as it becomes too heavy to be dealt with satisfactorily by the caretaker-operator and his family. Where possible, the premises are rented; but under present conditions it is frequently necessary to purchase and in some instances the only way of disposing of a sitting tenant is to appoint him as caretaker-operator. In some of the smaller towns room can be found for the switchboard and other equipment at a head office or salaried sub-office, where residential accommodation is available. This is clearly an economical arrangement, as the day work can be done by directly-employed staff and the night work by the sub-postmaster, if he resides on the premises, or by a caretaker-operator installed in the residential part of the premises, in cases where the switchroom can be shut off at night from the rest of the office.

So far, we have been considering the smaller exchanges, where the chief problem is to make satisfactory provision for attention to calls. When we come to exchanges of somewhat greater importance, a new factor is introduced. A switchboard, with all its associated equipment, is a complex thing, which cannot be lifted up bodily and transported to another place even a short distance away. If, therefore, for any reason the premises in which an exchange is housed, have to be vacated, another board with all

* Paper read before the Post Office Telegraph & Telephone Society of London, Oct. 20 1924.

its equipment must be fitted up in the new premises and the old board must be kept in use until the new one is ready, in order to prevent any break in the continuity of service. The complexity of the equipment increases very rapidly in relation to the number of subscribers it caters for, and the cost involved in a change of premises increases proportionately. In order to guard against unremunerative expenditure of this kind, it is necessary to make some forecast of the probable growth of the exchange, having regard to the nature of the district, any industries carried on in it, and any housing or other schemes which may affect it appreciably in the course of the next few years, and then to search for premises which will permit of expansion of the equipment to the extent anticipated to be required. If the premises are not purchased, a lease for a sufficient term of years must be arranged.

If the locality is one in which the subscribers' circuits are provided by means of underground cables or may be so provided in the near future, the location of the exchange becomes important, as the first cost of underground plant is higher than that of overhead, and the lengths of cable required depend upon the situation of the exchange in relation to the subscribers' premises. It is therefore necessary for the engineers to study the distribution of the premises of existing subscribers, together with such forecast as the district manager's staff can give of the number of new subscribers likely to be forthcoming in each part of the area in a given time, and then to fix an ideal centre, in order that the exchange may be housed as near it as circumstances permit. Where underground plant is contemplated, there is additional reason for insisting upon security of tenure of the exchange premises, in that a shift will almost inevitably involve the laying of fresh cables, and not improbably leave some of the existing cables more or less useless.

It will be seen that the housing of even a comparatively small exchange involves an appreciable amount of preliminary investigation, followed by a search for premises of a certain size as near as may be to a specified point. In the present shortage of houses the search may be protracted. On the other hand it may result in the finding of two or three buildings, to be purchased if not rented, none of which is suitable in all respects, and the relative advantages of each in regard to the price or rent asked, the accommodation afforded and the distance from the ideal centre have to be weighed in consultation with the engineers. When a decision has been reached, formal negotiations have to be begun with the owner and a variety of technical points may arise before the necessary legal documents are completed. After this any necessary adaptation of the premises to receive the exchange has to be carried out. It is not surprising, therefore, that a period of several months frequently elapses between the decision to open an exchange or to seek new premises for an existing exchange, as the case may be, and the inception of the engineering work. But it is all the more important that the traffic and engineering officers in each district should keep in constant touch, so that the need for new premises may be foreseen and the preliminary inquiries completed well in advance of the date when the new exchange will be required.

It is not, however, possible as a rule to find premises which would be suitable, even after some amount of alteration, for a fairly large exchange of, say, 500 lines. The requirements are exacting. For example, there is a large amount of apparatus, its weight is considerable, and its components must be distributed in different parts of the building in accordance with a more or less uniform plan, so that the engineering and operating staffs may perform their respective functions with the minimum of interference. There must be a well-lighted and properly ventilated switchroom; and provision must be made for the comfort of the staff in the way of rest rooms and dining accommodation. The policy of replacing manual equipment by machine-switching or automatic equipment as the larger manual exchanges reach the end of their useful life, wherever circumstances are favourable, tends to make the accommodation requirements still more exacting in some directions; the floors for example must be stronger and the rooms higher. In some cases it is possible to obtain the necessary accommodation by building on to an existing post office, but usually a site must be purchased and a building erected on it.

Since the end of the war a considerable number of important new exchanges have been put into service, many of them in buildings specially provided for the purpose, and there are many more in progress. I shall refer later on to some of the difficulties which have been met with, and I will only remark here that a very serious situation might have arisen but for the temporary arrestment of development which resulted from the revision of rates in 1921 and the depression of trade. Nevertheless there are nearly 150 magneto exchanges with 300 lines and upwards still in service, and in order to keep pace with the present rapid growth of subscribers in all parts of the country, a number of these will have to be replaced in the near future by automatic or central battery exchanges. In all the large towns also the spare capacity of the existing exchanges is being quickly absorbed, and they will have to be replaced by larger exchanges, usually of automatic type, or supplemented by additional exchanges.

In the next few years the efficiency of the telephone service will thus depend in large measure upon the completion of a number of new buildings, some of them of considerable size, by the time each is required for the reception of the apparatus. It is therefore a matter of great moment that the machinery for the preparation and settlement of schemes, for the finding and purchase of sites and for the approval of building plans should be relieved of complications and circumlocution wherever possible, and that the executive officers in all the branches concerned should do their utmost to make it work smoothly.

In March 1921, in an instruction enjoining the local officers to keep close watch upon the absorption of spare capacity in exchanges, it was laid down that a period of 5 years must be allowed for the completion of a scheme involving the purchase of a site and the erection of a building. This includes the time required for preparing preliminary traffic data and also the time occupied in installing and testing out the apparatus, which may be as much as 18 months for a large exchange. The experience of the last few years does not suggest that the period can safely be reduced at present. For example, in the time-table of the building in Manchester which is to house a toll exchange, two or more 10,000 line automatic units, the manual board for the whole area and administrative and engineering staff, 12 to 15 months are allowed for the preliminary work of preparing plans and working drawings and obtaining tenders, and 24 to 27 months for the building operations. In the case of 3 large London exchanges the preliminary work has occupied 9, 10 and nearly 20 months, while the actual building is estimated to take 12, 12 and 18 months respectively, even with the payment of additional sums to the contractors for acceleration of the work. These matters are in the hands of the Office of Works, who are fully alive to the importance of speedy completion of telephone buildings and must be assumed to have explored every possible means of attaining this end.

I do not propose to enter into the work which is necessary in order to determine whether a given area can be best served by one or more exchanges, what is the ideal position for the exchange or exchanges, and how many subscribers should be provided for. It is highly technical, especially in the case of new exchanges in London and the large cities, and it has been very fully described by Mr. Greenham in a paper read before the Institution of Post Office Electrical Engineers a few years ago. I would, however, remark in passing that any change of plans at a later stage will probably involve serious delay, to say nothing of wasted work on the part of the Post Office and Office of Works. It is very desirable therefore that the necessary studies should be put in hand in sufficient time to allow full consideration of the merits of the various possible schemes, and that the information and figures supplied for the purpose of those studies should be accurate.

As a result of this preliminary work, it is decided that a site will be required as near as possible to a specified point for a building to provide specified amounts of accommodation for the equipment, staff and other purposes. The building may be so arranged as to be capable of extension, but the site must be large enough for a building which will contain all the equipment estimated to be required before the exchange reaches the end of its useful life. In some cases it is considered desirable to purchase a site which will allow of the building being extended when the equipment is nearing the end of its life, so that new equipment can be installed in readiness to replace it. The requirements are communicated to the Office of Works, whose local representative searches the locality for possible sites and then visits those selected with the representatives of the Surveyor (or the Controller in London) and the Superintending Engineer. After ascertaining their views, he has to enquire into such matters as rights of way, ancient lights, drainage, fire risks, any restrictions on user, and sitting tenants—the last being a question of considerable importance in present circumstances. He then reports to headquarters, giving the approximate prices of any sites considered suitable in all respects, and his report with any comments and with an Inland Revenue valuation for the purpose of the Treasury is referred to the Secretary's Office of the Post Office. The possible sites are reviewed with regard to the economics of the cabling scheme which each would necessitate, and other matters and as soon as a decision is reached, the Office of Works is asked to obtain definite offers for the site or sites considered most suitable.

A firm offer having been secured, the scheme has to be submitted to the Treasury; and it is usual to furnish at the same time plans and an approximate estimate of the cost of the building unless there is an option on the site which expires before plans can be ready. When the Treasury approves the purchase of the site, the Office of Works conducts final negotiations and the Post Office Solicitor's Department proceeds with the necessary formalities for the conclusion of the purchase.

Clearly all this must take time, even if everything goes smoothly. And very often it does not. Sites are usually scarce in the business areas where large exchanges are required, in spite of the fact that for good reasons the telephone administration does not emulate the banks in building splendid premises at prominent corners—a practice which Sir Leo Chiozza Money commended to the Post Office recently in the *Daily News*. And it may come out that a site is required for a telephone exchange, with the result that if the owner of a likely site feels secure from competition he will naturally raise his price.

Local authorities are not above this temptation, however much they may clamour for cheap telephones. Two new large exchanges have been seriously delayed in this way. In one case the Corporation snapped up an eminently suitable site which had been offered to the Post Office on very moderate terms, and eventually forced the Post Office to buy from it at a high price an irregular site, to make full use of which will entail a costly building. In the other case the Corporation, after first objecting to the building of a new exchange on the ground that it would divert labour from their housing schemes, withdrew their offer of a site, and then renewed it on extremely onerous terms. Fortunately, in this instance an alternative site was found in the end; but the replacement of an out-of-date exchange has been seriously delayed and the Post Office has to bear the blame.

In another case the Corporation, who owned the most suitable site, demanded a price something like four times the Inland Revenue valuation. As the replacement of the exchange was not a matter of extreme urgency,

a search was kept up for alternative sites, but at the end of three years nothing suitable had been found and it has now become necessary to seek Treasury authority to come to terms with the Corporation.

Delay is occasionally caused also by the not unnatural desire of local authorities to take the opportunity of securing a strip of a site for road-widening, which may involve negotiations for the purchase of an equivalent amount of ground at the back or side of the site, and the revision of the building plans. One Corporation, bent on adding dignity to its town, expressed a desire that the new combined post office and telephone exchange should face its new Town Hall—a war memorial—and offered a site which it owned in place of the one which the Post Office had acquired. The Post Office was very willing to meet its wishes, but unfortunately difficulties of legal and other kinds arose and the commencement of the building was delayed nearly 3 years.

The Rent Restriction Act has added considerably to the difficulty of finding sites, as it is frequently impracticable to get rid of sitting tenants on a site which would otherwise be satisfactory. There have been two notable instances of this in London. A site purchased in 1915 for a new exchange at Bishopsgate had to be abandoned in 1919, as there were 13 houses on it, whose tenants could not be evicted. An alternative site was found after some delay; but it has not yet been practicable to dispose of the original site because vacant possession cannot be given. In the other case, the Post Office had decided on a site for a new exchange in the western part of London, when it was forced by opposition on the grounds of amenity and reduction of rateable value of other property in the neighbourhood to consider the only other site available, which was larger and cheaper. On this, however, there were a number of sitting tenants and although a considerable amount of time was spent in negotiating for vacant possession, in the end the effort had to be abandoned and the purchase of the original site completed.

In the London area and on the outskirts of the large towns sites are required for exchanges in residential districts, and difficulties arise from the restrictions imposed by property owners. Not infrequently these preclude the use of the land for building an exchange, while in other cases the building plans have to be altered to meet the approval of the vendor of the site. Serious delay has arisen from this cause in providing two badly needed exchanges outside the London ten-mile area. In one case the site first proposed was rather far away from the ideal centre, and in deference to the Treasury views another offer was obtained with much difficulty; but the site proved to be subject to a restriction, which would prevent its use for an exchange and the removal of which was doubtful, even if it were possible to discover the party able to consent. The original site was fortunately still available, but six months had been lost. In the other case a site was on the point of being secured when a land company intervened with the offer of a free site on certain conditions on an estate which they proposed to develop. The offer was accepted, but later on the company broke off negotiations. Another site was then found, but it proved to be subject to a restriction prohibiting the use of "operative machinery" in any building erected on it. Counsel has advised that this term would cover some portions of the exchange equipment and, as removal of the restriction cannot be secured, search has to be made for yet another site.

Even at the late stage of formal conveyance, obstacles may be encountered. A site in the Midlands was part of a trust estate. One of the trustees became insane and application to a Master in Lunacy was necessary before a valid contract of sale could be drawn up. The contract was about to be completed when notice was received of an allegation of fraud in respect of one of the title deeds, and negotiations which had extended over about 4 years had to be broken off. Happily, another site was found in a comparatively short time. In another case, it was found necessary for the vendor of a site to obtain a fresh lease from the owners of a large estate before he could effect a conveyance to the Post Office, and this he has not so far succeeded in obtaining in a suitable form. As all the land in the vicinity belongs to the same estate similar difficulties would probably arise if another site were pursued. The plans for a large exchange in the Midlands had to be revised, because it was found that a site which had been discovered after much difficulty included two pieces of ground consecrated for interments, although one of them had never been used for the purpose, and the Burial Grounds Act made it necessary that the building should not encroach on these portions of the site.

It may seem surprising that a telephone building could be projected in any spot where it could be held to mar the beauties of nature, familiar as we are with such objections in the case of poles. Nevertheless, this did happen not long ago just over the Border; but the building was required to house not an exchange, but repeaters for use in the long-distance trunk cables between London, Edinburgh and Glasgow.

A most unexpected obstacle presented itself in the case of another repeater station. Negotiations were proceeding satisfactorily for a site owned by a Member of Parliament, but when he discovered the identity of the purchaser he withdrew his offer in the belief that the transaction would contravene the Members of Parliament Disqualification Act.

As soon as the acquisition of a particular site is reasonably certain, steps are taken by the Office of Works to prepare building plans in accordance with a schedule of requirements supplied by the Post Office. The procedure was revised some months ago in order to expedite this part of the work by closer co-operation with the Post Office in the early stages. It has been arranged that the Board's Architect shall consult with the Engineer-in-Chief of the Post Office as regards the general lay-out of the telephone equipment, and then prepare rough plans for his consideration. If the building is to accommodate operating or other staff, the telephone lay-out will not be the only factor to be considered. In that case the architect consults the Surveyor (or the Controller in London) before preparing rough plans and sends sets to him as well as to the Engineer-in-Chief. The rough plans are referred with any comments to the Secretary, and after approval returned to the Office of Works. Sketch plans with a detailed estimate of cost are then prepared for formal approval by the Post Office, and submission to the Treasury. This procedure has the advantage that the sketch plans are practically agreed before they reach the Secretary, and can be returned approved almost at once, whereas formerly they had to be considered in detail by the various departments concerned and frequently needed considerable amendment, or even complete re-casting.

After the plans have been approved, the Office of Works have to prepare working drawings, get out quantities and invite tenders. The time allowed for this used to be 5 months or longer for the biggest buildings; but unfortunately it has extended of late to considerably more than this in some cases, partly—it is understood—on account of the shortage of draughtsmen, and partly on account of the upward tendency of prices, which results in the tenders being as a rule in excess of the estimate, so that they have to be scrutinized in great detail and the case submitted to the Treasury again.

The time allowed for building operations varies from about 6 months for the smaller automatic and common battery exchanges to 2 years or even more for the largest buildings designed to house a toll exchange, or a large clerical staff in addition to one or more 10,000 line exchanges. The times often seem to compare unfavourably with those achieved in the case of commercial buildings provided for private firms, but this is probably inherent in the system under which it is necessary to accept the lowest tender which is reasonably satisfactory. In some recent cases the Treasury have authorised extra payments to contractors for the purpose of expediting the completion of buildings which are urgently required, and the results will be watched with interest.

Telephone buildings are delayed—but perhaps not more than other buildings—by strikes, shortage of labour in particular trades, and shortage of materials. And they are subject occasionally to curious accidents, as in the case of an exchange in the London area where the building operations, carried on in wet weather, reduced the surrounding ground to such a state that it was impossible for a time to get the heavy switchboard sections across it. A more serious matter is the delay which has resulted in several recent cases from the bankruptcy of contractors. Some risk of this must no doubt be accepted under the system of competitive tenders with its temptation to contractors to cut prices to an unsafe extent: but it is to be hoped that the Office of Works will find some means of reducing such cases to the minimum.

Repeater stations for the long-distance cables seem to have been particularly unfortunate. One has been delayed some ten months through the bankruptcy of the original contractor, another has been held up for some time through the flooding of the kilns, from which the contractor obtained his facing bricks, while in a third the plaster began to crumble after a fortnight and had to be entirely replaced. After the building in the last case had been completed it refused to dry, and eventually a double roof with an air chamber had to be provided.

Comment is sometimes made on the fact that, if we exclude the very small exchanges, the majority of exchanges are housed in separate buildings and not in post offices, which would seem the natural place for them. This is partly due to the fact that a large number of the smaller exchanges, and quite a number of the more important, are still in the premises which were acquired from the National Telephone Company in 1912. When one of these exchanges has to be replaced, the question of housing the new exchange in the post office is considered; but this often means an extension of the premises, which cannot be conveniently arranged, and it may involve additional expenditure on cables, if the post office is at some distance from the ideal telephone centre. In a number of cases advantage has been taken of the need for a new building for postal purposes to include in it accommodaton for a telephone exchange. This has the advantage of economy in some cases, but serious delay often arises from the fact that the cost of the postal part of the building has to be met from funds voted by Parliament. As a general rule, although there is a tendency now towards relaxation, no money can be spent until the Estimates have been passed by Parliament, probably towards the end of the summer, and the Office of Works cannot get the building work started until August or September, with the result that little is done before the bad weather sets in. This disability does not exist in the case of purely telephone buildings, which are paid for out of the Telephone Loan, and can be proceeded with at any time after the plans have been approved by the Treasury.

It will be apparent that, apart altogether from the financial aspect, telephone buildings are a matter of serious concern to the higher administration of the service. The activities of the various departments concerned have to be carefully co-ordinated, and for this purpose a constant watch has to be kept on each scheme from its inception, in order to ensure that at each stage the necessary data are ready for the Office of Works and the engineering department, that the exchange equipment will be ready for installation when the building is sufficiently advanced to receive it, and that the external cables will be ready by the time the exchange is completed. When the time-table has to be revised through delays in securing a site or in the erection of a building, the situation must be reviewed in case it may be necessary to make temporary provision for meeting demands from new subscribers, as, for example, by putting up a make-shift building on the site with a small exchange to take the overflow from the existing exchange. This work of co-ordination has

been materially assisted and the progress of building schemes accelerated by periodical conferences in the Secretary's Office, attended by representatives of the Office of Works, the Solicitor, and the engineering and traffic branches, who report the position, so far as they are respectively concerned, of each of the more important schemes in hand.

It is satisfactory to find that, in spite of the difficulties to which I have referred at some length, substantial progress has been made during the past five years. In London 7 new exchange buildings have been completed, including Clerkenwell, Holborn, and Royal, 7 existing buildings have been enlarged or adapted, and 11 relief exchanges have been accommodated either in temporary structures put up on the site of the permanent exchange or in adapted buildings. In the provinces 20 new buildings for automatic or central battery exchanges have been completed. These include Luton, Dewsbury, Eccles, Windsor, St. Albans, two in Liverpool and two in Glasgow. In addition provision has been made for 45 new exchanges by enlarging existing buildings or adapting buildings purchased for the purpose. These include Oxford, Dundee, Perth, Inverness, Eastbourne, Ramsgate, Southport, Southampton, Swansea, Gloucester, Ipswich, and seven exchanges in the Liverpool district.

I have rather laid stress throughout this paper on the importance of telephone buildings from the point of view of good service. But it may be of interest to give some indication of the expenditure which they involve. In a number of typical cases in London, mostly exchanges between 1,200 and 4,000 lines, the cost of the building, apart from the site, varies from £2 10s. to £6 per line; but exact comparison is difficult, as in some instances accommodation is provided for engineering staff and stores in addition to those needed for the exchange itself. In the provinces the cost runs from £2 5s. to nearly £4 per line. The number of cubic feet per line varies from 14.4 to 23.

Two buildings now being erected in London for automatic exchanges of 10,000 lines, are expected to cost about £37,000 and £48,000 respectively. The building in the City which will house two or three automatic exchanges eventually is estimated to cost £177,000, while that at Manchester, to which I have referred previously, will cost nearly a quarter of a million.

The expenditure on sites and buildings varies a good deal from year to year, according to the results of searches for sites and the progress of building work. For the five years ending March 31 1924, the total was £1,363,000, and it is expected that the expenditure in the present financial year will be in the neighbourhood of £600,000. This is more than 50% higher than in any of the previous years, and it indicates, I think, that the efforts made to improve the organisation of the work are bearing fruit.

THE NEW CHAIRMAN OF THE MERSEY AND N. WALES (LIVERPOOL) CENTRE OF THE I.E.E.

As an old Post Office man, and one who has never lost his hold upon or his love for the craft of telegraphy, the C.T.O. and the Post Office Telegraphs generally will note with intense pleasure the election of Mr. H. H. Harrison, M.I.E.E., to the chairmanship of the above centre of the I.E.E. Mr. Harrison will deliver his inaugural address on the 3rd inst., and we cannot do better than reproduce the brief account of Mr. Harrison's activities as set forth in a recent issue of the *Electrical Review*. It is regrettable that we cannot also reproduce the excellent photograph of our much respected friend, which appeared in the issue of the last-named journal of Oct. 17, but perhaps this is by no means so very serious in the case of a gentleman so well known in telegraph circles as is H.H.H.

Mr. Harry Hughes Harrison, M.I.E.E., the new chairman of the Mersey & North Wales (Liverpool) Centre of the Institution of Electrical Engineers, entered the British Telegraph Service on the operating side, and after three years was transferred to the Testing Branch. He received his early instruction in telegraphy and telephony from Mr. (now Sir) William Slingo. He left the Telegraph Service after a few years to go into heavy mechanical engineering, at which he remained for eleven years, subsequently entering the service of the British Insulated & Helsby Cables Ltd., in London, on the engineering staff. Later Mr. Harrison joined the engineering staff of the Automatic Telephone Manufacturing Co., Ltd., of Liverpool. He was the author of, and awarded the Fahie premium for, a paper on *The Principles of Modern Printing Telegraphy* which he read before the I.E.E. He has contributed professional papers to the Post Office Electrical Engineers on the historical basis of modern printing telegraphy and on the story of the Keyboard Perforator. Books to his credit are: *Printing Telegraph Systems and Mechanisms* (Longman's Series of Telegraph and Telephone Engineering Manuals), edited by Sir Wm. Slingo; and "*An Introduction to the Strowger System of Automatic Telephony* (Longmans). Mr. Harrison has served on the Council of the Institution of Electrical Engineers, and is a member of the Institution of Railway Signal Engineers.

J. J. T.

REVIEWS.

"*An Introduction to the Strowger System of Automatic Telephony.*" *By H. H. Harrison, M.I.E.E., M.I.R.S.E. Longman's. 7s. 6d. net.*

This work, primarily intended as a text-book for class instruction, deals exclusively with the Strowger System, of which the author gives a very comprehensive description in a book of only 143 pages.

Divided into three main sections the subject is arranged so that the student is enabled to obtain a thorough grasp of the underlying principles of step-by-step switching, the elementary types of switches, trunking, &c., before embarking on the study of the more complex mechanisms such as the Large Group Selector, Switching Selector Repeater, Key Sender, and finally the Director, which all come within the scope of the book. The whole is well arranged in progressive stages. The operation of each switch is clearly explained and fully illustrated by circuit diagrams. In many cases drawings of the switches or parts are given, and these should prove of great assistance, especially to the private student who has no means of seeing the actual switches.

The value of the work is not impaired by its being confined to the Strowger System for any differences between the various step-by-step systems are mainly concerned with details, a description of which would only lead to confusion until the fundamentals are understood.

The only suggestions we have to offer are that the more complex diagrams should be printed on folders to make it possible more easily to associate them with the descriptive text, and that a diagram should be added showing, for the benefit of new students of the system, a complete straight-forward, 3 digit, station to station, connexion.

This is an excellent book and we have no hesitation in recommending it to any of our readers who wish to understand the principles of the step-by-step system of automatic telephony.

CORRESPONDENCE.

LONDON AND BIRMINGHAM TRUNK LINE.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

DEAR SIR,—With reference to your article *re* the above under the heading "From an old press cutting book" the following extract from an old note-book of mine may be of interest:—

"Trunk lines opened; London, Birmingham to Oxford Court, July 10, '90 at 7.30 p.m."

In a short "History of The National Telephone Company," however, which was written by Mr. Albert Anns, the secretary of the Company, he stated on page 11: "In January, 1891, the trunk wire between Birmingham and London was completed, thus putting the metropolitan telephone subscribers in connexion with the network of trunk lines, which had been erected in the Midland and Northern counties."

It will be seen that there is a discrepancy of six months between the dates given by Mr. Anns and myself which I am unable to explain. At this length of time I cannot remember whether there was any delay between the completion of the line, and the actual opening of it to the public service, but they would certainly not extend to six months, viz., July '90 to January '91. As your press cuttings are dated January 1890, and you say that the line was completed some months later, there would seem to be some support for the date in my note which to the best of my belief was made at the time.

I well remember the erection of the line and the wayleave difficulties to which you allude. The late Mr. J. W. Ullett, who had charge of the London section used frequently to ring me up from Edgware, when I was District Manager in Birmingham to tell me of the difficulties and prospects overcoming same.—Yours truly,

ARTHUR E. COTTERELL.

Beckenham, Oct. 20.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE total number of telephone stations working at the end of August was 1,205,102, an increase of 7,901 over the July figure. Rather more than one-third (425,907) of these telephones are connected with exchanges in the London Telephone Area.

The number of new stations added during the month of August was 15,717, a falling off compared with recent high results, due no doubt to the holiday season. The cessations totalled 7,816, the net growth of 7,901 being below the average, and lower than that for August last year.

The number of circuits rented at the special private residence tariff increased from 197,369 in July to 199,786 at the end of August. These installations represent rather less than one-third of the total exchange subscribers in the Kingdom. The proportion, which is a steadily growing figure, is higher in London than in the rest of the country.

Further telephone statistics for the month of August are summarised as follows :—

	London.	Provinces.	Total monthly increase for Kingdom.
Number of Call Offices working at the end of the month	4,070	14,145	78
No. of Kiosks in public thoroughfares (included above)	32	732	38
No. of Exchanges working	102	3,562	24
No. of Rural Exchanges opened in connexion with the specially favourable terms authorised June 1922	—	556	29
No. of Rural Party-line Stations	—	8,873	59

Of the new connexions made during August 23% were completed within one week of the issue of the authority, 46% within two weeks, 61% within three weeks, and 71% within four weeks. In the case of the remaining 29% delay would be inevitable on account of wayleave difficulties, opening up of new routes in outlying districts, &c.

Inland Trunk traffic continues high. The latest statistics are for the month of June, during which month 6,189,531 calls were dealt with. The traffic for the June quarter, 18,879,671 calls, exceeded all previous records.

The number of calls made to the Continent was well above the average, viz., 16,731, an increase of 1,865 over June last year.

Further progress was made during the month of September, with the development of the local exchange system. New exchanges opened included the following :—

PROVINCES—Penzance.
Radcliffe (Manchester).

And among the more important exchanges extended were :—

LONDON—Bromley. Maida Vale.
Hammersmith. Thornton Heath.
Kensington.

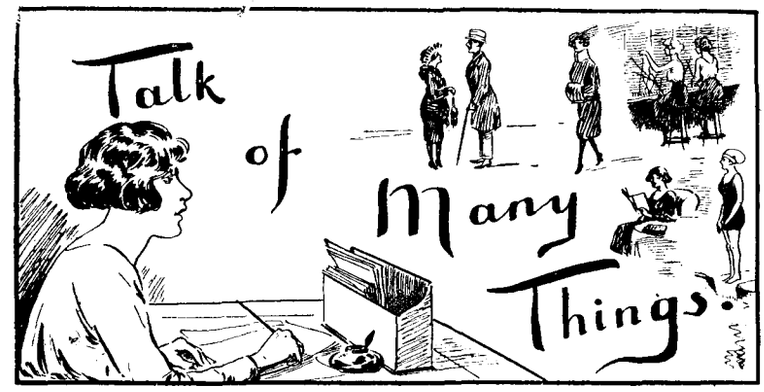
PROVINCES—Barnstaple. Sheffield (South).
Hyde.

During the month the following additions to the main underground system were completed and brought into use :—

Romford—Brentwood,
Liverpool—Chester,
Rochdale—Halifax,

while 53 new overhead trunk circuits were completed, and 86 additional circuits were provided by means of spare wires in underground cables.

WE TELEPHONISTS



"As It Was in the Beginning."

IT is difficult for any one who has seen gradual development over a period of thirty or forty years, to realise what those who have only had (say) 5 or 10 years' experience would know or be interested in. Some few weeks ago I was talking to a very experienced telephone man and referred to an old pattern instrument. I said "Oh, you remember the so-and-so instrument ; we used nothing else in 18—" He said "No. I don't remember it : I was not born then !" Perhaps there are some now in the service who do not remember when the exchanges closed at 6.30, and there was no night service of any sort in London.

Then, the switchboards (there were two kinds in London) required good lungs. There was no "multiple," and an operator who wanted a subscriber in the same exchange had to call another operator to make the connexion. Coleman Street was worked thus ; the subscriber's ring dropping an indicator on a large board where all the switching was done by one, two, or three switching operators. The switching operator inserted in the jack one plug of a loose cord ; and on the top of this plug, another plug called a *knife jack*. This was connected to a table where a "talking" operator sat. The "talking" operator spoke to the subscriber and called to the "switching" operator the number the subscriber wanted ; the "switching" operator thereupon inserting the other end of the cord in the wanted subscriber's line. The "talking" operator then rang both the subscribers together, informing the "switching" operator, through the "knife", when she heard conversation begin. The "knife" was then withdrawn, and the subscribers were left through on the connecting cord, both calling indicators being in circuit. When the subscribers rang off, both indicators were supposed to drop. *Sometimes* they did ! When the "switching" operator thought the subscribers ought to have finished she told a "talking" operator to "tap." The "knife" was again inserted and the "talking" operator said, "Finished, Finished, Finished, Clear !" This was repeated for the benefit of, perhaps, a dozen subscribers ; often so quickly that the subscriber had not time to say "No !"

At the Avenue Exchange there was what was known as a "peg board." This had no cords, the connexions being made by inserting small loose plugs into brass strips, so as to join a vertical strip to a horizontal one. In this case the operations of "switching" and "talking" were performed by one and the same operator, as they are to-day. This system, however, was even more noisy than that used at Coleman Street, because, for example, an operator with a call on No. 1 position, requiring a subscriber on No. 12, had to shout to No. 12 operator thus, "4450 on 6," six being the number of the connexion between the boards. As there would usually be from 6 to 12 operators all wanting numbers, the noise can be more easily imagined than described. It is enough to say that an operator with a weak voice was useless !

In those very old days the subscriber merely passed a number, and the operator had to know at which exchange it was to be found. For instance, Coleman Street numbers were 1 to 500; Leadenhall 500 to 1,000; Chancery Lane 2,500 to 3,000 ; Westminster 3,000 to 3,500 ; Heddon Street—afterwards Gerrard, 3,500 to 4,000 ; East India Avenue 4,000 to 4,500. When the numbers originally allotted to any particular exchange were all appropriated, a new group was given—Gerrard had at least three sets of numbers. It was difficult for new operators to remember where the various numbers were to be found.

I see that both the Coleman Street and Avenue buildings have been pulled down within the last few weeks.

"CORNHILL."

The other day when I was sitting in the bus, I suddenly thought of "Our page" of the Journal, and became inspired with a desire to write a short article for it. Well, what should the subject be ? Quickly the words flashed through my mind "It must be something to do with Telephonists." Well, I thought, I will try and write something to give a bit of encouragement to the "weary ones," (if any such exist ?) those who perhaps are feeling the strain of "The daily round, the common task." Then I thought of a little story I once heard about a Missionary—"A young native convert came to

a Missionary one day and said, "Sir, I have composed a hymn." "Have you, really," said the Missionary, "What is it?"—whereupon the man eagerly recited—

Go on, go on,
Go on, go on,
Go on, go on,
Go on.

"Well," I can hear you saying, "What a stupid thing to repeat." Perhaps so, but there is more in those simple words than meets the eye. They are full of encouragement and good cheer. Now listen to the first "Go on." Imagine a group of soldiers marching towards the trenches; perhaps some of them are inwardly afraid; some are tired after the long march. Suddenly the voice of the General comes loud and clear and encouraging "Go on!" (Quick march) and shoulders are squared and chins are raised, and the men march forward inspired and cheered.

Take a second meaning. When you come to a bit of dusty road (and who doesn't), a dull, dreary, head-aching, heart-aching, sort of day. Well, just "Go on"; a bit further along the road ends, and you will find a green field, with perhaps sweet wild flowers growing.

Take a third meaning. You are faced with some difficulty, which creates a sort of foggy atmosphere around you. Well, never mind, "Go on"—when you come through the fog you will find the sun is shining, and probably all the brighter because it was hidden for a time.

Or perhaps you are feeling "out-of-sorts"—well, just "Go on," when you have climbed this little bit of mountain you will come to a rustic seat, where you can sit down, and gain breath again.

And so on, and so on. It's a long lane without a turning, and if we just "Go on" instead of giving way under reverses (even if they amount to nothing more than exasperating subscribers) we shall find that the race is not always to the swift, nor the battle to the strong.

L. R.

From a Contemporary:—

New Telephone Trouble.

"They are cheerful people in the telephone department. A subscriber was greatly annoyed the other day because conversation at intervals came to an abrupt close, with long periods of 'hulloaing' in vain. A sympathetic person at one of the exchanges diagnosed the disease at last as '*intermittent death*'. It sounds pleasant."

It does—although we prefer to spell it "dis."

Accommodation at "Hop."

Come all ye people here at "Hop,"
And let your dire complainings stop,
You've new accommodation!
Now one and all your voices raise,
In songs of thankfulness and praise,
To show your great elation.

For you shall have a kitchen new,
Wherein to cook an Irish stew
Without the gravy spoiling.
The sweet young clerks will breathe more fair,
Purer by far will be the air,
Which they inhale when toiling.

And if late duty be your fate,
For seats you will not have to wait,
When for refreshment pining.
There'll be the maximum of space
For waitresses to run a race,
To serve you when you're dining.

Then nevermore you'll be turned out
From "Rest Room?" when there is about
To be a "Supers'" meeting.
Should they desire to make a "stir"
In "Conference Room" they will confer,
Your comfort not defeating.

Oh! sigh no more! oh, sigh no more!
For better days are now in store,
When eight o'clock is dawning.
If you should at your locker stay,
You will not be in someone's way,
So early in the "mawning."

So all ye people here at Hop,
Come, let your dire complainings stop,
You've new accommodation!
Now one and all your voices raise
In songs of thankfulness and praise
To show your great elation.

G. M. TURNER.

Extract from Supervisor's Report during the Limerick epidemic.

Registration.

The staff I at present control
Record calls with care, on the whole;
But I still sometimes find them
(When I'm not behind them)
Omitting to cap calls for Toll!

Discipline.

I have twice had to speak with Miss Crockett
For carrying sweets in her pocket,
Which from thence ('tis averred)
To her mouth were transferred—
The effect on her jaw was to lock it!

It is felt that our only protection
Is to have her removed from the Section
To a place in the sun,
Where the toffee will run,
And her colleagues won't catch the infection!

Wrong Numbers.

The total wrong numbers connected
Were higher than might be expected,
For with figures phonetic
And staff energetic
Nine and five are oft still misdirected!

One instance is worthy of mention
Sub. calling the Ritz from extension—
Did not get his hotel
But was told "Go to—Cork!
You're on to the Mormons' Convention!"

C. A. S.

London Telephonists' Society.

When joy had gone and hope was dead, our President his paper read, and in a fervent maiden speech, "Expect the best" he strove to teach. And now in prose and now in verse, warned us against harsh thoughts—or worse, and told us all to bear in mind "That which you look for you will find." (Ten thousand pounds should come my way; I'm looking for them every day). He showed us pictures fraught with pain, then smiled and cheered us up again; and joy returned, and hope, and pride; and laughter was revivified. Unworthy plans were put to flight, and kindly thoughts were born that night. Oh, may we very soon detect Part 2 of "What can you Expect?" And then in verse and then in prose he brought the meeting to a close.

November 7th—Be sure the date's kept well in mind, for Mr. Thwaites will open up a subject vital, with "Automatics" for the title. ("The Advent of"—it really ran, but that's too difficult to scan.) So come prepared with speeches short the speaker's paper to support. November 7th—don't lose your way—The Drawing Room, Y.M.C.A.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," *Telegraph and Telephone Journal*, Secretary's Office, G.P.O. (North), London, E.C.

WEST YORKSHIRE TELEPHONE DISCUSSION, RECREATION, AND SOCIAL CIRCLE.

The opening meeting of the fourth session of the West Yorkshire Telephone Discussion, Recreation, and Social Circle, was held at Priestley Hall, Leeds, on Oct. 7. Mr. Bates, District Manager, presided in the unavoidable absence of Mr. Coulson, Postmaster of Bradford, who has kindly consented to occupy the presidential chair for the coming session. Mr. J. O. Walker, Traffic Section, Leeds gave a very interesting and instructive "Talk on "Wireless" to a large and attentive audience.

Miss Heyward, of the Leeds Trunk Exchange, sang several songs which were very much appreciated by all, after which dancing and games were indulged in and so ended a most enjoyable evening.

The "Circle" have an excellent programme for the coming session. The membership is likely to exceed that of last year, which is thought very good taking into consideration the fact that the West Yorkshire District covers a very large area, and it is very difficult in many cases for members of the staff at the out-lying exchanges to attend these meetings.

M. A. R.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

THE London Telephonists' Society embarked on its sixteenth session on Friday, Oct. 3, when it held its first meeting in the drawing room of the Central London Y.M.C.A., where it is hoped to hold meetings permanently in future.

Miss A. E. Cox presided and introduced Mr. P. W. H. Maycock as the new president and a very old friend of the Society. The presidential address was entitled "Random Reflections, or What can you expect?" and expressed delightful ideas of the effect upon one's work of the qualities of Imagination and Humour, and also touched on the ideals of the principles of brotherhood and co-operation amongst the various grades of workers in industrial life.

The meeting was preceded by the customary half-hour concert, the musical items, which were greatly appreciated, being provided by the staff at Streatham exchange,

Members of the Society were particularly pleased to have with them on this occasion Mr. J. E. Edmonds, Miss A. A. Heap, and a number of visitors, all of whom were welcomed as old friends.

* * * *

Choral Society.

The Langham Choral Society has commenced its rehearsals for the new winter's session. The work in hand is Coleridge Taylor's ever-popular "Hiawatha." This was the first work performed by the Society some four or five years ago and there is nothing they do better. The rehearsals are held in the very comfortable Morley Hall, at the Y.W.C.A. Head-quarters, George Street, Hanover Square, on Mondays at 6.30 p.m.

As usual the special need is for more men, but there are vacancies in all sections, including the orchestra. Intending members can enrol at any of the rehearsals.

* * * *

L.T.S. Amateur Swimming Association.

The L.T.A.S.A. held its sixth annual gala at Pitfield Street Baths on Sept. 29. There was the usual representative attendance and many keenly contested events. The program arrangements were improved on this occasion by the elimination of long drawn out heats. These were contested early in the evening, before the commencement of the real show. The chief results were :—

Gerrard Exchange Team. Winners of the Pounds Challenge Cup.
MISS WILSON. MISS RAE. MISS DAVIS. MISS BURT.

LEARNERS' RACE.

Miss Tyler (Regent) 1
Miss Walters (Trunks) 2

There were 25 entrants, a good index to the valuable work being performed by the Association.

MISS HILDA DAVIS : CAPTAIN OF GERRARD.
Winner of Graceful Swimming Competition ; second in Diving Championship. Under her captaincy Gerrard have won the Pounds Challenge Cup 3 times and the Business Houses Championship.

"POUNDS" CHALLENGE CUP (133 YDS.)

Gerrard 1
Misses H. Davis, Burt, Wilson and Rae.
Trunks 2
Misses Porter, McBinney, Miller and Isaacs.
Regent 3
Misses Cole, Broomsgrove, Williams, and Amos.
Time : 1 min. 48 4/5 Secs. Won by 10 yards.

This trophy is much coveted and excitement and partisanship ran high Gerrard won comfortably, but there was a fine struggle for second place. Thirteen teams entered.

LOTOS CHALLENGE SHIELD. (133 YDS.)

Accounts Branch 1
Messrs. Fryer, Thompson, Teed, and Wild.
Traffic Branch 2
Messrs. Gregory, North, Pettigrew and Niles.
Time : 1 min. 37 Secs. Won after a good race by 5 yards.

HANDICAP RACE (33 YDS.)

Miss Bauch (Avenue), 25 secs. 1
Miss Bennett (Paddington) 21 secs. 2
Miss Newman (Holborn), 10 secs. 3

There were 104 entrants for this event, nearly all of them facing the starter.

"PROSSOR" CUP.

Trunk District 1
Messrs. Ragbourn, Perriss, Niles and Baker.
East Central District 2
Messrs. Beck, Burgess, Gerrard and Mason.

Five teams started and the winners gained their victory by a touch.

L.T.S. DIVING CHAMPIONSHIP.

Miss Williams (Regent)	1
Miss H. Davis (Gerrard)	2
Miss Stevenson (Avenue)	3

SUPERVISORS' RACE.

Miss L. K. Davies (Trunks)	1
Miss Hare (Victoria)	2
Miss Spalding (Regent)	3

GRACEFUL SWIMMING.

Miss H. Davis (Gerrard)	1
Miss Amos (Victoria)	2
Miss Lawrence (Toll)	3

During the evening a thrilling exhibition was given by five members of the Amateur Diving Association.

The distribution of prizes will take place on Tuesday, Nov. 9 at 7.30 p.m.

In connexion with swimming it is of interest to note successes gained by the L.T.S., at the Civil Service Swimming Association's gala. The Diving championship and cup was won by Miss Williams of Regent, Miss Stevenson of Avenue being second. The open team handicap race was won by Gerrard, and the sealed handicap by Victoria. Congratulations to them all.

* * * *

Culled from the Exchanges.

City.—City are holding a dance on Saturday, Nov. 15, at the Bishopsgate Institute at 7.30 p.m. The Bon Accord orchestra have been engaged and an attractive program arranged. Tickets 4*s.* 6*d.* (including refreshments) can be obtained from Miss Rawlings.

Streatham.—A successful dance was held in St. John's Hall, Kensington on Oct. 2, in aid of the South London Hospital for women.

The proceeds were forwarded to Miss Hemp, and acknowledged with grateful thanks and appreciation. Will those interested please note that a second dance at the same hall has been arranged for Nov. 11, in aid of funds for a Christmas tea for poor children? Tickets 2*s.* 6*d.* (including refreshments) from Miss Hatcraft, Streatham exchange.

PERSONALIA.

Resignations on account of marriage :—

Miss M. L. E. BLUNDEN, Assistant Supervisor Class II, of Gerrard Exchange.
Miss L. M. JUDGE, Assistant Supervisor, Class II, of Hampstead Exchange.
Miss E. ROSE, Assistant Supervisor, Class II, of Park Exchange.
Miss E. G. BOWRING, Telephonist, of Gerrard Exchange.
Miss L. ADAMS, Telephonist, of Gerrard Exchange.
Miss M. S. HAWLEY, Telephonist, of Gerrard Exchange.
Miss A. W. M. FURTWANGLER, Telephonist, of Park Exchange.
Miss E. L. SMITH, Telephonist, of Museum Exchange.
Miss E. WILLIS, Telephonist, of Regent Exchange.
Miss M. L. GEE, Telephonist, of New Cross Exchange.
Miss D. WORLEY, Telephonist, of Victoria Exchange.
Miss L. M. VINCENT, Telephonist, of Victoria Exchange.
Miss M. L. HULL, Telephonist, of London Wall Exchange.
Miss G. PRESTON, Telephonist, of Chiswick Exchange.

CARDIFF TELEGRAPH, TELEPHONE, AND POSTAL SOCIETY.

SYLLABUS, 1924-25.

DATE. 1924.	SUBJECT.	BY
Oct. 29.	"The Coinage of England"	Mr. C. A. Jackson, Assistant Surveyor, South Wales District.
Nov. 12.	"Rudyard Kipling" ...	Mr. W. G. Hogford, Cardiff Telegraphs.
Nov. 12.	"Idealism in Literature & Art"	Mr. W. Phillips, Cardiff Telegraphs.
Nov. 26.	"Charles Kingsley"... ...	Mr. J. J. Stoney, Engineering Branch.
Nov. 26.	"A short history of the Opera"	Mr. A. E. T. Jarvis, Cardiff Postal.
Dec. 10.	"The probable trend of Telegraph and Telephone Development"	Mr. J. Stuart Jones, Secretary's Office, G.P.O., London.
1925.		
Jan. 14.	"Shakespeare"	Mr. C. P. Chapple, Cardiff Telegraphs.
Jan. 28.	"Ceylon"	Miss A. M. Dent. Cardiff Telephones.
Feb. 11.	"The Individual and Society"	Mr. W. A. Thomas. Cardiff Postal.
Feb. 11.	"The Life of a S.C. & T. from 'The Good Old Days' until now"	Mr. E. Tildesley, Cardiff Postal.
Feb. 5.	"Lightning and High Power Protection and Safety Device"	Mr. G. S. France, Engineering Branch.
March 11.	"A Post Office Romance—Then and Now"	Mr. T. McGowan Hole. Chief Superintendent, Cardiff.
March 28.	"Thomas Witherings—The Founder of the British Postal System"	Mr. E. A. Williams. Cardiff Postal.
March 28.	"Evolution of Postal Administration"	Mr. W. J. Hare, Cardiff Telegraphs.

CORRESPONDENCE.

MEUCCI AND THE TELEPHONE.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

SIR,—Without questioning the decision of the American Courts (July 1887), which presumably had the fullest available evidence before them, I am not sure that the extracts which your correspondent gives are very convincing, as although they are used to indicate that Meucci only succeeded with some form of mechanical telephone, they contain references to certain electrical conditions, the use of which is not apparent in relation to the propagation of mere mechanical transmissions.

I remember reading a very interesting article in the early eighties, which if I remember rightly, appeared in *The Electrical Review*, in which Meucci's apparatus was fully described and illustrated, and reasons given why he did not succeed in showing adequate publication and protection for the alleged invention. I was so much impressed with the article at the time, that I felt constrained to make the following observations in the course of a lecture (of which the print is before me) which I delivered before the South Staffordshire Institute of Iron and Steel Works Managers, on the 10th of October, 1885 :—

"ON THE DEVELOPMENT OF TELEPHONY."

> "The first of whom we hear would seem to be Antonio Meucci, an Italian, who has asserted that he first made the discovery whilst living in Havanna, in the West Indian Island of Cuba, in the year 1849, but that owing to his means not being such as would enable him to work it out thoroughly, or to pay the necessary fees in connection with the patenting of the same, he was debarred from protecting himself. His apparatus in 1857 consisted of an electro-magnet fixed in a suitable case, having adjusted in front of it a membrane or diaphragm made of a substance capable of magnetic induction. Practically an armature, and in reality a thin circular disc, fixed round its edge or periphery. This instrument was connected to a similar one at the distant end by means of two wires, one wire of which joined the extremities of the magnet coils, one extremity of one instrument to one extremity of the other, and having inserted between the other two extremities and the second line a galvanic battery."

I am sorry that I have not a copy of the article by me, but I remember it well, and the remarks quoted above were based on it and represented the main facts which were stated. If these facts could be substantiated, it would be clear, not only that Meucci's invention was an electric telephone, and that Bell's telephone did not appear until at least 19 years afterwards. It has always seemed curious to me, however, that Meucci, if he really did invent the apparatus described, should have failed to make it more fully known. As described, it had the precise elements of Bell's telephone, and therefore must have functioned, in which circumstances it is difficult to conceive that he would be unable to obtain some financial assistance.

However this may be, the fact, of course, remains that Alexander Graham Bell succeeded in every way where others failed.—Yours truly,

Arden Bank, Manor Way, Beckenham, Oct. 8, 1924. ARTHUR E. COTTERELL.

THE

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CONTENTS.

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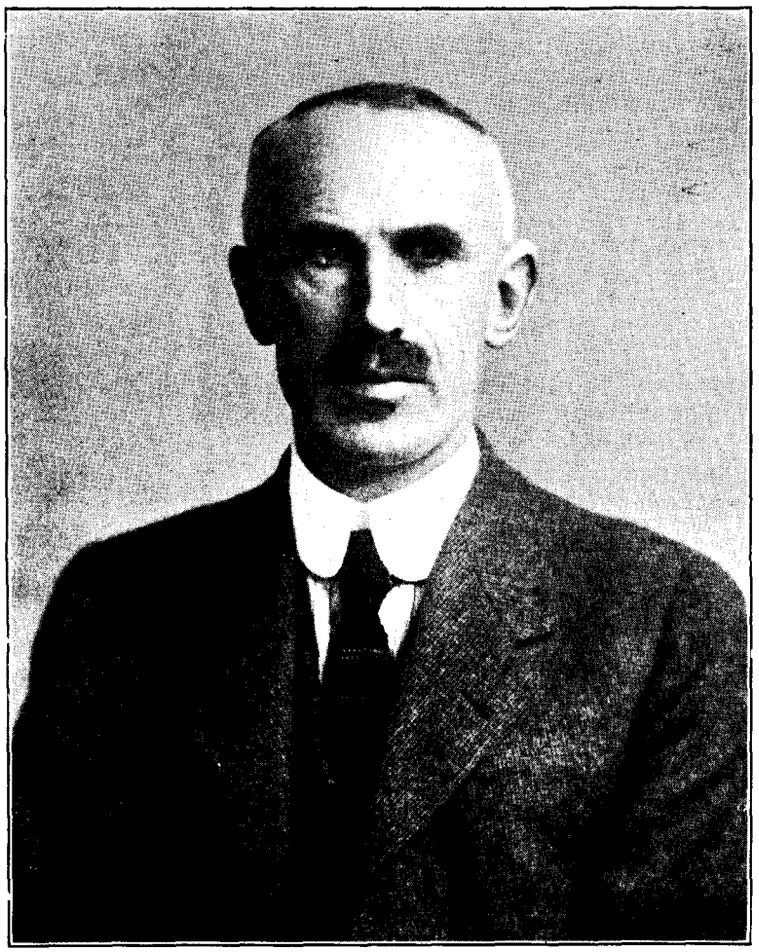
TELEGRAPH AND TELEPHONE MEN.

XI.—MR. R. MCILROY.



LIKE many other distinguished electrical engineers, both inside and outside the Post Office service, Mr. R. McIlroy, the Post Office Superintending Engineer for the London District, commenced his career as a telegraphist. He entered the Post Office service at Belfast in 1885, and after six years' experience of the telegraph instrument room, became a clerk in the local Post Office engineering department. In 1893 he joined the Engineer-in-Chief's staff in London, and his subsequent promotion was rapid. He became a Second Class Clerk in 1895, a Technical Officer in 1897, and in 1903 Assistant Superintending Engineer for the Metropolitan District. He returned to Head-quarters in 1907 on promotion to a Staff Engineership, and in 1909 went to Cardiff where, as Superintending Engineer, he had charge of the extensive South Wales District until 1921, when he succeeded Mr. Moir in the control of the Metropolitan engineering district.

In the London District there are 102 exchanges and 425,000 telephone stations, the Central Telegraph Office and innumerable offices with public telegraph and telephone facilities. The responsibilities of Mr. McIlroy's position are heavy, and it is well that they should be in such capable hands.

BROADCASTING—DOES IT MAKE FOR HAPPINESS?

BY A. H. JOHNSON. (C.T.O.)

THE President of the Pharmaceutical Society's School, at the opening of a new Session recently, attributed the large number of failures at Examinations to the undue prominence given to such "sports" as going to the pictures and listening-in. He did not doubt the educative value of broadcasting, but from the serious student's point of view it was the most ruinous discovery ever made.

The speaker undoubtedly hit at the root of the trouble. No invention has been so alluring and distracting as the application of wireless broadcasting.

Our children are negligent with their home-lessons and musical practice. The educative value of broadcasting is questionable. It rarely follows any systematic course and is therefore almost useless. We listen-in in much the same way as we read our daily newspaper,—darting from one subject to another most widely divergent: and how much do we remember?

Our interest in horticulture has flagged. We view the garden now purely from its suitability for the erection of a wireless aerial, and we ruthlessly dig up the flower beds wherein to bury miscellaneous old iron for purposes of an earth connection.

These are but minor matters when compared with the wireless worries wrought in domestic circles. America experienced trouble in this direction long ago. A writer in the "Red Magazine" sends out a warning to girls about to wed.

"Oh, girls! If you think you'd like married life,
Consider the wail of a wireless bug's wife,
There's wires in the parlour and strung through the doors.
There's boxes and tables and things on the floors.
The coal's on the lawn, for the shed's full of trash.
It's enough to make any wife do something rash."

Amplifiers and loud-speakers have done much to alleviate the stress caused by the need of absolute silence by the listener-in. Wireless in the early days demanded concentrated attention and delicate neuro-muscular co-ordination, for which probably many of us are now suffering. Almost every occupation is accompanied by some form of disease. There is, for instance, telegraphist's and writer's cramp, baker's itch, potter's rot, butcher's pemphigus, and X-Ray dermatitis.

Time alone will reveal what obscure disease is lurking behind broadcatching. The nervous tension, which is very common in domestic circles, is adequately described by a writer in a London daily paper:—

"Have you ever heard of the wireless widow? No, it is not a West End revue. I made her acquaintance the other day at a friend's house. "What would you do," she asked me, "if you had a wireless maniac for a husband?"

Before I had time to reply that I wasn't thinking of taking a husband, she continued: "I call him to dinner, but it is always stone-cold before he comes. The moment he gets home at night he begins tinkering with his box of tricks in the corner, and every time I open my mouth to utter a word I'm brought to a stop with a traffic policeman's gesture, and the silence is so intense that a pin dropping would cause me to jump out of my skin.

My husband might just as well be the other side of the world for all the companionship I get, for his whole being is wrapped up in that infernal machine, and I am a real lonesome wireless widow!"

The "Windsor Magazine" recently gave us an amusing episode of things as they really are.

"George has only got a crystal set at present, thank goodness, but even even so the way he jiggers about with it passes belief. I tremble to think what life in his immediate vicinity will be like when he gets the valves he is hankering after.

Just as you are getting interested in the news and the weather, he snatches the 'phones from your head and says: 'Excuse me, old man, you've got the wrong pair; you'll find these much better. How's that? Worse! Oh, then you had the right ones, after all. Better change over *again*.' Interval of three minutes. 'Can you hear alright?' 'Splendidly.' 'Well, perhaps I'd better give you a fresh spot on the crystal. That better?'

A foxtrot starts and comes to a sudden and unexpected end. 'Hear anything now?' 'Not a sound.' 'Good! I've just cut you off to see if the switch is working properly.'

George can keep up this nerve-racking performance for the entire evening, and then has the assurance to remark: 'Well, it's nice to be able to give our friends a bit of pleasure with a little thing like this!'"

It has been said that Edison thought people slept too much, so he invented the gramophone. Similar thoughts must have emanated from Marconi when he introduced Wireless.

When Wireless was invented it was an instrument. It has now grown up and become a weapon.

Broadcasting is an excellent application of a scientific principle, but has it made life happier or better?

It is very problematical whether it has added materially to the sum of human contentment.

A writer in the *Daily Mail*, referring to the scientific exhibits at the Wembley Exhibition, says:—

. . . "Things are bad enough now, what will they be like in the future? When one considers the almost incredible display of scientific and engineering ingenuity gathered under one roof at Wembley, and when one realises how much of this has been brought to its pitch of perfection of recent years, one cannot but suppose that the future will be boundlessly prolific in mechanical devices and that our whole existences will be under the sway of machines.

It is not a prospect I view with equanimity. It is all very well to talk about the march of progress, but it is possible that mental happiness is a sounder test of life than mechanical efficiency. Machines are excessively useful things, but if they are going to banish our peace of mind and become taskmasters, then, indeed, they will have gone beyond their proper purpose." . . .

We have created mechanisms which, like the monster created by Frankenstein, may one day turn and destroy us.

EDINBURGH TELEGRAPH AND TELEPHONE SOCIETY.

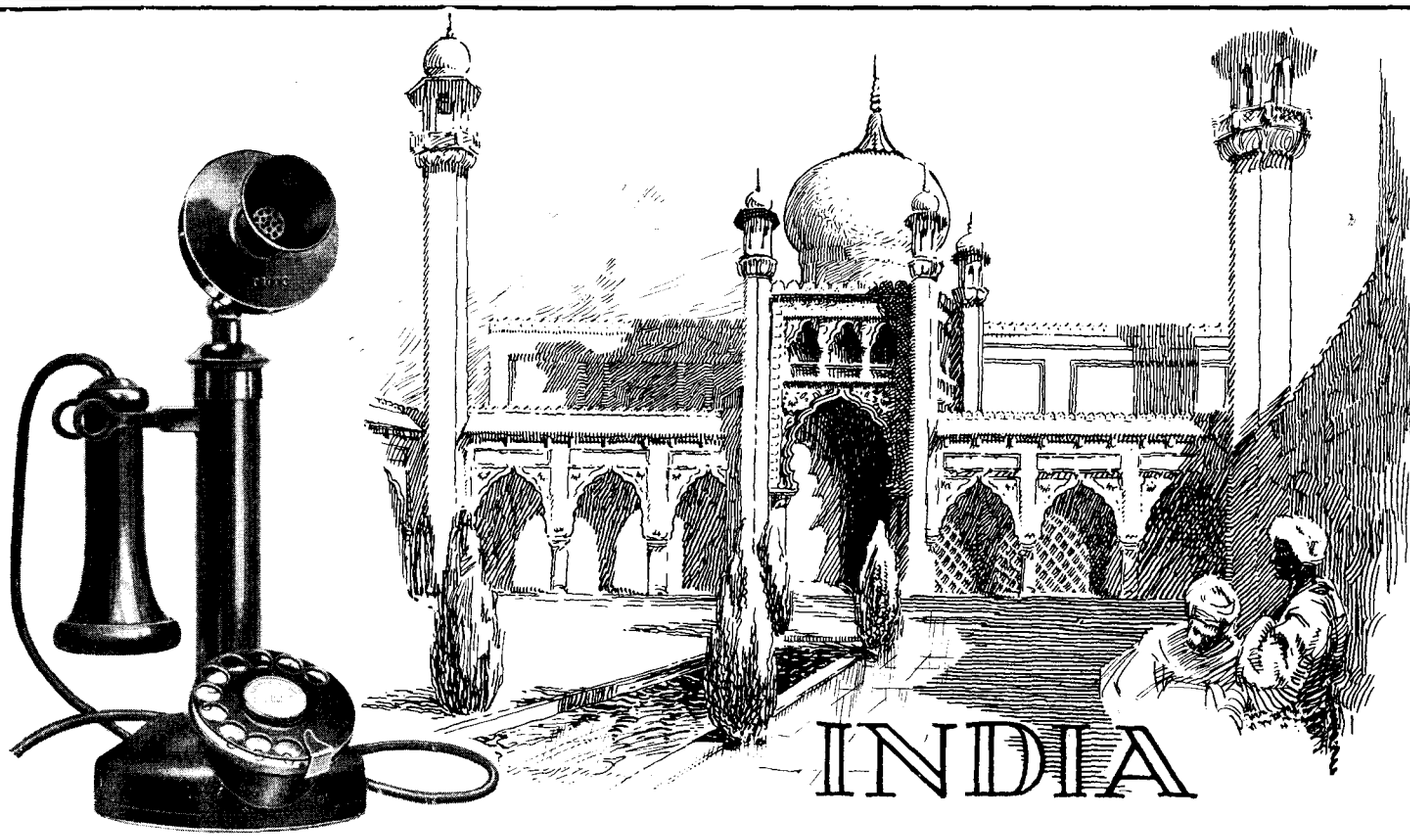
IN connexion with the above Society an interesting series of lectures has been arranged for the 1924-1925 session. The subjects to be dealt with are as under:—

"The Psychology of Communications"	John Lee, Esq., C.B.E., M.A., &c.
"The Twentieth Century and The Post Office"	Major A. A. Jayne, D.S.O., O.B.E., M.C.
"Light upon a Dark Subject" ...	Mr. W. H. Smith (Investigation Branch).
"A Talk on Wireless" ...	Mr. E. Hamilton.
"Public Criticism"	Mr. R. M. Hendrie.
"The Baudot System"	Mr. G. Dickson, senr.

In addition to the syllabus of lectures, the Committee have arranged for this winter a series of visits to several of the more interesting and instructive undertakings near at hand. In this connexion members are to be taken to see *The Scotsman* Newspaper, Granton Gas Works, Register House, Portobello Electric Power Station, and the Engineering Laboratories of the Edinburgh University.

The first meeting for the session was held on Nov. 4, when Major Jayne delivered his lecture on "The Twentieth Century and the Post Office." There was a very satisfactory turn-out of members of the staff together with some representatives from other departments. Mr. F. G. Milne, Secretary to the Post Office for Scotland, who was unavoidably absent, sent his regrets.

The lecture was favourably received and was afterwards well criticised and discussed by various members present. It is thought that the prospects of the Society gaining strength this winter are very hopeful.



INDIA

HOW little do most of us realise the significance of the word in the title block above. We may be ready to say without hesitation, perhaps, that it is an inverted triangle, coloured red, dipping southward from the main body of Asia, into the warm seas of the equator. Those of us who have paid keener attention to the geography hour may amplify this by the statement that the said red triangle is nineteen hundred miles long from north to south, and more or less as many in width across its upturned base. To get a finer appreciation of this vastness let us lift the red triangle out of its monsoon-swept seas and superimpose it upon our more familiar Europe. What do we find? The comparison staggers us by its revelation of India's immensity. We are accustomed to think parochially; to us great landed estates simply mean "broad acres." India measures her face in hundreds of thousands of square miles. Rivers, mountains, all are on the same grand scale. It remains, however, for the numbering of the peoples of India to strike deeply into our minds the full knowledge of the puny nature of our standards of measure. One-fifth of all the human beings inhabiting the earth are born, live and die under the burning sun of India. One-fifth! Coming back to our own measures, that is three times as many people as are citizens of the United States of America, or eight times as many as of France.

From time immemorial mighty men of genius, valorous commanders, and great potentates have striven to make the numerous and varied peoples of the great peninsula one grand empire under their sole sway. One such effort after another has met with failure until at last only in the nineteenth century adventurous sons of a far distant island kingdom succeeded in uniting all India's diverse nations, creeds, and castes into one great family under the benign sovereignty of Victoria The Good.

Steadily since that time material progress has blessed the land. Great public works have been initiated and extended everywhere. Irrigation has made fertile great areas that formerly were entirely unproductive, so in great measure obviating the risks of famine that were at one time a black spectre overhanging the land.

Railways in a great network reduce the vast distances to accessibility, and telegraphs and telephones have spun a coppery spider web all over the sun-kissed country.

The march of progress in India has brought the transference of the seat of Government to Delhi, the one-time capital of the great Mogul Emperors. Conceived in a spirit worthy of the continent empire, a great new city is rearing itself outside the old walls. It is called RAISINA.

His Majesty King George V. expressed his desire that the planning and designing of the public buildings to be erected should be considered with the greatest deliberation and care, so that the new creation might be in every way worthy of the ancient and beautiful city of Delhi. The growth of these buildings which form the heart of Raisina gives evidence that His Majesty's words did not fall on deaf ears.

The heart of an empire and the location of its brain too. Raisina is also a nerve centre. Telephones here, linking with telephones there and everywhere, carry incessantly the spoken business of the great capital. A finger to a dial, the unfaltering stepping of the automatic switch wiper, unerring and precise as the finger of an inexorable fate, the soft clicking of the relays, and a tinkle of the bell, all with the absence of the human intermediary,—these are the unobtrusive indications of the presence of the "Peel-Conner" nerve system in the new Capital of the Red Triangle.

RANDOM REFLECTIONS; OR, WHAT CAN YOU EXPECT?

BY P. W. H. MAYCOCK.*

(*Continued from page* 23)

LET us now switch over to Rule 2, which is full of delightful mystery to a Traffic Officer in meditative mood :—

> "The *aim* of a telephonist should be to *instil* into users of the telephone a feeling of confidence that she will do her best for them in all circumstances."

The word "instil" strikes our attention first. The dictionary says that to instil means to insinuate gradually. To insinuate means "to introduce by a winding motion, to worm in." So the aim of the telephonist should be to introduce gradually by a winding motion—to worm into—subscribers, a feeling of confidence. But how can you do this with your voice ? Even metaphorically, a corkscrew voice would hardly mix with "the voice with the smile," and a wormy, winding, promptitude in answering calls would delight only the telephonist's colleagues ! We can only surmise, then, that Instillation is like what the Mock Turtle described to Alice as "reeling and writhing and fainting in coils," and so must be reserved for those subscribers who visit the exchange. Picture the telephonist "introducing" after the manner contemplated by the rule—a benevolent twentieth-century Salome with not only the wisdom but the sinuosity of the serpent, gliding snakily up to the guileless subscriber and, by delightful arts that can more discreetly be imagined than described, imparting to him "that confident feeling !" I suppose that, following out the great principle of co-operation, he also will reel and writhe, and may possibly faint—in sheer ecstasy of joy or horror ! If so, when a party of subscribers is being "introduced" to the exchange by a group of telephonists and Instillation is in full swing, the switchroom must present a sight for the Gods ! No doubt this explains why a subscriber who visits an exchange returns an altered character ! But it is odd that we have no Traffic Instruction on Instillation, the Aim of a Telephonist. . . . Perhaps this is because it is not easy to explain how to aim with a wormy, winding motion. They don't do it that way at Bisley. . . . But what can you expect ? *They* live in blissful ignorance of L.T.Ex. wun oh—oh sev—en ! But why should telephonists and subscribers only have the benefit of this delightful if somewhat Terpsichorean principle ? Why not Supervisors to the *n*th degree—indeed everybody ? Perhaps it is because the stage is hardly large enough for Instillation on such a scale ! But—happy thought—we could overcome this difficulty by dropping this wormy, winding business, and stating the central idea of the rule in its simplest form :—

> "Deal with others as you would have them deal with you."

As, in effect, we say in our Directory headline. Then we come into line with Bisley Methods :—Steady, and aim for the "bull."

Some hold Compulsion Master, and the heart of every rule;
And swear by "birch" and "impot" and "detention after school."
But the *Rule-book* switchboard maiden—even when she's not in love—
Though as wise as any serpent is as gentle as the dove !

Some hold that Rules are perfect guides to action and to speech—
"A spade's a spade" is what they say, and thus the Faithful teach.
But the *real-life* switchboard maiden, on rule four point oh intent,
Knows well that coach-and-four may drive through Act of Parliament !

One more rule, and we have done. Take No. 3 :—

> "It is most important that a telephonist should not give way to temper, even in the most trying circumstances."

As one of the fair sex, the telephonist is of course inscrutable—the Eternal Question—but it is doubtful whether telephonists realise how completely sphinx-like the rule expects them to be. What is temper ? One dictionary says that temper is "a due mixture or balance of different or contrary qualities, state of mind—especially with regard to the feelings; passion, calmness, moderation." So, as Messrs. Hall and Knight would say, substituting the value of X we get :—

> "It is important that the telephonist should be unbalanced, and that she should not give way either to passion, calmness, or moderation !"

The Riddle of the Sphinx should present no difficulties to a good telephonist. Perhaps it doesn't :—

"By exasperating Patience, by eternal Smiling Voice,
By excessive Moderation, thou shalt make the Sub. rejoice,
But the *real-life* switchboard maiden, with her age-old wisdom, thinks,
That to be Herself—Eve's Daughter—solves *this* riddle of the Sphinx !

These are just a few crude specimens of the treasure that may be found in the famous booklet by a little random reflection. You, our younger sisters of the Telephone craft, full of the joy of life, can easily improve upon them. Go through the booklet and try. It will give you many an amusing half-hour, and you will find at the end of your study you will know more about the technical meaning of the rules than you did at the beginning; and will at any rate see very clearly that *it is the spirit and not the letter of the rule that matters.* And when you have completed your revision, and bound your notes in a green cover, be sure to put this on the title page :—

A century of working rules in cover coloured green.
Keep them in your locker that they never may be seen !
And when you leave the Service, pray remember this, the gist,
Burn the Book, and you will be a Good Telephonist !

But you will find that some of the rules are too inhumanly perfect to lend themselves much to frivolity of this kind. Then try rhyming. Even the rule about the pegs looks less terrible when put in this form :—

"If I see a white peg,
Ah, what shall I do ?"
Caller wants the Monitor,
Softly see him through.

"If I see an all-black peg !"
Then expect a row !
Tell the caller 'There's no sub.
On that number *now !*

"If I see a pale green peg—
Number three inscribed !"
Put the caller through at once,
Don't wait to be bribed !

"If I see a nice pink peg—
Heavens ! What *can* I do ?"
You may bet the call has come,
For some glad S.Q.!

White pegs and nice pink pegs, all in their jacks, delight 'em
Black pegs and pale green pegs—so on, *ad infinitum !*

Or, if your taste for verse be strong, you may picture the Telephone Service addressing you in romantic vein, with its hand upon its throbbing, passionate, heart : and reconstruct the booklet accordingly. What can you expect then, taking for example the terse statement in Rule 2, about the Three Virtues of Courtesy, Accuracy, and Speed, by which the complete telephonist attains the Paradise of Perfection ? Perhaps something like this (Telephone Service speaking to you, with lover-like glances straying through the spectacles of Humour !) :—

Star of my soul ! Sweet Fragrance of life's morning !
Fair Weaver at the Loom of ruthless Fate !
Three jewels thou must wear, for thy adorning
If thou would'st jest with Peter, at the Gate !

A dulcet tone, mellifluous and tender,
Softer than cooing doves, shall wrath abate.
This thou must have, or else thy chance be slender
When thou would'st plead with Peter, at the Gate !

Heart of my heart, they say "to err is human"—
But scarcely human, we who "serve the State !"
Be sure ! Inconstancy, thy name is—Woman !
As will be known to Peter, at the Gate !

Be swift, sweet maid, and let who will be clever !
"More haste less speed" is somewhat out of date !
Get on a move ! Thy motto "now or never"—
If thou would'st slip past Peter, at the Gate !

The slight disturbance of the emotional atmosphere in the last verse illustrates the eternal struggle between the Romantic and the Practical ! The idea of the Telephone Service in romantic mood, will probably first occur to you on the First of April, commonly known as—the birthday of the financial year !

But, you may say, granted that we can find humour almost anywhere if we look for it, how can this improve our work ! It can in this way. Everything we consciously do is pictured in our minds in advance, and our successful action depends upon the kind of picture we make, the clearness with which we see it, and the resolution with which we hold to it. As you know from your experience with the abusive subscriber, fear, anger, and resentment blot out all that is constructive or harmonious in our picture just as the familiar outlines of our city are blotted out by the sudden descent of a November fog. But—this is the point of the whole thing— you cannot at one, and the same time feel amused and frightened or amused and angry. It follows then that *the more easily we see the amusing side of our life and work, the less the power of fear and anger to spoil the mind-pictures we must make, before we can do the thing that we would.* And though the mists of humour may lightly veil the crude outlines of the naked facts, this will only bring a greater harmony to our mind-picture of work, and it is in proportion to this harmony that our work will benefit both ourselves and the service.

And if the humorist feels that, despite her philosophy, she must sometimes express dissatisfaction, the present session of this Society gives a splendid chance of turning her indignation into "literature." Limericks afford an excellent outlet to one's feelings. For example—but stop ! For safety's sake I must camouflage the names of the exchanges used for the example. We will call them Bark, Hank, and Pop. Let us assume that the telephonist at Bark who usually takes calls incoming from Hank, is absent, her place being taken by an inexperienced junior, who is working very slowly. Unless we have seen this B telephonist, we shall of course picture her as a disagreeable, and repellent frump ! But don't tell her so—even officially. We can express

* Presidential Address delivered to the London Telephonists' Society, Session 1924-1925.

the same idea much more delicately and satisfactorily by means of a limerick, *after this fashion* :—

There was a young lady of Bark,
In appearance, just out of the Ark !
She was *not*, I may mention—
Without churlish intention—
Afraid to go home in the dark !

But the Bark B telephonist may say that the Hank A telephonists were breaking in on the order-wire, and will picture them as fools rushing in where angels fear to tread. But again, don't tell them so. Limerick them thus :—

There were many young ladies at Hank,
Whose *mental* equipment was—rank !
They would madly rush in—
With no end of a din—
Where the angels would rather leave blank !

As they probably would, for more reasons than one !

Or suppose you are being "ragged" with more severity than you think the case demands, and are tempted to reply sharply, here we are on delicate ground, and must walk circumspectly. But a nice discreet limerick at the back of the mind, which gives the soft answer that turns away wrath will help :—

There was a young lady of Pop,
Whose eloquence nothing could stop !
Her words came so fast,
That what happened at last,
Is—a matter *I'd* better let drop !

Since the assassination of Presidents is almost standard practice, let me hasten to say, in case anyone penetrates the disguise, that Bark, Hank, and Pop have been chosen for no other reason than that they are so closely bound together in our tables of kindred and affinity.

And what is the next step ? Keep our limericks to ourselves for a while, improving them as much as possible—gloating a little, perhaps, over the ghastly expression of impotent wrath that would suffuse the usually benign countenance of Miss X or Mr. Y if he or she could see our work. By this time we shall be laughing instead of cursing. Then, having perfected our work—and this is very important—*ruthlessly destroy it before anyone else has seen it !* Then send in a rather more impersonal contribution to the Limericks Competition. Your technique will have improved immensely by the practice ! But we must now leave limericks, or you will too readily, endorse the following—*and don't forget the spectacles of Humour !*

An Assistant Suspector of Haffick,
With a liking for visions seraphic,
In attempting to joke,
By good fortune did choke :
Which relieved the congestion of Traffic !

But what can you expect from humour ? You can expect the power to meet undisturbed and even to laugh at what we are accustomed to call "misfortunes." These, being externals, need not affect your real self : for, as one of the greatest of Englishmen has said, the citadel of Mansoul, can only be taken when its defenders open the gates.

(3.) BROTHERHOOD.

For this, the final section of our paper, we drop frivolity altogether.

Imagination and Humour, which require a view of life and work as from a distance, are necessary to the realisation of the idea of brotherhood, which requires the exact opposite—closer association, at least of mind. Unfortunately for the purpose of its discussion as an agent of efficiency in work, the name "Brotherhood" has a sentimental sound quite out of keeping with the thing itself, which is nothing if not practical, and operates as a rule of conduct quite apart from sentiment. The "social instinct" therefore, is not the only manifestation of the principle of Brotherhood.

Many have written of the idea of Brotherhood as expressed in the fields of sport and social intercourse, but few have dealt with it as an essential element of business relationships. This is a very wide field, and this paper merely touches one aspect.

For practical purposes, the ideal of the principle of Brotherhood cannot be more perfectly expressed than by the well-known formula "Deal with others, as you would with yourself." What else can you expect, since there is a sense—quite a technical sense—in which All are One and Each is All ! But the particular aspect of Brotherhood referred to here is its application as the central principle of what is called "control" or "supervision."

The *proposition* that Brotherhood—as defined—and what is called "supervision" and Brotherhood, and what is called "Business" can and should co-exist, is admittedly difficult to accept, more difficult to work to, and seems almost a contradiction in terms, but since the principle has reference to *human* relationships, it is either universally true or universally false. If it is universally false, the Law of the Jungle—the Law of Tooth and Claw,—is the true law, and return to the jungle its logical consequence. But to a technical Society, the technical justification of Brotherhood will chiefly appeal. Though this justification is no doubt well-known to many, it is not often stated. I will, therefore, try to state it in broad outline. Will you, Ladies and Gentlemen, take this statement as a problem submitted for your judgment *in its threefold aspect of Intuition, Imagination, and Reason* ; for it is a problem upon which all three aspects of consciousness must be employed. In trying to state wide generalisations simply and in a few words I may seem in varying degrees dogmatic, incomplete, dull and possibly elementary. For these things I ask your indulgence. The problem cannot be too often stated, because upon its solution depends the future not only of industry, but of civilisation itself. Briefly, the problem is how to reconcile the claims of essential equality and temporary inequality.

Human effort—yours and mine—in so far as it is consciously controlled by personalities apart from ourselves, is directed ultimately by two forces only—Compulsion, driving from without, and Brotherhood, impelling from within. The *motive-power of Compulsion is Fear* : the motive-power of Brotherhood is the opposite of Fear. The atmosphere of Fear is Suspicion : the atmosphere of Brotherhood is Trust. It is the atmosphere that makes the world habitable—or the reverse.

All Power is distributed through Centres. Power, therefore, cannot be exercised without Authorities, to which obedience—obedience in Act—must be given. Since the hierarchy of Powers is infinite, in this sense all are servants and subjects ; but since, in the distribution of Power, Mind must control Mind, there must be Inequality as between individuals. Thought, however, is free.

But while Authority implies Inequality, there is a sense—a sense which touches the deepest depths of Being—in which all are equal. Equals cannot compel Equals ; hence in varying degrees every personality mentally opposes compulsion by another personality as soon as the deeper depths are stirred. The Principle of Brotherhood resides in those depths ; and when Compulsion reaches them, a stronger Power answers the challenge. That challenge is given when Compulsion seeks to order Thought, which is free, as well as Act, which it may have right to order.

Therefore, in the realm of Mind, *everyone* is both Subject and King. All are One and Each is All. One in Service ; all in potential Kingship. Therefore Co-operation *is* Brotherhood, or it is the co-ordinated action of lay figures moved by the strings of Fear.

When any personality seeks by Compulsion to impose its will on any other personality, Consciousness of Essential Equality is awakened, and mental resistance and counter-current follow. *This is a natural reaction operating in the realm of Mind, and must not be mistaken for Insubordination, which operates in the realm of Action.*

Further, we are led by our mind-pictures. We are drawn to those which are pleasing and repelled by those which are unpleasing. Every mind-picture of Compulsion or the actions it enforces is unpleasing to the subject compelled. The more Compulsion is used, or suggested, therefore, the more your subordinate must exert her will to look at her mind-picture ; and—this is the important point—the more she has to exert her will in this way, the greater the power of that mind-picture to repel her. The stronger the thought-current *forced* into the personality, the stronger the mental resistance and counter-current. It is important to remember that *this again is not the resistance of Insubordination* : *it is indeed the exact opposite.* As a loyal officer, your subordinate will if necessary exert the full strength of her will to carry out your command ; but the more she has to exert it, the greater the power of the Imagination—the mind-picture—which opposes it ; and in the last resort the Imagination is stronger than the will.

And what of Brotherhood ? Since it *means* Equality, it awakens no opposing force. Moreover, all mind-pictures of brotherhood and the actions it requires are pleasing. No effort of will is required to look at them ; and there is, therefore, no conflict between Will and Imagination. Mind-pictures of work which repel under Compulsion are re-painted in entirely different colours. Brotherhood, therefore, is both the frictionless force, and the strongest force. It is also the only force which makes possible co-operation between individualists, for in some way or other everyone *desires* to express Brotherhood. It is also the only force which can dissolve the barriers set up by the Imagination between Mind and Mind.

These, then, are the two great forces, regulating human effort, between which choice must be made for general use: Compulsion—which in effect is repulsion—through the agency of Fear, acting against the deepest of the fundamental laws of Being : and Brotherhood—which in effect is attraction—acting in harmony with that law. The choice is ours—when Fear is conquered. Fear is the only real obstacle to Brotherhood ; and to the average Briton—in which category the writer includes himself—fear of ridicule is the Great Fear. For this reason, the scientist who can invent a catchy and descriptive, but technical and harsh-sounding name for the principle of Brotherhood will probably do more to hasten the coming of Utopia than all the eloquence of orator, poet, or novelist. Time does not permit more than the barest outline of the technical argument for Brotherhood, so Ladies and Gentlemen, I must leave it to you to strengthen or weaken the case for Brotherhood in supervision, according to the degree in which your minds incline either to Brotherhood or Compulsion as a general principle.

This year especially, through the agency of the press, many memories of the Great War have been awakened. Surely the chief of the abiding memories of that time—strangely moving even to the mere non-combatant—is its expression of the great central idea of Brotherhood—Sacrifice ; for without sacrifice there is no Brotherhood. Ten years have passed since the first battalions of the tawny legions of Britain moved, swiftly and silently after the manner of their race, to answer the challenge of the Teuton—the challenge of Compulsion ; in their eyes the light of willing sacrifice ; in their hearts the dawning vision of a new Brotherhood which mocked the limitations of class and creed, of a comradeship to be sealed in blood on a hundred battle-fields. Six years have sped since those that were left returned to a new world, a world confronted by new principles, calling for new methods, and for the

willing labour of all in a great rebuilding. Some say the response proves the failure of Brotherhood, but is this so ? From multitudes—combatants and non-combatants alike—the war has taken away that which admits of no replacement. To some has come the loss—not always by death—of those dearer to them than life : to others, and we think specially of Russia, the greater tragedy of lost Ideals—Ideals of Love, Beauty, Faith, and Hope, without which the pictures on the canvas of life seem, but the meaningless daubs of an amateur. But surely even to these sometimes—chiefly perhaps on the day of the Great Silence now not far distant—the cold dawn of what is still the New Day flames for a moment with the rose-glow from the undying fire of the Great Sacrifice, lighting the Old World which lies back beyond the seeming ages since the War slew its thousand fond Illusions. And at the great lodge of the Brotherhood of Sacrifice, the empty chair is filled ; the vanished face that one never can quite recall looks into their eyes with the old happy smile ; or a glimpse of the lost Ideal returns with wistful splendour ; and for a little moment the shattered world is whole again, and even our grey cities,—like Camelot of old—are built anew to Music as the Old World calls to its own :—

" For they shall come back, come back again, as long as the red Earth rolls.
He never wasted a leaf or a tree. Do you think he will squander souls ? "

And though the Old World may seem dead, in the grey and misty dawn of the new, the cry for Brotherhood grows stronger. It is behind the lofty ideals of the League of Nations ; and, perhaps most significantly of all, is seen in the great and growing impulse towards the Reunion of Christendom, animating schools of thought once at bitter war. For the demand for Brotherhood must find its answer, and is finding it. Even in the field of Industry there is evidence of greater efforts to provide for those whose work is executive, rather than directive, a more helpful material environment. But the demand goes deeper. It is spiritual rather than material, and is not a question of financial cost. It calls for some great solvent force which will break down in greater measure the barriers—invisible as either but stronger than steel—which isolate mind from mind, for the life-forces which the late Premier, in one of his speeches in Parliament was not ashamed boldly to name before men—the life-force of Brotherhood and Faith. And the need for these is claiming ever wider recognition. Dimly conscious of new and untried forces within its grasp, the awakened spirit of Britain is ready for fresh adventure : and, in the dawn of a new world, once more seeks a Golden City—the City of its dreams, made not with hands, wide as the world.

So when the world is asleep, and there seems no hope of her waking
Out of the long, bad dream that makes her mutter and moan,
Suddenly, all men arise to the noise as of fetters breaking,
And *everyone* smiles to his neighbour and tells him his soul is his own.

And *that* is Brotherhood.

THE HISTORY OF THE TELEPHONE IN THE UNITED KINGDOM.

AN interesting forthcoming publication is the book with the above title by Mr. F. G. C. Baldwin of the Superintending Engineers' Office, Newcastle-on-Tyne. We learn from a preliminary notice that the book deals broadly with the history of the telephone from the legislative, administrative, commercial, and technical aspects. The various Acts of Parliament, and the circumstances which led up to their enactment are dealt with and their effect also is indicated. Legal disputes and other controversies, particularly as regards early patents, which have been numerous and have exercised great influence upon technical development, receive treatment. The activities of all the various administrations which, from the commencement, have participated in exploiting and developing the telephone and in furnishing telephone service in this country are dealt with.

Engineering practice and its development in regard to the principal features of overhead, and underground line plant, exchange switching devices of all descriptions, and other telephone apparatus is followed from the earliest days of telephony practically up to the present date, and the principal earlier inventions relating to the various branches of telephony, which have originated in this country and in America, their development, and the use to which they have been put in the United Kingdom are described.

The pioneer work performed in this country by many men who are still living, and some who are not, receives adequate mention.

The book includes illustrations and information of much interest collected by the author from numerous sources and which have never before been published. Many of the photographs and a good deal of the information has been supplied by men and firms of prominence, many of whom were amongst the first to enter the telephone field in furnishing telephone service, and in the manufacture of telephone apparatus and materials.

The competition arising between rival telephone administrations and with several municipalities is dealt with, as also the results which followed.

Telephone development in the United States and the United Kingdom is compared and reasons for the inadequate development here are deduced.

A chapter is devoted to the invention and development of automatic switching appliances in America, also to the introduction into manufacture and employment of machine switching equipment in this country.

The question of line distribution, a subject which has received but scant literary attention hitherto, is dealt with fairly fully in a separate chapter.

Radio Telephony and its comparatively recent adaptation to broadcasting receives treatment in a separate section.

The book does not claim to be a text book, but there is much information included which should prove of value and interest to students of telephony, and those engaged in scientific, technical, and managerial work connected with the telephone service and industry.

TELEGRAPHIC MEMORABILIA.

AUSTRIA.—Broadcasting has become very popular in Vienna of late. The recently-established Oesterreichische Radio-Verkehrs Aktien Gesellschaft has already a subscribers' roll of 15,000. Influential bodies and individuals took part in the foundation of this institution, comprising the State, the Public Works Credit Institute, the Steyrer Bank at Graz, the Municipality of Vienna, the Oesterreichische Anzeigengesellschaft, the Austrian Telegraph Works, the Ericcson Electric Co., the Kapsch Telegraph and Telephone Works, and the firm of Leopold.

CHINA.—The following is the outline of part of a Government report on the present situation as regards Radio-Telegraphy and Telephony in China in general.

International difficulties arising out of conflicting agreements entered into by the Chinese Government still delay the development of long-distance radio communication between China and foreign countries and no progress was recorded during the past twelve months. As regards broadcasting, also, no regulations have yet been issued by the Chinese Government and the importation of receiving sets is still prohibited. In Shanghai the number of receiving sets, mainly manufactured locally from imported material, is slowly increasing, but (apart from objections raised by the Chinese authorities) the demand has not yet become sufficiently widespread to offer much inducement for the establishment of an expensive broadcasting system. Official obstruction will, however, doubtless grow weaker in course of time and there is every reason to expect that the demand for radio equipment in China will tend to increase very materially within the next few years.

Increasing attention is being attracted to the desirability of installing radio equipment in the steamships plying on the China coast, where the prevalence of violent storms at certain periods of the year and the numerous cases of piracy in southern waters make it particularly necessary that these vessels should be in a position to exchange weather signals or to summon assistance in case of need. Hitherto the expense of employing European operators has acted as a deterrent to the installation of radio apparatus on most of the smaller steamships, but arrangements are being made for the establishment of a training school at Hongkong, and it is hoped that, at least in the case of British vessels, the provision of wireless signalling apparatus will soon be universal.

From other sources comes the information that a German firm is asking permission of the Ministry of Communications to install radio telephone services between Peking and Tientsin and Tientsin and Shanghai.

The *Electrical Review* informs us that a scheme to link Pogranichnaya, on the northern border of Manuchuria and Siberia, with the western terminus of the Russian railway line in Manchuria and the Chinese Eastern railway, by a long-distance telephone line, has been planned by the French consul at Kharbin (M. Lepissier). Eventually this telephone line will be extended to Vladivostok and westward to Chita. Capital to realise the scheme will be supplied by a Franco-Chinese company to the amount of 1,000,000 yen. The whole of the telephone network is to pass into the hands of the Chinese in 16 years.

ESTHONIA.—According to *Commerce Reports*, the Ministry of Communications has entrusted a radio committee with the preparation of regulations defining the use of radio apparatus by private persons and business organisations, as well as the operation of broadcasting stations. The committee has had under discussion the question whether a State monopoly should be established for the sale of receiving apparatus and broadcasting, or whether it should be on a concession basis. Temporarily the free sale of radio apparatus and the issue of licences for its use to private persons are allowed. The use of radio for business purposes is not yet permitted, pending the promulgation of the necessary regulations.

Later reports from the same authority state that preliminary regulations regarding broadcasting have been passed by the committee, subject to the approval of the Minister of Communications. Under these regulations Esthonians must procure a receiving licence, valid for one year, from the Postmaster-General, while foreigners must apply to the Minister of the Interior for a similar licence. The length of the antenna of the receiver must not exceed 50 metres, and private broadcasting sets are forbidden, while the wavelength of receiving sets is limited to a maximum of 700 metres. The regulations specify preference for sets of Esthonian manufacture, the importation of foreign apparatus being permitted only after the consent of the Minister of Communications has been granted.

FRANCE.—From Reuter's agency in Paris, we learn that the first trials of the wireless station erected on the Pic du Midi, in the Pyrenees, near

Tarbes, which is said to be the highest station in the world, have been carried out in spite of the fact that the pylons, 30 metres high, which were to have supported the aerial, could not be taken to the summit of the mountain. The station was accordingly opened with a temporary aerial. Great difficulty was experienced in assembling the material, which had to be taken up in sections on the backs of mules. The chief objects of the station are to maintain a permanent liaison with Bagneres and to broadcast weather reports. Hitherto communication with Bagneres has been difficult, as the wires were so often broken by snow and avalanches, and for months at a time the weather experts on the mountain top were cut off from the world.

GERMANY.—The *Electrical Review* is responsible for the following three paragraphs :—

The fishery authorities are using the Hamburg broadcasting station to promote the sale of fish, and in two recent announcements gave the catch of the day, the retail price in 214 shops, and details of the herring's life history. Every Monday and Wednesday a short, popular "fish talk" is provided. The broadcasting campaign is stated to have increased the demand for fish.

"*Wired Wireless.*"—Prince Reuss is reported to have made successful use of the high-pressure power conductors for transmitting broadcast programes, the receiver being connected to the ordinary lighting circuit.

At the first German broadcasting congress in Berlin, it was stated that there are now a quarter of a million receiving sets in use in Germany, of which 120,000 are in Berlin, with a daily increase of 2,000. Dr. Von Bredow, of the Postal Ministry, said that a million Germans now listened every day, and the total would soon be doubled.

GREECE.—Radio telephony is being used as an aid to the conduct of business by a number of business houses in Greece, where the regulations permit of the private use of this means of communication. Four important firms are equipping their premises with the Marconi "Popular" set (type XP) to link their head offices in Athens with their branch offices in the Piraeus, and further inquiries for similar sets have been received from other commercial firms.

INDIA.—In reply to the Government's circular on broadcasting in India, the Radio Club of Bengal has expressed the opinion that control should be in the hands of a public company under Government supervision and formed on the lines of the British Broadcasting Co. in Great Britain, but with provincial councils to watch local interests. No monopoly should be granted to any one company for the sale of receiving apparatus, but the public should be allowed absolute freedom as to the type of set they wish to make or purchase. There should be no restrictions on the import of goods, but a duty of 7½% on complete sets and 5% on accessories should be charged, 80% of which should go to the broadcasting company. All persons using radio apparatus should be compelled to take out a licence at a cost of 10 rupees per annum, 80% of which should go to the broadcasting company.

It is also publicly stated regarding the ordinary telegraph service of India and through the same medium (*Commerce Reports*) that approximately 412,000 miles of telegraph wire and cable are now operated by the Indian Government, and connect with the Indo-European Telegraph Co.'s system. The company operates a service over land and water cables from Karachi, *via* the Persian Gulf, Jask, Teheran, the Black Sea, and Constantinople, to Central Europe, Germany, and England, and re-opened its international service in August, 1923, after having been interrupted for nine years on account of the war. The company operates 2,978 miles of wire on the Mekran coast and 5,323 miles of the lines connecting India with Europe. About two years ago a line was extended by the Indian Government from Calcutta to Lhasa, *via* Darjeeling and Gyantse.

A portion of this information has already appeared in the columns of the *T. and T. Journal.*

ITALY.—From official sources it is gathered that with a view to improving the telegraph communication between Trieste, Rome, Milan, and Genoa, corresponding to the increase of traffic, the Ministry of Communications sanctioned the erection of a line from Milan to Trieste, of another from Genoa to Trieste, and of two lines between Rome and Trieste, one being partly overhead and partly underground. The linking of Trento direct with Rome is also provided for. These several lines were recently opened to traffic ; a complementary circuit will shortly be constructed to link Fiume, Trieste, Quarnaro, and Milan.

MANCHURIA.—The *Chinese Economic Bulletin* is my authority for stating that Manchuria has now 17 radio stations. The largest are at Mukden, Harbin, Chang-chun and Hulutao.

NEW ZEALAND.—The Government has introduced a Bill making all radio broadcasters agents of the Crown, which means, it is understood, that if the Marconi Co. sought to assert any monopoly it would have to deal with the Crown.

The Times, however, reports that Amalgamated Wireless, Australasia, Ltd., recently warned broadcasters to cease operations on the ground that they infringed the company's rights. The Postmaster-General states that broadcasters will be at liberty to resume operations as soon as the Bill is passed.

PERU.—A 10 years' concession for exclusive broadcasting privileges has been granted by the Government to the Peruvian Broadcasting Company.

POLAND.—According to a report from Warsaw, the development of radio telephony will be stimulated by a new law governing the use of such apparatus by the general public. It is understood that licences for the operation of transmitting and broadcasting stations will be granted to scientific, educational and manufacturing institutions, while the regulations governing the use of receiving sets will be similar to those in operation in France.

PORTUGAL.—Reuter's, Lisbon, state that a new wireless telegraph and telephone company is projected on the basis of a contract with the State, which would be represented on the board of directors by two nominees, one being appointed by the Ministry of Commerce on behalf of the postal authorities, and the other by the Ministry of the Colonies. It is stated that the Ministry of Commerce will offer its post to Senhor Antonio Maria de Silva, while the representation of the Ministry of the Colonies will be offered to Dr. Alvaro de Castro.

RUSSIA.—It is reported from Moscow by the London *Times*, that Soviet Russia and Mongolia have signed a Postal and Telegraph convention.

S. AMERICA.—A new radio station will in all probability soon be established in Colombia. It will be erected in Ibagué, the capital of Tolima.

SWEDEN.—The Swedish Government has extended until 1935 its present concession to the Great Northern Telegraph Co. for the transmission of cablegrams between Sweden, Finland, Denmark and England. At present this company's cables in Sweden consist of four to Finland, two direct to England, and one two-wire Swedish-Danish cable, of which one wire goes direct to England.

Coloured photography may receive a fillip from the fact of its recent connexion with wireless transmission, for Mr. George A. Taylor, president of the Association for Developing Wireless in Australia, New Zealand, and Fiji, recently delivered an address at Australia House, Strand, on recent wireless discoveries, and explained a process by which, it is claimed, coloured pictures of distant scenes can be transmitted. His apparatus was shown for the first time in Europe, and, according to the *Morning Post*, he explained that the picture is photographed through screens on to metal plates in the ordinary way for printing in their three primary colours, yellow, red and blue. Each plate is printed in black ink, and the print is enlarged, so that when acid is used on a metal plate it will leave deep etchings between the screen lines, The plate is then placed on a revolving cylinder with a needle in contact with the metal parts untouched by the acid, such contacts being transmitted by the "dot and dash" method, being picked up as in ordinary wireless reception by means of an ink-marker on a cylinder covered with paper. Each colour is transmitted as a black print, and the three pictures are then at the receiving station reprinted in their primary colours, thus reproducing the original picture.

The *Telegraph and Telephone Age* records that Mr. George Bain, cable electrician for the French Cable at New York, retired on a pension on Oct. 1, He commenced his telegraphic career with the British Post Office telegraphs, later joining the Direct United States Cable Co., from which he transferred to the French Cable Co.'s service a quarter of a century ago, with which company he has remained ever since. His colleagues presented him with a gold watch as a token of their esteem and goodwill.

The month before last Mr. J. Cornock, Asst. Supt.—to be precise on Oct. 28—retired from the Central Telegraph Office, London, having reached his 60th year and having completed 44½ years of service. On the day when our friend took his departure, his father Mr. James Cornock was still living, hale and hearty, and Ramsgate's oldest inhabitant, having himself been in receipt of a pension from the G.P.O. since 1882. Pathetically enough Mr. Cornock senior passed peacefully away only a few days after his son's retirement, having lived just long enough to have created, what is probably a record for father and son, in the Post Office service.

The following is a condensed report of the statement issued by the B. Broadcasting Company on Capt. Eckersley's impressions of his American visit :—He is of the opinion that English broadcasting cannot in any sense of the word be said to be behind American, but the problem is different on this side. The area of America is hundreds of times greater than the British Isles, and the average American listener is probably keener on the hobby side of broadcasting than upon its artistic aspect. Receivers are all designed for long-distance reception, and not to give pure reproduction in the same way that the problem has been tackled in England. Unity of control is vastly superior to the happy-go-lucky American method. There are said to be 550 odd stations in America, but it is admitted that perhaps at the most only 100 of them can in any way compare in power or programme with our main stations. Stations divide time constantly—that is to say, they do not all work at once, so that the variety of programme that has often been talked of, although it is sometimes greater than that in certain parts of England, is in general less than has been thought. With regard to linking up Britain and America, tests have been arranged between the two countries, but it is unlikely that any guarantees whatsoever can be made at present.

The British Broadcasting Co. has issued its educational programme for the autumn session. Special transmissions for schools are given from the London station every weekday at 3.15 p.m., and other stations are also developing their own school programmes. A 15-minute talk at 7.10 p.m. has been planned in series in consultation with the Adult Education Committee, and a similar talk at 9.40 p.m. has been arranged for the general public. There is no diminution of the time hitherto devoted to music, news, &c.

BRITISH INDUSTRIES.—The organ of the Federation of British Industries makes the following interesting statement regarding the cable-making industry in October, both as regards high and low power transmission. "In some departments, if the general trade and financial outlook were more settled, increases of equipment would be justified. It is anticipated that the coming winter will establish a record in the supply and consumption of electricity from the various generating and distributing stations, and this is naturally

reflected in the necessity for increased cable carrying capacity. The extensions of the telephone underground system are also causing large demands to be made on these departments. The exhibits staged under the auspices of the Cable Makers' Association at the British Empire Exhibition, have excited considerable interest among engineers from overseas, more particularly in connexion with extra-high-tension cables; there is a good exhibit both of cables and jointing systems up to 60,000 volts. Substantial trial orders from abroad are being received for these cables. *In telephone cables, while no radical change has recently been made, a steady march of technical improvement is being achieved by the co-operation of the Post Office technical staff and the cable manufacturers. Results as to accuracy of manufacture, which a year or two ago were regarded as commercially impossible, are being achieved in daily production.*" [The italics are editorially produced.]

When, over a quarter of a century ago the writer drank in with avidity that fascinating social novel of Bellamy, entitled "Looking Backward," the possibility of so near a realisation of some of the forecasts of that remarkable volume as is indicated by the American publication *Electrical Merchandising* of to-day, was undreamt of—certainly not within the ambit of a couple of generations. The Detroit magazine, above mentioned, gives details of an "Electric Service Restaurant" in Detroit thus :—

"By means of electricity, an entire meal can be served in this restaurant without having a waiter in sight or without grudgingly leaving a tip to an unobliging waiter. The principle of operation is similar to that of the dumb-waiter or elevator. The guest enters the restaurant, selects his table, notes on the menu the food he requires, drops the menu through a slot in the table and waits a minute or two. Presently there is a little humming noise, and lo! in the centre of the table, on a four-poster tray, appears the food he has just ordered. When the menu is slipped into the slot it drops to the kitchen below; the server there immediately fills the order, presses a button, and the food is on its way to the table. When the guest has finished his meal he takes the bill, which has also been delivered by electricity, pays it at the usual cashier's stand, and leaves the restaurant with a feeling of ease and well-being, something he has never experienced, he reflects, after dining in a bedlam of scraping chairs and rushing waiters."

To this invention one would add as of special interest although of more disquieting a nature is the mechanical bank ledger which, upon being operated by the bank clerk, promptly gives the amount of the customer's balance at will—if solvent! Should there be any doubt as to the solvency of the client, the machine simply refuses to budge. Truly we live in a mechanical and electrical age! The restaurant sounds beautiful and restful, but the bank-ledger!

At long last it may surely now be said that the negotiations for the Americo-Germano Transatlantic cable are finally settled, for the president of the Commercial Cable Co. announces through the *Financial Times* that negotiations have been completed for a new Transatlantic cable between America and Germany *via* the Azores. The company will be responsible for the laying of the New York-Azores section, while that between the Azores and Emden will be in the hands of the Deutsch Atlantische Telegraphen Gesellschaft, of Berlin. The two cables belonging to this company previous to the war, were subsequently confiscated by the Allies, one now being operated between Great Britain and Canada as the Imperial Cable, while the other is operated between Brest (France) and St. Pierre (Miquelon) by the French Cable Co. on behalf of the French Government.

There are no signs of waning interest in the broadcasting programmes On the contrary there is a steady increase, both in the number of licence holders, in the centres from which programmes are radiated, and in the means of receiving the same. The number of licence-holders in the British Isles by the time these notes are published will probably have passed the million mark, the B.B. Company is gradually opening new centres, while passenger ships in increasing numbers are adding receiving sets as a permanent attraction.

Marconi apparatus for example, specially designed for the reception of broadcast programmes at sea, has now been fitted on a dozen ships, and is giving satisfactory results. This installation is similar to the standard V 4 set, with the addition of two protective tuning circuits; it is arranged to operate the loud speakers or telephones through transformers so that any chance of the high-pressure supply becoming ineffective through the action of salt water, &c., is obviated. One of these sets was carried by the motor yacht *Naz-Perwer* on a recent voyage to Norway, and when at Bergen the Aberdeen station was received clearly during daylight, and at night Aberdeen and Newcastle were heard up to about 100 miles north of Bergen. The Chelmsford station was received during practically the whole of the cruise, including times when the vessel was landlocked in the fjords 200 miles north of Bergen. During the regular voyages of the D.P.L. steamship *Perth* between London and Dundee, the London, Chelmsford, and Newcastle stations are delivered by means of a loud speaker to the passengers. Other ships fitted include the C.P.S. liner *Marglen*, the R.M.S.P. Co's *Arcadian*, the Campbell line vessel *Lady Moyra*, and a number of private yachts. A special single-wire aerial is erected for use with the broadcast receiver so as to avoid any interference with the ship's ordinary radio services. At present the broadcast receiver is only used when transmission by the ship's own apparatus is not taking place, but promising experiments are in progress with a view to making it possible to receive broadcast while the ship's transmitter is in operation.

The use of directional radio communication is also extending, and is now being applied to the special requirements of vessels engaged in whaling operations. The *Sir James Clark Ross*, which recently sailed from Cardiff for the Ross Sea, has been fitted with a direction-finder, and is taking with her five others for use on board the small boats associated with her. The large vessel is fitted with a Marconi 3-kW telegraph-telephone transmitter, which enables her to give instructions to the small boats' crews, as it not infrequently happens that they are overtaken by fog or darkness, and have difficulty in finding their way back to the parent ship.

With the permission of the British Government and the co-operation of Trinity House, the first experimental radio beacon has been erected on the coast of Great Britain at Nash Point, between Swansea and Cardiff, and has been subjected to severe practical tests over a period of six months with most satisfactory results.

The installation, which has been provided by the Marconi International Marine Communication Company consists of a ¼-kW quenched-spark transmitter which automatically transmits its own call sign, GKD, on a wave length of 1,000 metres. It is operated by means of an Austin engine, petrol being used for starting, and the machine automatically switching over to paraffin. The power used is sufficient to enable bearings to be obtained by means of the Marconi marine direction-finder at a distance of 50 miles. The beacon, however, does not interfere with broadcast reception outside a range of three miles from the beacon. This beacon has proved very useful in the Bristol Channel, where the opportunities to make use of a direction-finder are very limited.

The painstaking and thoroughness of the Development and Research Department of the American Telephone & Telegraph Co., are much in evidence in the August account of the Proceedings of the Institute of Radio Engineers. It is of course not possible to give anything but the bare outline of the combined report of Messrs. R. Brown and Gillett on "Radio Wave Distribution." However, the mere mention of some of the conclusions arrived at will give our scientifically-minded readers a very fair view of the extent of the labour involved in the collection of the data necessary.

The results obtained were those of a quantitative study of the distribution of radio waves from broadcasting stations, in and about the cities of New York and Washington. The wide variations of attenuation over different kinds of territory, the causation of radio shadows or dead spots, and the phenomena of refraction and diffraction are all illustrated by the data and curves, while radio field strength contour maps of the two territories are of great interest. Some of the conclusions arrived at are: (1) The radio attenuation over different kinds of earth surface varies widely; it is low for sea water and for flat moist ground, while for dry ground it is relatively much greater. In the case of closely-built cities filled with steel buildings, the local attenuation may be enormous. (2) Sudden changes in land elevation and large masses of conducting material cast radio "shadows" which may be very heavy in extreme cases. (3) Shadows cause local dead spots; but usually within a relatively short distance beyond, the shadow is wiped out by refraction or diffraction. All of these effects can be predicted by purely theoretical considerations; it is impossible to predict the magnitude of the effects, however, on account of the irregular and complex nature of the transmission media and the lack of quantitative data on their electrical characteristics. The experiments not only show the magnitudes for specific cases, but as a whole throw the picture into focus and provide the mind with a sort of scale which is useful in estimating the probable effects in other similar situations.

From across the herring-pond also comes the following interesting observations, made by the consulting engineer of the Pittsfield works of the General Electric Co. of America, a Mr. Peek, who from conclusions made after very careful high-voltage laboratory work, is enabled to inform us that "lightning always strikes the highest point unless it is over 2.5% of the cloud height above ground. An object 1.1% of the cloud height would be struck 50% of the time; thus, a man standing directly under a cloud 1,000 ft. above the ground would be struck 15 times in 100 strokes, and a man flat on the ground only once in a hundred strokes. Similarly, a 25-ft. building would be struck every time. Surrounding a lightning rod there is a protected area with a radius four times the length of the rod. A lightning flash may be of several million horse-power, with voltage of about 100,000,000, while the current is about 80,000 amperes, and the energy 3.6 kilowatt-hours. One or 2% of the lightning voltage and two hundredths per cent. of the energy may be transferred through space to a transmission line several thousand feet from the flash. The insulation of 220,000-volt transmission lines is sufficient to make them almost free from lightning trouble." After which we should feel quite safe taking shelter under a 220,000 volt transmission line during a thunderstorm, and should feel perfectly at ease in a 1,000,000 volt laboratory such as that of the Hermsdorf Schomberg Isolatoren, Freiburg, Saxony, where tests with this voltage may be made.

The report of The Amazon Telegraph Company Ltd. for the year ended June 30 last shows a gross revenue of £52,778 and working expenses amounting to £25,208. After providing for income tax and debenture interest and contributing £14,699 to the sinking fund and £1,500 to general reserve, there remains a balance of £3,066, which the directors recommend shall be carried forward, subject to corporation profits tax. There has been some improvement in business on the Amazon but the rate of exchange remains very low.

The above report and that of similarly little-known telegraph companies, reminds one of the service rendered to the world at large by out-of-the-way telegraph organisations of the type of the "Amazon" and the "West Indies P.T. Co." The latter company, after many years of unremunerative work, is apparently about to be superseded. A personal friend of the writer's, who spent many months and years on cable-laying vessels, and who knows the ocean depths of the neighbourhood traversed by the company's cables, writing on this subject says :—"I wonder if anyone realises the actual conditions this company worked under—conditions almost beyond imagination—of earthquake and rocky sea bottom, and of new cables laid over old." My informant very definitely claims that the laying of new cables over old is the primary cause of most cable breaks, and that if more of the old and derelict cables could have been picked up many a break of working

cables would have been saved. Be this as it may, the world owes a debt of gratitude to the pioneers of cable laying and maintenance and working of telegraph cables in the less accessible parts of the world.

The services rendered by the cable telegraphists themselves, at out-of-the-way spots, such as those covered by the Pacific cable routes and those of the companies just mentioned, were well brought to the writer's mind when he recently read a letter from one in the service of the Western Telegraph Co., St. Vincent C.V.I., West Africa.

"With regard to the work itself, I cannot complain. We have a six-hour duty which is continuous, no time being allowed off for meals (except breakfast), which are all brought round, in the case of tea to your circuits, where you devour them when you get a chance. . . . . .

The duties are night (which I abhor, loathe, and detest), midnight to 6 a.m.; morning, 6 a.m. to noon; afternoon, noon to 6 p.m.; and evening, 6 p.m. to midnight. Of course, overtime is done as well, and in 6-hour shifts, and is fairly common here, as the quarters are not big enough to hold the large staff which is really required on the *second largest and most important station in the world.* I have more than once done in one day the following:—midnight to 6 a.m., duty (6 a.m. to 11.30 sleep); noon to midnight, duty; or another series:—6 p.m. to midnight, duty; midnight to 6 a.m., duty (6 a.m. to 11.30 sleep); noon to 6 p.m., duty (8 p.m. to midnight sleep); midnight to 6 a.m., duty; or a total of 24 hours out of 36!

We have 9 cables, 3 to Madeira (relayed thence to London (1), and Larcavellos (2), one to Sierra Leone, through relays at Praia, St. Jago, and Bathurst, for West Coast traffic, (2) to Pernambuco for North Brazil traffic, (1) to Ascension Island, for traffic for South Brazil, Uruguay, Argentina, &c., and the Eastern Telegraph Co. have two cables running through, one to Fayal in the Azores, which is relayed thence to London, and in the other direction to St. Helena, through a relay at Ascension, for the Cape and Australian traffic. . . .

After nearly two years at S. V. I can supply you with all the facts which you may wish to know. First, a description of the island. It's about three-quarters the size of the Isle of Wight, and is about 600 miles from the West Coast of Africa. It belongs to the Portuguese (for whom I have absolutely no admiration), and is devoid of all vegetation except in one or two infrequently met spots. It is composed of (1) sand, (2) gravel, (3) rock (4) dirt! . . .

Mindello is the only *city* here and by far the largest town. The others are a mere collection of houses. Salamanca is composed of five only—all broken down. A year or two ago Mindello was closed down for six months owing to plague. There was an outbreak last year, which necessitated inoculation against bubonic plague. I was inoculated twice, and had to be carried out of the office on the morning after my second dose. The Portuguese doctor pumped in the liquid out of what appeared to me to be a football inflator. I was in hospital for three days, and next time the plague breaks out it'll have to be pretty bad for me to have another inoculation. Good-bye-e-e-e. . . ."

After being away from London for just under a month, the *Stephan* has returned to dock, having laid 1,400 miles of cable, linking the new mid-European system with the United States and South America. The new cable will be partially controlled by the Italian Government, and the portion which has been laid by the *Stephan* is that between the coast of Spain, at Malaga, and Fayal, in the Azores.

The agitation in and outside France itself, for the stabilisation of the telegraph and telephone lines of that country appears at long last to have begun to bear definite fruit. Should this prove to be the case, it is safe to say that the outspoken report of a couple of years ago, by M. Laffon, will have had much to do with bringing matters to a head. Information reaches us through Paris and Berne, that the proposed new underground cable, between Paris and Strasbourg, will contain 150 wires (? pairs of wires), and these should assure reliable communications between these two cities. The route primarily agreed upon has been somewhat modified, and up to the moment the road followed will be via Lunéville, Baccarat, Raon l'Étape, Saint-Die et Selestat. It would form a good connection between Switzerland and Central Europe, although other underground cables to Switzerland are projected. It is also reported that work on the Paris-Havre and Paris-Lille *reseaux* have commenced. Cables between Paris and Marseilles and Bordeaux also appear in the programme, but there is much leeway to be made before our Channel neighbour will be able to find herself abreast of the most efficient nations as regards telegraph and telephone line-maintenance. This is apparently by no means due to the permanent administrators in France, but rather to the failure of the French public to recognise the real and national importance of stable telegraph and telephone communication.

As the *Journal* goes to press, news reaches me of the sudden death of Mr. A. E. Eames, who retired from the Controllership of the C.T.O. sixteen years ago.

There are other pens more capable of adequately dealing with the career and personality of this-much loved man, but I cannot but place my own little token upon the grave of one whose kindly nature simply radiated to all around him, and whose very presence gave even a delinquent confidence that a fair hearing and justice tempered with a touch of human kindliness would surely be the worst.

An ex-Asst. Controller of the C.T.O. who was present at the funeral service held at St. Augustin's Church, Honor Oak, on the 22nd ult. and subsequently at the Committal in Forest Hill Cemetery, writes:—There was a large attendance evidencing and emphasizing the kindly characteristics by which Mr. Eames had endeared himself to his staff, the C.T.O. being specially represented by the present Controller and Deputy-Controller, Mr. John Lee and Mr. Edwards.

A very special feature at the Church was the soprano solo, "Blest are the Departed," from Spohr's Last Judgment, beautifully rendered by a boy chorister.

Many other officers present and retired attended.

After the Committal Service Mr. A. McEwan made a striking oration on the worth of our late Chief as a man and an official. He was truly a Great-heart!

The Belgrade correspondent of the London *Observer*, relates the following story of the Yugo-Slavian telegraphs:—"The local authorities, even including the gendarmes, have risen in Ochrid to join forces with all religious denominations, Christian and Mohammedan, in preserving a holy tree from desecration and destruction by unfortunate employees of the Yugo-Slav Posts and Telegraphs Ministry. The tree is stated to be a plane tree of great age, with a trunk '18.5 metres thick,' which contained, not a mere archway for the passage of horse vehicles, as in the custom with big trees in America, but six different shops.

"The quarrel started when the telegraph men began to set up a new overhead cable, when it was found that the route traced on the map went through the holy tree. The workmen promptly cut off an obstructing branch five feet in diameter, and the particular Albanian tribe that is most earnest in the worship promptly showed its teeth. When the men turned to a second, slightly smaller, branch the local municipal authorities also rose, and protested against the destruction of an antiquity which the population guarded successfully even during the Bulgarian occupation. There are traditions of the worship of this tree in the Middle Ages during the reign of the Serbian Nemanja dynasty."

What King Belé said:—My sons! When I am gone I would have you three dwell in one mind. As the spear-ring bindeth the spear-shaft together so fellowship shall make you strong. Helgi! Be strong, but forget not mercy. Mercy adorneth Might as a flower. The mighty should be tender. The best blade bendeth most. Halfdan! Get knowledge; fools are many, wise men few. Let thy sword-hilt glisten with gems, if so thou hast the mind, but when thou drawest it let all men know that the blade is steel.—*The Story of Frithjof and Ingeborg.*

J. J. T.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE number of new telephone stations installed during the month of September was 15,327, and of cessations 6,987, making a net increase of 8,340 telephones. Both September and August figures fell somewhat short of those of months immediately preceding, progress having been affected adversely by the holiday season and possibly by the uncertain state of trade.

The total number of telephones working at Sept. 30 was 1,213,442, of which 428,532 were connected with exchanges in the London Telephone Area, and 784,910 with Provincial exchanges.

The following statistics as at Sept. 30 give a brief analysis of the growth in the different phases of the system:—

	London.	Provinces.
Residence Rate Subscribers:—		
Total	74,561	127,755
Increase per month	1,002	1,618
Call Office Stations:—		
Total	4,086	14,229
Increase	16	84
Street Kiosks:—		
Total	37	757
Increase	5	25
No. of Exchanges working	102	3,580
Increase	—	18
No. of Rural Exchanges opened under the 1922 rural development scheme:—		
Total	—	574
Increase	—	18
Rural Party Line Stations:—		
Total	—	9,005
Increase	—	132

It is too soon to gauge the effect on the calling rate of the reduction in the local fee from 1½*d.* to 1*d.*, brought into effect on July 1, 1924. Normally, telephone traffic diminishes during the summer quarter by reason of the holiday period, and this year has been no exception. Moreover it will, probably not be until subscribers receive their accounts for the past quarter that they will realise the benefit of the reduction and increase their calling rate as a result.

The number of trunk calls dealt with during July—the latest available information—was 6,850,722, an increase of over 900,000 over July 1923, and the highest number recorded so far during any month on record. International traffic also was heavy.

Further progress was made during the month of October, with the development of the local exchange system. New exchanges opened included the following :—

LONDON—Upper Warlingham.
PROVINCES—Maidenhead.

And among the more important exchanges extended were :—

LONDON—Ealing.
Wimbledon.

PROVINCES—Ashton-under-Lyne, Cambuslang, Colwyn Bay, Hamilton, Helensburgh, Hythe, Northampton, Llandudno, Langside, Margate, Oxford (trunk), Slough, Uxbridge.

During the month the following additions to the main underground systems were completed and brought into use :—

London—Southend-on-Sea,
Liverpool—Manchester,
Newcastle—South Shields,

while 110 new overhead trunk circuits were completed, and 92 additional circuits were provided by means of spare wires in underground cables.

IS TELEPHONY OUSTING TELEGRAPHY?

BY J. J. T.

THE International Telegraph Bureau at Berne has recently issued a special *Circulaire*, and published the same in the columns of the official *Journal Télégraphique* for October, which, while not attempting to answer the question at the head of this article in terms definitely negative or positive, has yet thrown much useful light upon post-war relationship of the two crafts.

The Berne Circular is the result of replies to the following *Questionnaire*, regarding the cause or causes of the fall in telegraph traffic, both interior and international, since 1920. Every telegraph administration was approached and requested to give the fullest information to the six queries :—

1. Has your administration noted any decrease in the interior and/or international telegraph services ?
2. In the affirmative, what is the extent of its importance ?
3. To what causes do you attribute these decreases ?
4. Has the increased telephone traffic influenced the decrease ?
5. Has the aerial post also proved an appreciable competitor to telegraph traffic ?
6. What measures has your administration taken or propose to take in order to meet this decrease ?

To question No. 1 the following administrations have replied that neither has their interior, or their international telegraph service been detrimentally affected by the telephone :—Ceylon, Cuba, Congo (Belgian), Dahomey, Ecuador, Ivory Coast, India, Iceland, Japan, Morocco, Mauritania, Réunion, Senegal, Yugo-Slavia, Tchad, Turkey, and the United States of America.

The Chilian and Greek administrations have registered an augmentation or even an increase of their interior telegraph traffic, but a decrease of international traffic.

On the other hand, the following administrations have notified a decrease of their internal telegraph traffic, but either a maintenance or even an augmentation of the international traffic, viz. :—Australia, Belgium, Egypt, Great Britain, Germany (1921-22), Italy, Lettonia, Madagascar, New Zealand, Union of South Africa.

The following have experienced a decrease of both interior and international traffic :—

Africa (Equatorial—French).
Bulgaria.
Cyrenaique.
Denmark.
Danzig (Free city of)
Esthonia.
France.
Holland.
Indo-China (French).
Luxembourg.
Nigeria.
Norway.
New Caledonia.
Palestine.
Persia.
Poland.
Rhodesia Southern.
Roumania.
Sarre (Territory of).
Siam.
Sweden.
Switzerland.
Syria.
Tchecoslovakia.
Union of the Soviet Socialist Republics.

2. What is the extent of the decrease ?

The replies under this heading are interesting, although only a round dozen of the administrations concerned appear to have given definite answers. The percentage decreases of interior traffic show very wide differences, ranging from 7% in Great Britain in 1921 to 42.25% for Holland in 1922, 50.75% for Switzerland in 1923, and even to 56% for Luxembourg for a period the dates of which are not indicated. The figures vary remarkably in some cases even for the same country, thus :—In 1921 the decrease in Dutch interior traffic was 16.25% ; in 1922 it had dropped to 42.25%. In Sweden the same type of traffic fell nearly 22% in 1921, and by the end of 1923 had dropped by 36.4%. The Swiss interior traffic which had already fallen by more than one-third of the previous total, within the succeeding twelve months had passed the very low figure of 50% decrease.

There are even cases where for the same country and for the same period the fall in one part of the same administrative territory shows an extremely high disparity. This applies to Egypt where, while the 1st and 2nd Regions only showed a decrease of 14.41% in the interior traffic, the 3rd Region gave as much as 35% for the same period.

This latter case is only quoted as a curiosity. We shall discover, however, as we proceed to analyse the question, which is more complicated than would at first appear, that there are definite fundamental causes which should help us to answer the query with some degree of accuracy.

The writer proposes to develop these phases as we proceed with our study of the circular. In the meantime it is an interesting fact in connexion with the Egyptian figures that the explanation of the greater fall in interior telegraph traffic for the 3rd region was a great improvement in the postal service !

(To be continued.)

The
Telegraph and Telephone Journal.

PUBLISHED MONTHLY IN THE INTERESTS OF THE TELEGRAPH AND TELEPHONE SERVICE, UNDER THE PATRONAGE OF THE POSTMASTER-GENERAL.

Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

VOL. XI. DECEMBER, 1924. No. 117.

CHANGE OF NAME.

QUITE recently, in anticipation of the gradual conversion of the London telephone system to automatic working, the names of several exchanges have had to be changed. The reason, as many of our readers are aware, is that to obtain connection when that system is introduced it will be necessary to dial the first three letters of the name of the appropriate exchange and that the first three letters of some names are the same as those of others. More than this, as the discs of the dials are in most cases each inscribed with three letters, names which are not quite similar will also clash and require to be changed. For example to dial CRO for Croydon necessitates the same manipulation as to dial BRO for Bromley. The changes referred to, aided by useful and sympathetic explanations in the press, have been very well received, all things considered, for as the *Daily Telegraph* says, "Very few people, except brides, like their names to be changed." When it is question of replacing the name of an historic parish or town by some "fancy" name local feeling is naturally difficult to placate. The greatest care has been exercised in the selection of the most suitable names possible, and exhaustive lists have been compiled and tested in the endeavour to find substitutes at once euphonious, appropriate, and easy to telephone. The names of local celebrities, great Londoners, statesmen, soldiers, sailors, artists, poets, authors, rivers and even planets, have been considered in this research, and apart from the extraordinary number which were found to clash from the "dialling" point of view with existing names of exchanges, it was frequently found after a thorough test that names otherwise suitable were unsatisfactory from a transmission point of view. Again, whilst the names of the heavenly bodies, in a series by themselves, might have been distinctive and dignified appellations, it would sound incongruous to sandwich Venus and Mars between Hop and Avenue or Gerrard. The names of soldiers and statesmen, on the other hand, such as Palmerston, Wellington, Nelson and Collingwood, might awake in the man in the street associations with the signs of well-known taverns, and fancy titles are reminiscent, to some degree, of the names of suburban villas.

It will be seen, therefore, that the task of finding appropriate alternatives was by no means an easy one, and it may be considered that efforts in that direction have met with as much success as could be expected. Yet the *Daily Telegraph* in its otherwise sympathetic article says that anybody but a Postmaster General must think "Hornsey" is better than "Mountview." We believe we may say quite frankly that he would agree entirely; but unfortunately HOR and HOP clash on the automatic dial and the change is imperative. In most circumstances the name of the parish or district cannot be bettered as a title for an exchange. Englishmen are justly proud of the quaint and distinctive names of their towns and villages. Writers in *Punch* and in the "Magazine" columns of daily papers are constantly rediscovering the charm of such names as Toller Porcorum, Rolvenden, Wyvenhoe, Fifehead Magdalen, Belovely, Ryme Intrinseca, Barton in the Beans, Perranzabuloe, Bolusfleming, Margarets Rooding, Havering atte Bower, St. Just in Roseland, and hundreds of others. They fall naturally into resonant blank verse without additional embellishment:

> Norfolk can boast its Sco' Ruston, Costessey, Repps and Great Snoring; Sloley, Stiffkey and Quarles; Winfarthing, Wormegay and Trunch.

London parishes and places cannot claim such expressive names, although Norton Folgate and Horsleydown somehow suggest lanes and green meadows which it would be hard to find in those localities. We do not part gladly with "Hornsey" and "Hammersmith," but in the interests of a future automatic service "we think they ought to go"—as exchange names at least. The telephone is a utilitarian and commonsense appliance and knows little of sentiment. Better a new name correctly transmitted than an old and honoured one confounded with its congeners. And at that we must leave the question.

AN INTERNATIONAL VIEW OF THE TELEGRAPH SITUATION.

THE International Telegraph Bureau at Berne has performed a signal service to the telegraph world by the issue of its report on *Le Fléchissement du Trafic Télégraphique*. That the results of its report are not altogether as satisfactory as one could have wished is due to no lack of prevision on the part of the Bureau, when the latter drew up the *Questionnaire* the replies to which were to furnish the Berne office with the necessary material for their special *Circulaire*. Whatever may be lacking in wealth

Portrait by Lewis, 126, George St., Croydon.

SIR WILLIAM MITCHELL-THOMSON, BART., K.B.E., M.P.,
H.M. POSTMASTER GENERAL.

and exactitude of data in that circular is apparently due to the failure of certain of the administrations to make their calculations upon a common basis.

Thus it is impossible to plot satisfactory comparative curves from the figures given, as while some of the replies denote definite figures for definite years (1921-23), others quote for two years, others for only one, while other administrations (Egypt, for example) simply indicate percentages which may cover one, two or three years—there is no indication. This situation is unfortunate, but despite these drawbacks the International Bureau has published a very interesting and useful document, of which we intend to give our readers the full benefit in this and subsequent numbers of the *T. & T. Journal*.

To those whose bread and butter depends largely upon telegraphy, the study of the relationship between telephony and telegraphy, and between telegraphy and the international politico-economic situation, should prove of more than passing interest.

HIC ET UBIQUE.

LHASSA in Thibet has now, according to *Telephony*, a telegraph and telephone system. The former, we are told, is an extension from British India. It is said that great use is made of the telephone already in the "Forbidden City."

It is said that during the recent election campaign the number of purely electioneering calls must have amounted to upwards of six million. An average of between twenty and twenty-five thousand words was telegraphed daily during the same period.

We learn from the *Electrical Review* that the Madras Telephone Co. has completed all preliminary arrangements for adopting the automatic system of the Strowger type. The full capacity of the new exchange will be 10,000 lines, with provision for extension ultimately to 100,000 lines. The manufacturers are the Peel-Conner Telephone Works, Ltd., Coventry. A new building is in course of erection, which will be completed within a year. The estimated cost of the new system is Rs. 15 lakhs, and the system is expected to be in operation early in 1926. The company is also adopting the "message rate" system which is expected to be a boon to small users.

The Bengal Telephone Corporation, Ltd., of Calcutta, has also adopted the "message rate" system, which will come into force on Nov. 1, 1924. The majority of subscribers welcome the new system in preference to the flat rate, and besides, the Corporation has promised an improvement in the efficiency of the service consequent on the introduction of the system. The new rules will possibly reduce the annual expenditure of the private subscriber which is at present Rs. 250, and substantially increase that of the large user who at present only pays Rs. 300. Charges for extra mileage beyond the four-miles radius will remain as at present.

The number of telephones in Canada reached 1,009,203 in 1923. Of these 440,102 were in Ontario, 180,777 in Quebec, 97,864 in Saskatchewan, 86,178 in British Columbia, 67,102 in Alberta, and 66,610 in Manitoba. The best developed provinces were British Columbia with 15.57 telephones per 100 inhabitants, Ontario with 14.53 and Saskatchewan with 12.02.

General Carty gives some interesting data in the *Electrical World* showing how the range of telephone transmission has been increased. In 1876 the first telephone circuit, between Boston and Cambridge, measured about two miles. Four years later messages were sent from Boston to Providence, a distance of 45 miles. In 1884 a line was operated—occasionally—between Boston and New York, a distance of 235 miles.

Then followed the conquest of wide spaces. The New York-Chicago line, spanning 900 miles, was opened in 1892. In 1903 New York and Omaha—1,600 miles apart—had telephone communication with each other; in 1911 New York and Denver; in 1913, New York and Salt Lake City, and in 1915 New York and San Francisco had commercial telephone connection with each other, uniting the Eastern and Western seaboards of North America. In 1921 telephone transmission was obtained between Havana, Cuba and Catalina Island, off the California coast, a distance of 5,500 miles.

The *Birmingham Post* has some kind things to say about telephone officials. Even the suggestions and advice to subscribers contained in the Directory come in for their meed of praise:—

> The telephone is a convenience or a curse, according to circumstances; but, so far as its officials are concerned, it is a model of politeness. When you hear that ultra-refined voice asking "What number, please?" and remember that it goes on asking the same question all day and every day, you can but marvel at its civility, even though it be on occasion rather bored

civility. Nothing could be more courteously complete than the directions and advice compiled by the Post Office, showering suave suggestions upon you in embarassing profusion. One feels sometimes that the telephone itself is a disembodied intelligence, mysterious, aloof, and as impervious to our criticism as the god Baal when he was asleep or hunting. So perhaps I should praise these courtesies, which include the gift of a dozen postcards upon which is a neat portrait of the telephone itself and the printed information "We/I have had the telephone installed at the above address. The number is—. Will you please make a note of it in your telephone directory ?" A printed slip suggests that you should post these cards to "Your friends and business acquaintances." Nothing could be kinder and more thoughtful.

After two years of experiments the German postal authorities started, according to the *Telegraph & Telephone Age*, on Sept. 27, a wireless telephone service on the express train between Berlin and Hamburg which if successful—and experience proved very promising—will be extended immediately to express trains from Berlin to Frankfort, Danzig, Stettin, Hanover, Dresden and from Hamburg to Stettin.

On Sept. 27 a number of telephone conversations took place between passengers of the Hamburg express train and persons at Berlin and other German cities; and proved successful in every case. The apparatus on the train projects electric waves that have only a few meters to travel, being immediately caught by wires of the telegraph and telephone system which run alongside every German railway. Morse signs sent out by the train were thus transmitted to the central telephone station Spandau, whence men at the other end were called and put in connection with those who desired to speak with them on the train. But instead of Spandau, any other place might have been used as a relay station if it had been prepared.

The train on which experiments took place travelled at a speed of forty-five miles an hour. Only a few minutes were required to get the connection with Berlin. Conversations were very distinct, the absence of any noise by the train being especially noted. The price charged for a conversation from the train does not exceed that for an ordinary urgent telephone conversation of equal length.

A small compartment in one of the cars served as a telephone office. One booth was reserved for passengers calling Berlin, while another booth served passengers called up from Berlin who talked with them with equally satisfactory results.

We are arranging to publish a series of articles by Mr. G. T. Archibald of the Head-quarters Traffic Staff, entitled "Notes on British Telegraph Practice." The first one will appear in our January issue.

REVIEWS.

"Electrical Design of Overhead Power Transmission Lines." W. E. Taylor and R. E. Neale. Chapman & Hall Ltd. 25s. nett.

The authors deal with the electrical design of transmission lines of the type most likely to be met with in this country in the immediate future, i.e. lines of from 50 to 60 miles in length, which operate at pressures up to 60 kilovolts. The book opens with a useful and simple résumé, and explanation of the electrical constants of transmission lines.

Conductor materials are dealt with exhaustively and tables of standard sizes of conductors are given. Questions of power factor and impedance are discussed fully, and there are useful chapters dealing with the financial aspect of design.

The necessary mathematical work is expressed clearly and simply, and the symbols recommended by the International Electro-technical Commission are used throughout.

This book should be exceedingly useful to those engineers who will be called upon to deal with the prospective development of overhead transmission lines in Great Britain.

H. C.

ENGINEERING RESEARCH IN THE POST OFFICE.*

BY CAPT. B. S. COHEN.

IN the organization of the engineering department of the Post Office, research plays a considerable part. Until quite recently, however, the Research Section had been very considerably handicapped by unsuitable and insufficient accommodation. The opening of the new Engineering Research Station at Dollis Hill, in 1921, has remedied this unsatisfactory state of affairs, and we are now moving in the direction of ample accommodation with adequate equipment. The accommodation is temporary, consisting to a considerable extent of ex-army hutments and will be replaced shortly by permanent buildings.

Before dealing with the lay-out of the Station and describing the laboratories, and the work carried out in them it will be advisable to outline the organisation.

The Research Section is a branch of the Engineer-in-Chief's head-quarters organisation and is under the direct control of Staff and Assistant Staff Engineers, and is divided into six groups. These groups deal with :—

(1) *Trunk Telephone Research.*—Covers particularly problems relating to underground and submarine telephone cables and open wire trunk lines, and the associated apparatus such as repeater stations and loading devices.

(2) *Telephone Transmission.*—This group deals with the apparatus standards of telephonic speech and is responsible for the production and maintenance of standard transmitters and receivers and associated apparatus. This group reports also on all new apparatus for use in the speaking circuit of subscribers' instruments, lines, and local exchange and junction circuits, and studies new methods of measuring the transmission efficiency of telephonic apparatus.

(3) *The Telephone Exchange Signalling group* deals with C.C. and A.C. measurements involved in exchange signalling, electro-mechanical tests of relays, &c. The group also deals with all circuit problems involving special research work such as measurements of time constants of automatic telephone apparatus involving use of the oscillograph, &c.

(4) *Telegraphs.*—The telegraph group deals with all research problems in telegraphy.

(5) *The Physical & Chemical group* undertakes all physical and chemical problems, and electrical problems of a general nature which are not specially applicable to any one of the other groups. For example, problems of corrosion, investigation of primary and secondary batteries, study of insulating materials, study of materials used in thermionic tube construction, physical and chemical tests of such things as carbon granules and of alloys for contacts. The production of special magnetic alloys and so forth.

(6) *Construction.*—This group is concerned with the maintenance of the Research Station laboratories and the various electrical and other services. The control of research workshops and the design of all apparatus required by any group for research purposes.

Each of the groups is controlled by an executive engineer, or in case of one group, temporarily by a senior assistant engineer.

The personnel of the station at present amounts to about 190 including 38 engineers, a number of chief inspectors and inspectors, and a considerable workshop staff.

The main difficulty in the organisation of technical research is to obtain researchers combining both the requisite technical experience and the necessary aptitude for research which is to a great extent inborn.

The Post Office Research Section is fortunate in possessing a nucleus staff which has grown up with the Section, and which is supplemented by a staff of young assistant engineers and inspectors recruited by examination and selection, and whose college training will be reinforced by a period of specialist training in the various branches of Post Office Engineering work.

We will now make a tour round the Station. Fig. 1 shows the general lay-out of the station as at present. The floor area totals about 36,000 sq. feet. The permanent buildings will give an increased floor area calculated on the growth required during the next 10 years, and will house the offices and most of the laboratories in a three-story building with outlying wings containing the power plant, workshops and chemical and metallurgical laboratories.

The first outlying wing of the permanent building housing stores and garage has just been completed and is now in service.

To continue with description of the existing lay-out :—

The block marked A contains offices for the engineering and clerical staff, and includes the drawing office and the telephone exchange, and a water tower and pumping plant operated by remote control from a system of hydrants for fire fighting.

* Paper read before the Telephone & Telegraph Society of London.

Block B is divided up as follows :—

Garage, machine shop, woodworking shop, coil winding shop, workshop mess room, tranformer room, motor generator and switchboard room, and high tension laboratory.

The machine shop is well equipped with modern lathes, milling and grinding machines for the construction of research apparatus of any description.

The woodworking shop includes a useful series of machines for the rapid production of cabinets, boxes and mounting boards, &c., for research apparatus.

The garage is used for the maintenance and repair of testing vans, a considerable number of which are in use. These vans are equipped as travelling laboratories for the extremely delicate measurements necessary for the electrical balancing and testing of telephone trunk cables.

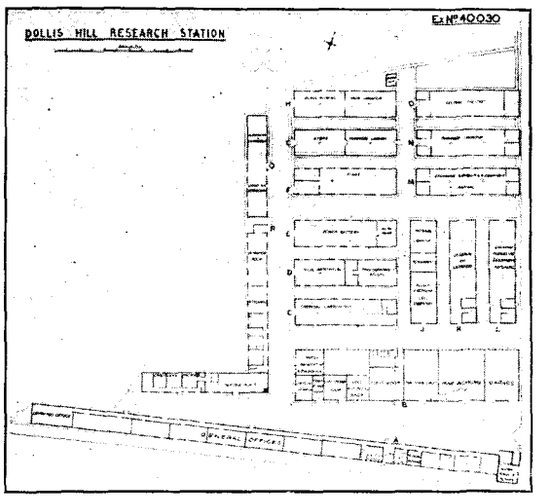


FIG. 1.

Electrical supply of the station is obtained from the Willesden Corporation at 3,000 volts 3 phase A.C., and transformed down to 480 volts.

The motor generators supply continuous current at 240 volts and at 60-80 volts for the charging of power battery and the supply of current to arc lamps for oscillographic and photographic work. There is in addition, a "booster" for regulating battery charge.

The coil winding shop is equipped with Igranic coil winding machines for the construction of coils of all types for various electrical purposes. The high-tension laboratory is not at present fully equipped. It is designed for the testing of insulation and insulating materials at high tension, and for research work with lightning protectors.

Passing a block containing caretakers' premises, heating plant for offices and staff refreshment room and kitchen, we come to a hutment containing an assortment of running machinery providing services for the laboratories as follows :—

A liquid air plant by the British Oxygen Co. which produces about a litre of liquid air in an hour's run. This plant consists of a two-cylinder compressor driven by a 15 h.p. electric motor which compresses air first in a low-pressure cylinder to 200 lb. sq. in. and thence in a high-pressure cylinder to 2,500 lb. sq. in. The compressed air after being cleaned and dried is passed into a Hampson liquefier which expands and cools the air regeneratively until the temperature falls to that of liquefaction. The liquid air is required for a variety of purposes, but chiefly to assist in the production of high vacua for research work with electron tubes, or as they are frequently termed thermionic valves. A CO_2 ice making plant is also installed here.

A series of compressors supply compressed air to the glass-blowing shop, and for metallurgical furnaces also for acoustical purposes.

Other machines in this hut supply alternating current at telephonic speech frequencies and also at telephone bell ringing frequencies for measurement work.

We now come to a series of laboratories, army huts of the familiar dimensions of 80 ft. by 20 ft. The first is divided into a glass-blowing shop and a valve exhaustion laboratory, where experimental electron tubes, often termed valves, which have become such an important factor in telegraphy and telephony, are constructed, evacuated and tested.

In these days the theory of the electron tube or valve is fairly generally disseminated. As this apparatus has become of fundamental importance for telegraphic and telephonic work, a brief explanation here may be, however, of interest.

It is now well established that the atom is no longer the ultimate divisible particle of matter, but merely the smallest particle of an element which maintains the individuality of that element. The atom itself is divisible into particles of two kinds which are identically the same for all elements. The two kinds of particles are electrons, which are particles of negative electricity and protons or particles of positive electricity. They are very small. 60,000 electrons in line could be placed along the diameter of the Hydrogen atom, and the proton is still smaller. Small as they are these particles of electricity appear to form the basic stuff of which all matter is created. Now all the phenomena of electricity with which we are acquainted are due in the first instance to the movements of these negative electrical particles. The electron tube or valve consists of a filament in vacuum which on heating throws off clouds of electrons and it is by the control of this cloud of electrons which, when in motion is nothing more or less than an electric current, that we obtain the various effects of which the valve is capable. For example, by suitable arrangements we can repeat on a much larger scale any small currents arriving at the valve and as we are operating with a free electric current travelling in space, that is to say, the vacuum inside the valve, we have eliminated all the losses and inertias set up when the electric current is used to repeat itself on a larger scale by means for example of electro mechanical methods.

Now coming back to the valve exhaustion laboratory.

The equipment includes Gaede and Langmuir pumps for the production of high vacua.

Arrangements are made to submit the internal metal work of the valve to electronic bombardment in order to bring it to a high temperature, so that the gases occluded in the metal may be released. An alternative arrangement of high frequency current to bring the interior metal work to a high temperature by induction is also installed.

We can dismiss the ensuing three huts in a few words. These comprise a stores for apparatus and materials, a metallurgical furnace hut, and a submarine cable testing laboratory. The two latter have not yet been equipped. The cable testing laboratory is used to house the temporary storage battery of 240-500 ampere hour cells, which supply continuous current at various voltages to the laboratories for experimental purposes. It is interesting to note that although this battery has been in use in its present position three years, and the roof of the hut is galvanized iron, there is no trace of corrosion due to acid fumes. This has resulted from the use of a film of pure petroleum on the surface of the electrolyte which is extremely efficient in stopping acid spray, and which is now generally adopted for Post Office batteries.

Next comes a photographic hut with one end assigned to the drawing office for blue printing, and the other fitted as a photographic studio for the photography of apparatus for embodiment in reports. The chemical laboratory is equipped chiefly for such work as the analysis of materials used in the construction of primary and secondary batteries, of which the Post Office is the largest individual user in the country. Problems of corrosion of cable sheathing and conductors and so on are also dealt with here.

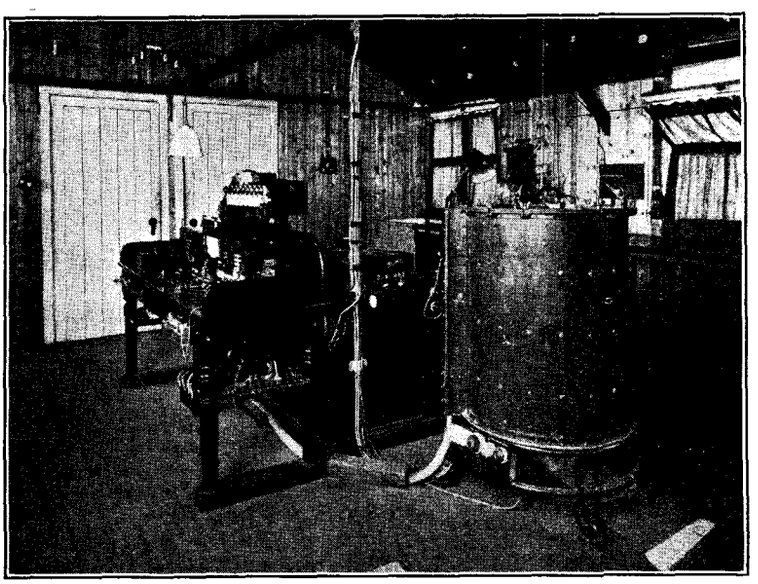


FIG. 2.

There is a metallographic laboratory which is provided amongst other instruments with a Leitz metallograph for micro photographic work, and a clean spectrograph of the detection of minute traces of various elements. This is of particular value for the study of electro tube filament, the life and emission of which are greatly affected by the presence of metallic impurities.

Trunk Telephone Research.—The greater part of trunk telephone research, including repeater research, is carried out at laboratories in Marshalsea Road in the Borough, where there are facilities for getting direct connections to the main trunk lines.

By telephone repeater is understood a speech-relaying device for insertion in a long distance line. Very great advances have taken place in this connection during the past few years, thanks to the development of the electron tube, and a research group has been employed for some time in developing telephone repeaters, which have now been installed in many long trunk lines

with marked results. The use of the repeater has not only greatly improved speech audibility, and extended the range of communication, but has enabled long underground cables of comparatively cheap construction to be employed. The accurate electrical balancing of the cable conductors, for which the Research Section is also responsible, also enables duplex working, resulting in still further economies and in these directions the work of the Research Section has contributed to savings in capital expenditure during the past few years, which may be reckoned in millions of pounds sterling.

Underground telephone cables embodying modern methods of design are now working between London and Manchester and Liverpool, London—Bristol, and London—Southampton, and are in course of extension towards Glasgow, and there are now very few technical difficulties in the way of extending long distance telephone communication between this country and the Eastern and Southern boundaries of Europe.

The Research Section is responsible jointly with other sections of the Engineer-in-Chief's Office for the design and testing of submarine cables. The problems of submarine telephony are of great importance to us as a consequence of our geographical position, and the comparatively small sea distances separating us from the Continent and Ireland. These problems have been studied for some years, and the British Post Office may be said to be one of the leading authorities on submarine telephone cables.

Telephonic Transmission.—We now come to one of the two laboratories at Dollis Hill, devoted to telephone transmission.

This laboratory deals with the telephonic speech efficiency of transmitters and receivers, and associated apparatus and circuits.

The group of engineers dealing with transmission also maintain and calibrate apparatus standards of speech. The British apparatus standards of telephonic speech were first selected and calibrated some 19 years ago, and their value has been maintained by elaborate methods of electrical and acoustical research.

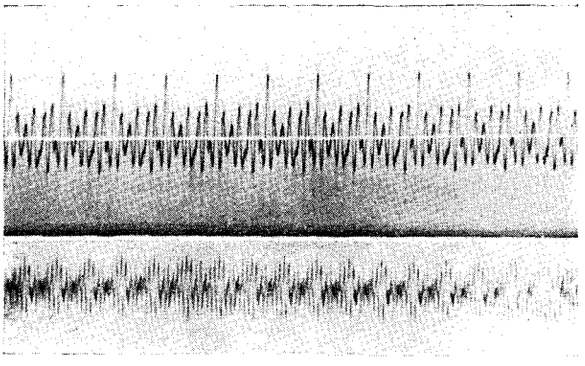


FIG. 3.

An installation of apparatus for determining the variation of efficiency of telephone transmitters after extended use is shown in Fig. 2.

This consists of a steel cylinder holding 100 transmitters under test, to which are applied the varying atmospheric conditions of temperature, moisture and pressure occurring in normal use, and in addition a synthetic voice, which produces a complex sound with the important range of frequencies existing in the human voice, actuates the transmitters at regular intervals.

The conditions of normal usage are reproduced even to the sharp jar given to the transmitter at the beginning and end of a conversation, by the removal and replacement of the receiver on the switch hook. A virtual usage to 10 years' life can be given to these transmitters in about 2 months, and they can be tested at intervals for all their electrical and acoustic qualities. This apparatus was referred to in a well-known daily paper as a "barrel full of moans."

The oscillograph, an apparatus for photographing electrical waves, plays an important part in telephonic research. In Fig. 3 we have, (upper part) the oscillogram of vowel sound Ah! as reproduced by an ordinary telephone transmitter.

The wave shown in the lower part of this slide is the same sound as recorded in the air before falling on the telephone transmitter. The difference between these curves gives an indication of the distortion introduced by the transmitter, and in this case the differences are small and of no practical importance.

The instrument recording the air-borne sound is called an audiometer. It consists of a very thin stretched film of collodion with a portion of the surface silvered and used to reflect a spot of light on to the sensitised paper. The film is readily set in motion by sound waves.

As telephonic transmission is of basic importance in telephone service, it may be of interest to describe some of the methods used in a little more detail. It is obvious that what is sold to the public under the title of telephone service consists of connection to the party desired accompanied by audible telephonic speech. Now, audibility depends mainly on two factors :—Volume or loudness, and articulation or clearness. Another factor in speech, timbre quality or tone has no considerable effect in itself on audibility but renders speech natural pleasing or the reverse.

The volume of sound is comparatively easy to measure and although considerably more difficult than the corresponding measurements for other forces such as light and heat. In this connection it may be of interest to mention that the action of the telephone receiver diaphragm at the threshold intensity, i.e. minimum audiable sound, is about 1/600th of the length of a wave of yellow light, and at a frequency of 206 wave, i.e. middle C., the ear detects a sound equal to a change in air density of 1/100,000,000 of an atmosphere.

The volume or loudness efficiency of telephonic apparatus is at present expressed in terms of miles of standard cable, the standard cable being a paper insulated cable with 20 lb. to the mile copper conductors, and with specified electrical constants of resistance, capacity, inductance and leakance. Telephone apparatus such as transmitters and receivers can be expressed

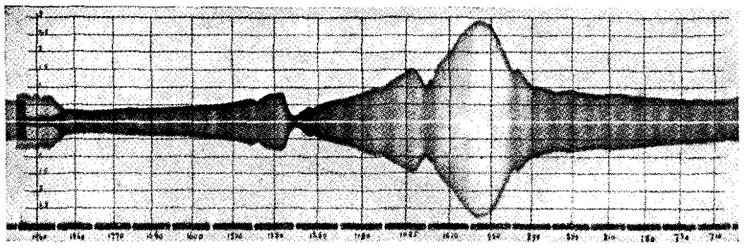


FIG. 4.

in terms of the volume efficiency of basic standards in units of miles of standard cable. By a transmitter which is stated to be 4 m.s.c. worse than standard, is meant a transmitter which requires x—4 miles of standard cable in circuit with it to bring it up to the same volume efficiency as a standard transmitter with x miles of cable in circuit.

The measurement of articulation is, however, even a more difficult problem. A very obvious method of comparing the articulation of two pieces of telephonic apparatus is to operate them under the same conditions of received telephonic speech volume, and to compare the relative percentage of words lost which will be under these conditions a rough measure of the articulation. Unfortunately, however, such a method is far more qualitative than quantitative, and the result will depend greatly on the person sending the telephonic speech and the nature of the words used in the message. The ear and the brain in conjunction will piece together the merest shred of familiar words and sentences. To get over this difficulty it is customary to adopt one of the following methods. Read newspaper paragraphs backwards, use isolated monosyllabic words or use monosyllabic meaningless sounds such as prăn, crăll, pŭne, lĭle. This last method is probably the best. The speaker must possess a good average voice with no abnormalities.

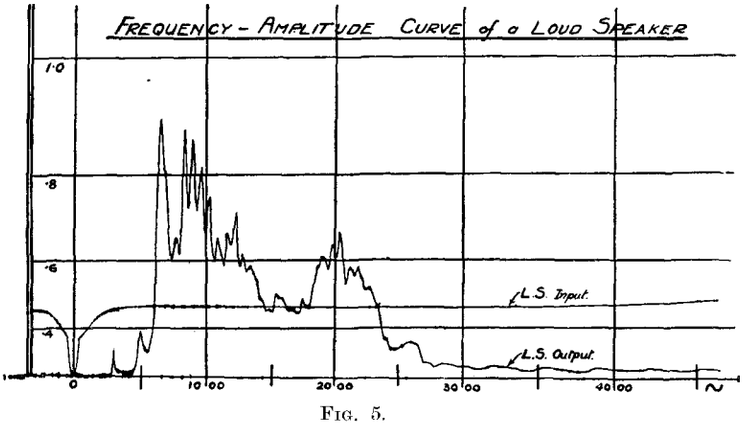


FIG. 5.

The transmission group is investigating a more quantitative method which is based on measuring what is termed the frequency characteristic.

If the intensity of response of a piece of telephonic apparatus to sounds of varying pitch (i.e. frequency) covering the whole gamut of speech is determined, we have a definite record of its behaviour and a means of determining its articulation and audibility.

Fig. 4 shows the frequency characteristic of a telephone transmitter taken on an oscillograph. The similarity to the "Smudgeographs" of our childhood days is apparent. This oscillogram indicates that the apparatus resonates, i.e. responds with enhanced power to a number of frequencies, and the comparison of this oscillogram with one obtained [from a highly articulate transmitter will give a measure of the distortion. The oscillograph,

however, is of limited application for this purpose owing to its comparative insensitiveness, and its accurate response only to maximum frequencies of about 2,000 wave.

A set of apparatusde signed by the Research Staff for photographing the frequency characteristic of telephonic apparatus will be briefly described. This consists of an oscillator and amplifier, capable of giving constant amplitude alternating currents over the important audio-range of 0 to 5,000 periods, by the rotation of an air condenser dial through 180 degrees. This condenser is placed in a light tight box, and carries a drum of sensitised paper on which a photographic record of output of the piece of apparatus under test can be obtained.

For testing a telephone receiver for example, the oscillator puts a constant electrical input over the audio frequency range into the receiver, and it is necessary to record the acoustic output of the receiver which will be its frequency characteristic. The most convenient method of recording this is to cause the acoustic output to actuate a special distortionless transmitter, and to record the electrical output of this transmitter by means of a reflecting galvanometer on the photographic paper.

A number of forms of distortionless transmitter are available for this purpose, and include condenser, thermal, thermionic and electro-magnetic types.

One suitable device in use now is a special form of electro-magnetic transmitter operating on eddy currents. Fig. 5 shows the frequency amplitude characteristic of a commercial loud speaker obtained with this apparatus.

The constant input from the oscillator is also recorded on a different scale of amplitude. This apparatus will, it is anticipated, prove of fundamental importance in studying the volume and articulation of all classes of apparatus used in the telephone-speaking circuit.

An entirely novel method of transmission testing has recently been developed at Dollis Hill. This method will enable a test clerk to measure the overall transmission efficiency of any subscriber's speech, transmitter and line, by observing the deflection of a special measuring instrument. The method is based on the action of an electron tube operating as a rectifier, by means of a leaking condenser grid circuit, so arranged that a galvanometer, which is connected in the plate circuit of the valve only records the average received voltage due to the subscriber's conversation. Gaps in the

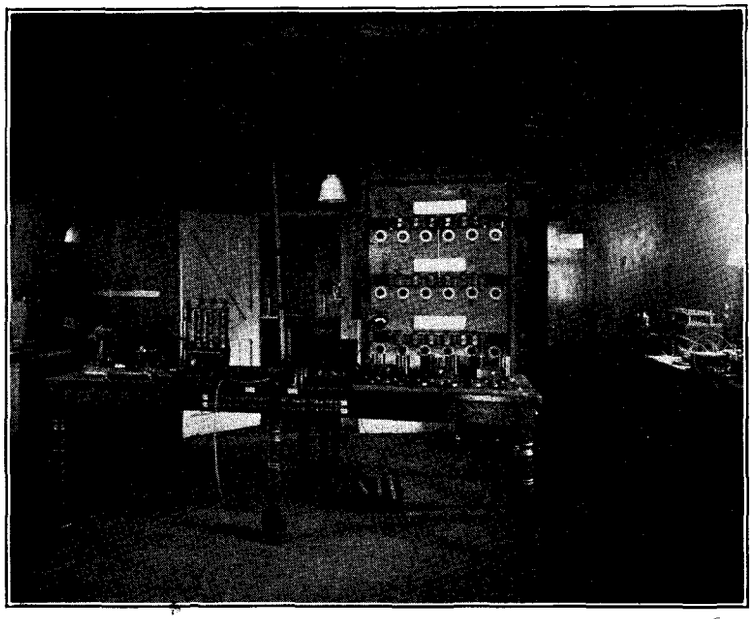


FIG. 6.

conversation have no effect as the leak across the condenser is disconnected by a special speech operated relay. Variations in efficiency equal to 1 m.s.c. are readily detectable. The possibilities of this apparatus in the maintenance of transmission efficiency and also for the routine testing of telephone transmitters are considerable.

In addition to this testing set several forms of routine transmission testing sets have been developed which are designed for the testing of line circuits, and exchange apparatus. One form is now in use for Repeater efficiency testing, and another is particularly designed for exchange apparatus, and junction line and circuit testing. The apparatus consists of two sets—a sending end set and a receiving end set. The sending end set consists of an oscillator capable of giving frequencies of 500 wave, 800 wave, 1,100 wave, and 1,800 wave. The current put in to the line is read on an alternating current ammeter and the received currents read on a micro-ammeter, in the receiving end set.

The transmission efficiency can be read to 1/10th mile of standard cable.

By the aid of this apparatus it has been found possible readily to detect faults in exchange apparatus in situ which no other form of electrical tests would show up. For example, a faulty repeating coil in a junction cord circuit gave a serious excess loss of 4.3 m.s.c. Faults of this type which may be due to a few coil turns short circuited would have an imperceptible effect on the ohmic resistance and it would not be feasible to carry out any other electrical measurements such as impedance in situ.

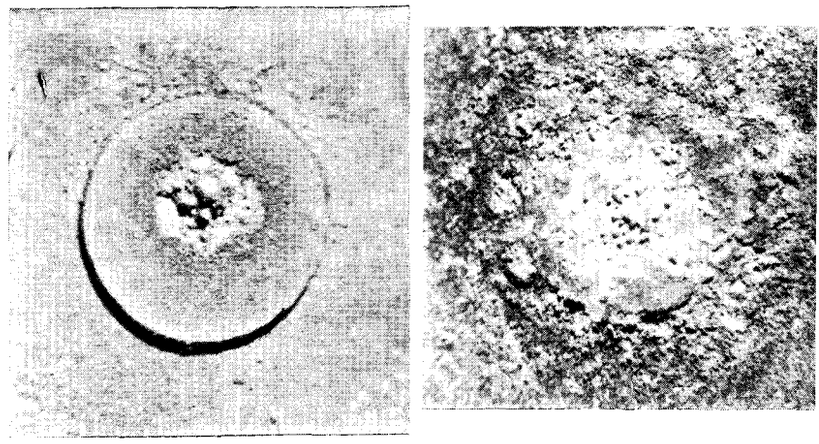


FIG. 7.

It is considered that the general adoption of transmission testing sets of the types described to enable transmission efficiency of subscribers' and exchange apparatus, lines and circuits to be easily and directly measured will prove of very great value in improving and maintaining the overall efficiency of the telephone system.

We now come to the laboratory in which exchange signalling tests are carried out. In this laboratory apparatus is provided for measuring the electrical magnetic and mechanical constants of connecting and signalling apparatus such as relays, bells, &c.

An investigation of general interest undertaken by the telephone exchange signalling and the physical and chemical groups in collaboration on the life and efficiency of various metals and alloys for electrical contacts may be mentioned here.

Fig. 6 shows apparatus set up for this purpose. Certain standard forms of relays are provided with contacts of the particular metal or alloy under observation and made to open and close rapidly circuits through these contacts representing the most severe conditions met with in practice.

The number of operations, which runs into millions, is recorded, and the circuit is so arranged that a slight and momentary increase in contact resistance of the order of .1 ohm will stop the particular relay from operating, and ring an alarm bell and light a lamp indicating the contact at fault.

Fig. 7 shows low power microphotographs of contacts of suitable and unsuitable alloys after a million operations, and indicates the formation of craters and the spraying of minute globules of melted metal.

In an automatic telephone exchange of 10,000 lines capacity, there will be about half a million contacts, and the difference in value of pure platinum or one of the suitable alloys as a substitute would amount to over £7,000.

We now come to the telegraph research laboratory. An interesting investigation on composited circuits is in hand here. By a composited circuit is understood a circuit used simultaneously for telegraphy and telephony. Other important work in hand here is the development of electric tube amplifiers for telegraphic purposes.

The next laboratory is devoted to the testing of new types of primary and secondary batteries.

We now arrive at a hut equipped for lecture purposes and used mainly for the education of staff recruited from the engineering district, and trained here to carry out the delicate electrical measurements involved in balancing cable conductors. This work is necessary for the operation of long distance underground high efficiency telephone circuits. We have now completed a tour of the Research Station, and this brings my address to an end.

A NEW DANISH INVASION.

SOMEWHERE about the tenth century (A.D.) we poor Anglo-Saxons agreed to pay one shilling per year, per person, in order to provide *Danegelt*, a fund which our chieftains had agreed to render to a band of pirates who came from the neighbourhood of the Kattegat, as a bribe to induce them to refrain from landing and raiding our shores.

Ten centuries later we open wide our arms to the descendants of these same Danes, and welcome them to our shores. Wide open, also are thrown the doors of our houses, and all the secrets of our business organisations. Hand grips hand, and we sit down and eat salt, and meat, and bread, and drink wine together.

In less parabolic manner, let me say that this country has lately been honoured by the visit of a number of delegates from the Danish Telegraph Administration, who are seeking all possible information regarding the lay-out of our telegraph offices, and the general organisation of our telegraph service and its offices.

The visit was not confined to our own Government telegraph services, but was extended to all the private cable companies which, with their usual courtesy, gave themselves whole-heartedly to the pleasurable task of imparting every scrap of information likely to prove of value to the invading inquirers.

The companies officers, as also those of the Central Telegraph Office here in London, were faced with the difficulty of the comparatively short time which the Danish delegation had allotted to their visit. However, thanks to the willing services of Mr. Neilsen of the Great Northern Telegraph Company, who acted as liaison officer, counsellor, guide and friend, the maximum facilities possible were afforded to the visitors by both government and private enterprises, Mr. John Lee, Controller, giving special facilities in the case of the C.T.O., Mr. Wilshaw for the Eastern Tel. Co., Mr. Rothwell for the Western Union Cable Co., and Mr. Goddard, likewise, for the Commercial Cable Co.

The Great Northern Tel. Co. most effectively crowned the ten days' visit by appointing Mr. Nielsen as host-in-chief of a farewell dinner to the delegates at the Savoy Hotel on Monday, Nov. 17, where covers were laid for our Danish colleagues, the representatives of the British Post Office and those of the cable companies.

The guests present were as follows :—Mr. A. J. C. Abrahamsen, Superintendent-in-Chief of the Danish Government C.T.O., at Copenhagen ; Mr. M. Klagenberg, Superintendent of the Telegraph Station at Fredericia, Denmark ; Mr. A. C. Gottlieb, Engineer Telegraph Station, C.T.O., Copenhagen ; Mr. H. D. Honoré, Asst. Superintendent C.T.O., Copenhagen. Mr. H. F. Russell, and Mr. A. W. Sunderland, Commercial Cable Co., Mr. W. S. Scott and Mr. A. Rothwell, Western Union Cable Co., Mr. T. A. Davies and Mr. E. Wilshaw (Secretary), Eastern Telegraph Co., and Messrs. S. Schaeffer, R. Tonnesen and C. W. Dennant, of the Great Northern Telegraph Co. were also present.

Mr. F. Wadley (Asst. Controller), and Messrs. J. J. Tyrrell and C. R. Gladman, Superintendents C.T.O., London, represented the British Government cables.

There were no speeches, but the following "silent" toast was proposed by Mr. O. E. Neilsen :—

"The Representatives of the Great Northern Telegraph Co. ask their British guests to join them in drinking a glass with the Representatives of the Danish Telegraph Administration, who have undertaken their present visit to England with the sole object in view of effecting such improvements as may be possible in the telegraph service between England and Denmark, in which we are all interested.

Such a visit of the Danish Telegraph Officials cannot but strengthen the ties of personal friendship and co-operation already existing between the officials of the several Administrations, and companies responsible for the telegraph service between Denmark and Great Britain and countries beyond, and a toast to our Danish visitors might therefore most fittingly be combined with a general toast for still closer co-operation in the future between all the administrations and companies represented here to-night."

The following silent reply was also duly honoured, all upstanding :—

"Gentlemen ! My fellow colleagues and I feel deeply indebted to the several telegraph administrations for the generous way in which we have been introduced to their stations, to the examination of their circuits, their instruments, and their modes of proceeding in overcoming the various difficulties in the present keen competition. Through the space of later years we people of the wire have been badly handicapped—first by the Telephone and later on by that terrible invention "The Wireless" !—But from what we have heard and seen during our stay on this side of the water we understand that the last word has not been said yet as regards the superiority of the telephone, or the wireless over the old system which still keeps the record for speed and accuracy.

We are animated by feelings of deep gratitude for the kindness with which we have been met by everybody in the telegraph service with whom we have conversed while in England, and we beg to ask the several telegraph representatives to accept our most heart-felt thanks. Further, we beg to address our special thanks to the Director of the Great Northern Telegraph Company, Mr. Nielsen, and to his staff for all the trouble they have taken in order to make our sojourn in England as useful and agreeable as possible.

With all our hearts we beg to express the wish that the friendly co-operation with our distant stations may be continued for many years to come.

Gentlemen ! I beg to propose a toast for our magnanimous host the Great Northern Telegraph Company. May they flourish !"

Mr. John Lee (C.T.O.) was unable to be present owing to a prior engagement, and Mr. Goddard (Western Union Co.) was also prevented from attending on account of a slight attack of influenza. The absence of both these gentlemen was much regretted.

The Danish visitors left London for Copenhagen the following day via Hamburg.

It was quite natural that gentlemen deeply interested in all forms of electrical transmission should take a keen interest in wireless broadcasting. As no one of those present on this occasion *appeared* to possess Terpsichorean proclivities, we must accept the explanation that it was purely a search after scientific truth, and a real curiosity to see how the microphones were positioned by the B.B.C. for broadcasting the Orpheans and Savoy Havana bands, which afterwards directed the steps of the entire company to the ballroom !

J. J. T.

ABERDEEN—PRESENTATION TO MR. MELVILLE.

A MEETING of the District Office Staff was held on August 6, to present Mr. David Melville, Contract Officer, with a token of the good wishes of the staff on the occasion of his wedding. Mr. Ruddock, District Manager, presented Mr. Melville with a signed etching by Brewer, and spoke in appreciative terms of his military service, and his good work in the contract section. Mr. Coulsell, Contract Manager, and Mr. Clow, Chief Clerk, also spoke of Mr. Melville's popularity in the Office, and his success as a Contract Officer.

A FEW REMARKS.

BY A. E. COOMBS (TRAFFIC SUPERINTENDENT), LIVERPOOL.

IT is some time since I contributed to the columns of the *Journal*. I have many times been on the verge of doing so, and equally as many times have I refrained, or been diverted to another form of activity. There has been no lack of material; on the contrary, there is a surplus, and my chief difficulty has been to decide where to begin and on what to concentrate. Having taken the plunge, however, I purpose restricting myself to a few remarks of a more or less general character, chiefly on service.

It may be stating the obvious to say that during the past decade there have been fundamental changes in regard to the telephonic organisation of this country, and I have no doubt that, but for the intervention of the war, even more would have been carried out.

The point that matters may, I think, be summed up in one question. Have these changes improved the standard of service rendered to the public? From my point of view the reply is a decided affirmative. As a general observation I feel I can say that to-day the telephone subscriber gets more and better service facilities than ever before!

May I take a specific instance. In 1912 the subscribers of the Liverpool Area enjoyed the privilege of a "No-delay" service to 28 Exchanges, which covered an approximate area of 180 square miles. In 1924 the same subscribers have a "No-delay" service to well over 300 Exchanges, which cover an approximate area of 2,400 square miles. The benefit of this change to the business community is well nigh immeasurable; one has only to move amongst the folk concerned to learn this, yet it is taken as a matter of course and we hear of it only when, instead of the usual 30 seconds, a call say to Manchester, Preston, or Rhyl, is not effected under a minute or so. It is a peculiarly British characteristic to accept all good things in the natural order, with little or no thought of the individual or organisation responsible; to go off at the deep end immediately trouble occurs, and cry aloud to Heaven to witness how badly we are being treated!

The extension of the area over which calls are effected on demand has naturally made the operating more complex; it is more than ever essential, therefore, that Traffic Officers should see that the Exchanges are properly staffed, and above all, that sufficient junction circuits are available, for nothing holds up the work of a telephonist more than inability to obtain circuits as required. To attain an ideal service Traffic Officers must keep a continuous and careful watch over the conditions applicable to each Exchange, and make frequent use of available statistics. Telephonists are capable of giving the highest possible grade of service, but without adequate facilities they cannot possibly do so.

The service critic, self-appointed and often with only superficial knowledge, seizes upon any excuse to air his views regarding the supposed deterioration of the service under Post Office control. All advantages secured as a result of that control are apparently ignored. For example, how often is the fact brought to light that within recent years facilities have been provided whereby, in Liverpool alone, subscribers command instantaneous communication to over one hundred thousand other subscribers instead of thirty thousand, and speak over two thousand four hundred square miles of territory instead of one hundred and eighty? Or that between Liverpool and London, and Liverpool and Manchester, the circuits have increased from 20 to 36 (80%) and 65 to 198 (204%) respectively? In addition the great bulk of these lines are now underground, and, therefore, free from the interruptions inherent to an overhead system while on the other hand giving a stable and rapid service, not only between the cities and districts named, but to places adjacent and beyond. There are other similar cases which could be mentioned, but perhaps these two will suffice as typical of the general progress, which critics are somewhat apt to overlook.

There is another point of view. In the Liverpool District over four million local and fee-junction calls are handled each month by the "A" telephonists. For September, 1924, the actual figure was 4,451,170. During that month we received 59 written operating complaints in respect of these calls. A simple arithmetical calculation will show that this works out at the rate of one complaint per seventy-five thousand calls. On the Trunk side of the service, for the same month, there were 308,779 calls, in connection with which we received 16 written complaints, or one for every twenty thousand calls.

At this point I wish to make it clear that the Liverpool figures are being used merely because I have no access to others. I trust other districts are showing even better results. My object in quoting the figures is to bring under review all phases of the service, for it is only from that point that sound reasoning can be made.

Statistics such as these prove, I think, the excellence of the service which subscribers are getting. It is surely unnecessary to enlarge on the figures; they are merely given in order that a true perspective should be presented to anyone who might chance to read these notes. Too often I fear we get out of focus, not only in telephone matters, but generally. It is not right to take one phase of any organisation and attempt to pull it to pieces without due regard to the working of the system as a whole!

From consideration of things as they are may we now pass on to what they should be. While the system as such is undoubtedly making progress as the result of concentration by our experts on technique and organisation, are we passing on to the staffs, and through them to the public, the requisite measure of improvement in the service which should result from these studies? I say we are not. I feel that the fullest advantage of the time and money spent on the Traffic Organisation is not being obtained because little or no machinery exists whereby the factors ascertained, and the benefits to be derived therefrom, may be communicated to the staffs, who are, after all, from a service point of view, the people to whom we must look. It is upon the work of the staff directly in touch with the public that the service is judged by the man in the street.

There exists one great drawback in the British character which to some extent hampers development in a progressive business, and that is the tendency to take up a passive attitude to new ideas, or to any idea for that matter, which does not fit in with our own view of what should or should not be. Such a point of view is not conducive to betterment of service so far as the telephones are concerned, for we are being continually faced with new problems and the introduction of new ideas, both of which are inseparable from progress of any sort. The most efficient official is, therefore, the individual whose mind is alert and ever receptive to new schemes, critical of them if necessary, but only in the constructive sense, for it is easier to destroy than to build.

Not all of us possess the receptive mind, but most of us are reasonable and willing to adopt new ideas when properly explained, and the results to be obtained therefrom proved to be worth while. This being so, how is the staff to be educated? Only, I suggest, by co-operation between officers occupying administrative posts; those who have to see the work carried out, and those who do the work. Assuming, therefore, that new ideas are about to be introduced to the rank and file, the next best step is to see that the good-will of the staff is with one, and then to see that the information acquired is imparted to them in such a manner that the most backward member could hardly fail to understand the ideas, in spirit as well as in letter.

As an example of what I mean may I again quote Liverpool. Generally I am averse to the "take my own case" method of illustration, but perhaps its further introduction at this point may be excused. The organisation of the Liverpool Traffic Department has for one of its cardinal points the principle of co-operation between controller and controlled. It has been found that one of the best

ways to secure this, again in spirit and in deed, has been the dissemination of information regarding the service, what it is, and what it should be. Any change of importance in respect of routine is duly advised, discussed, and points of doubt cleared up. First of all the matter is dealt with at a meeting of Traffic Officers, then with the Exchange Officers in charge, then with the Sectional Supervising Staffs, and through these latter to the telephonists. This system could even be extended so that at intervals, say once a year, the staff could be seen by the Head of the Department. It is surprising how many different interpretations may be placed on a simple-looking instruction, and none the less surprising how there can be lack of agreement as to the degree of usefulness a change of practice is likely to effect. The procedure indicated, however, reconciles conflicting views, and educates teacher and scholar to an appreciation of each other's point of view, therefore, when a change is carried out, we get a more intelligent interpretation because of the understanding that animates those chiefly concerned.

Specific examples bearing on the efficiency of this scheme in the Liverpool District are firstly, the introduction of the Liverpool—Manchester "No-delay" service—the first big change of its kind subsequent to the State acquisition of telephones in 1912; then within recent times the opening of the Liverpool New Central Exchange—a particularly delicate operation, as those who knew the old Exchange will appreciate—and, this year, the change over of the Royal Exchange from magneto to central battery working. There are other cases—many of them in fact—but these will perhaps suffice as typical.

Actually these vital schemes were carried through with hardly a ripple on the surface to indicate that anything unusual was occurring, simply because all concerned entered into the spirit of the thing with understanding and an appreciation born of knowledge as to what was going on, and why!

The day has passed of the official who sits apart and—so to speak—shuts himself up in a glass case through which he may be seen, but must not be spoken to, and then hopes to obtain the best from his staffs. The psychological effect of this administration is to destroy the atmosphere which I feel should exist between supervisor and supervised. It tends, in my opinion, to deaden enthusiasm and energy, and militates against efficiency because of the loss of personal sympathy and understanding which so often nowadays is a factor contributing to a satisfied and contented personnel. An enthusiastic staff is one of the finest assets any departmental chief could desire. One of the best methods of securing such a staff is by taking them into confidence, by imparting the fullest information to them at all times in regard to their duties the organisation of their particular section, the necessity for this, that, or the other procedure, which on the face of things may seem to be foolish, and by impressing on them the great fact that we are selling something to the public, and the necessity for putting the best into our share of the sale so that the customer shall receive full value for monies paid. Above all no officer should be looked upon as a number, or a cog, or some other piece of mechanism, but as very much a fundamental part of the whole service!

There is another point of view in regard to education—or the lack of it—which gives rise to unsound ideas. I refer to discipline. This is a much abused and misunderstood word. It is too frequently standardised by a meaning derived from the old army system of rigid punishment for all sorts of trivial offences, often unintentionally committed. To me the term has never appealed as meaning merely the power to punish, or the suspending of a Damoclean sword over the heads of all and sundry, as being the most effective way of securing adherence to rule and regulation. An administration that is successful only in ratio to its power of punishment is in fairly sore straits itself, and if any disciplinary measures are to be taken they might well begin at home.

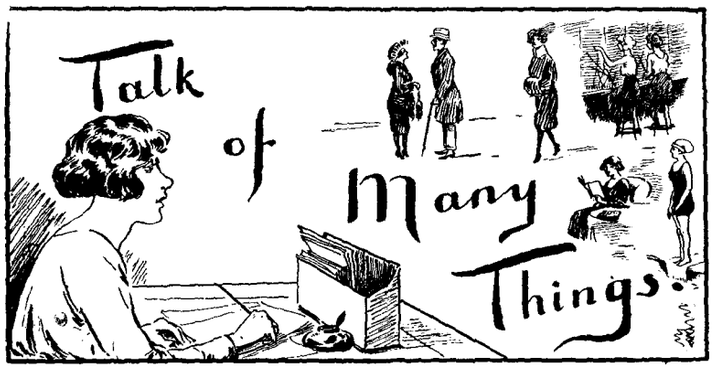
We are, of course, all familiar with the "good old days" grouser who lives in the past, bemoans the present, and positively shrieks when he thinks of the future. We know his ideas regarding the children of to-day and how the country is going to the dogs because the "young 'uns" do not get the hidings he received—and no doubt deserved—when *he* was a boy! This person's idea of discipline is of a punishing sort only; he would drive out the imp of mischief by liberal doses of official cautions, but never does he think that in most cases a few words of help and advice will have a better and more lasting effect. The methods he favours merely drive and destroy, they do not lead or construct. If this type really represents the old days, then maybe their passing has been a good thing, particularly if, in their train, we can be sure of leaders who lead in deed and in truth.

Discipline is really another phase of education. In the service, Supervising Officers who are wise will obtain a perfectly disciplined staff if they consistently educate them to a fuller appreciation of their responsibilities. Punishment merely as such, is an effect, a result of some wrong doing. Education gets to the cause of the trouble and by a rousing interest and intelligence, consequent upon expansion of the mind, it automatically cuts at the root of the growths that express themselves in varying forms of irregular conduct. I urge all, therefore, to teach, teach, and keep on teaching, and assuredly the staff will then not only adhere to the regulations of the service but will carry these out with zeal and efficiency because they believe it is right to do so, and not because of punishments that may follow non-observance.

I trust my point is clear. There must be discipline; this should, however, mean firm and strong administration on the one hand, and on the other education, tolerance, sympathy, and help. There must be at all times, and by all officers, due and proper observance of official regulations and an understanding, and a conveyance of that understanding to those around us, applied with intelligence and breadth of view.

We are doing wondrous things already by way of developing the service; we shall do even more if we create and maintain such an atmosphere as that I have endeavoured to portray. By doing this we shall undoubtedly influence those round us, change their points of view, make the work less of an irk and more of a pleasure, and take them with us in a broad and beneficent interpretation and understanding of the service, its controllers, its administrations, its complexities, and difficulties, its expansion, and last but not least, the great part it is playing, and will continue to play, in the history and life of our country.

WE TELEPHONISTS



Flage Flagellated.

THESE are the words of Elizabeth and William: words whispered coyly and thrillingly amid subdued lights and soft airs in some secluded spot on the heath at Hampstead. "D yer love us, Bill?" "Yus, Liza." "Then why don't yer knock us abaht?" Transposed out of the vernacular they are an appeal that the existence of amorous passion should occasionally be demonstrated by some exhibition of masterfulness and muscularity. Modernised, they are the appeal to the sheikh and the desert and to the "strong silent man."

There are times when it is far better to be kicked than to be ignored, although to be kissed is no doubt better than either. Even a dog will interrupt the philosophic musings of his master to tempt him into so foolish a prank as playing with a chewed slipper, but only because he is not being noticed. "Full many a flower is born to blush unseen and waste its sweetness on the desert air" says Gray. Most of us, were we in that condition, would sooner be plucked, and it would be better for us and for others if we were.

As for me, I am happy—I have been kicked. No longer am I unnoticed: no longer does the silken rag of cob-web cling to me. I have been accused of a muddled mentality, of using absurd arguments, of uttering dangerous doctrines, of writing insufferable inanities, of weak wit and wicked wisdom, and indeed of a whole alphabet of vices. Judging by the pretty handwriting, the perfumed notepaper (somehow suggestive of Phul-Nana), the sweet patience and the virtuous anger, I gather that my correspondent is a lady. Is not the wrath of angels better than the praise of fools?

But the significance of the whole thing is that I have a reader and one who, to judge by her sweeping and minute condemnation, must have read all that I have written. Isn't it wonderful? and how much more wonderful it would have been had she read all those other articles that the Editress would not accept at any price!

But you say, am I not vexed that I have been the subject of such criticism, and am I content to let it be supposed that it is all true: will I not fulminate? Well, of course, now you mention it, it is a bit thick, although I must confess that in the excitement of realisation that I had a reader I had overlooked the matter.

I think that my proper course would be not to kick the lady, but to ignore her, and that is one of the many reasons why this article ought never to have been written.

PERCY FLAGE.

Cats.

There are fast cats, saucy cats, silly cats, spiteful cats, old cats, but our Nigger is none of these. He is a Real Cat and a beauty. He has blue blood and a black coat, holds his tail high and refuses to eat in the kitchen. Unlike the human nigger his hair is perfectly straight and not even his whiskers curl. He hates being fussed, but loves to be brushed and shows his appreciation by putting his tongue out just the teeniest tiniest way. When he is told "push Nigger" he rubs his own chin along the brush—he can brush himself you see. Although he is so intelligent he is not at all high brow, and has the sweetest playfullest manner, and sleeps in becoming attitudes on the rug in front of the fire. He has full day private employment next door, and therefore can find time to pay us long visits almost every day. Should he be prevented, when he does arrive, he comes with *such* a song. He commences *out*side the door. He talks of course in the usual way, and when he overhears conversations about himself he hooks his tail as well as flapping his ears. He is thoroughly efficient and kills all he catches. He takes his standard load and is responsible for the luck of the Exchange.

Quite recently a fellow-clansman became attached to us. On the first day of his arrival Nigger showed good fellowship by play and conversation, but the stranger, rather rudely *we* thought, showed preference for the attention of the ladies, and although Nigger went so far as to offer kisses, the plebeian "held off." We have christened him Michael and we give him meals in the kitchen.

He is certainly of the same black race, but his colour is as rusty as his manners and his tail is not nearly so long and slender and fine.

They both object to the Supervisor's lectures, and on the first occasion they fought each other, and had to be turned out. It must have been Michael's fault, and this we think was proved on the second occasion, because Nigger tactfully absented himself. Michael stayed, thumped his tail, hunched his back and spat! "Blood tells," but even so we are sure that all cats are lovable in spite of idiosyncracies, and that no cat is a fast, saucy, silly, spiteful old cat.

"A REG'LAR READER."

The Automatic Operator: or "The Pink Dolly."

The Tel'phonists of London Town
Each in the very latest gown
(Fashions which make dear Grandma frown
Whilst Great Grandma is left astoun--
Ded by such simple raiment).

Met in a Drawing Room they tell
Palatial as the Ritz Hotel,
But lacking just that luring spell
Which haunts us when we sniff the smell
Of viands most exquisite.

They met to hear our Mr. Thwaites
(Who when he speaks ne'er hesitates
But promptly and in set terms states
Essential facts and useful dates)
Lecture on "Automatics."

The room was full. The overplus
Crowded the corridors, and thus
Made movement forth to catch the bus
A task "très difficile" which mus-
-T have tried some tempers.

With easy flow the lecture ran
And soon we saw the settled plan
On which these automatics can
Dispense with almost any man
Who plugs a switchboard.

'Twill not mature just yet, we're told,
And most of us will grow quite old
As operators, save the bold
For whom on wedding cakes they mould
An icy splendour.

And when our Lecturer was done,
Discussion bright was soon begun,
And Mr. Pink to everyone
Explained just how the thing was done
By dimpled dollies.

It seems these pretty little dears
Will skip and scramble up the tiers
Of *group selectors*—work appears
An easy task, and all our fears
Dissolve in blessings.

No more for us the tedious day;
The sun shows ever clearer ray;
Our tasks become like children's play
Without the slightest loss of pay,
Or lowered prestige.

Then let us sing our cheerful song,
And help the scheme of things along.
We soon shall watch them going strong,
As up selector banks they throng,
Those bright pink dollies.

Yet do I feel a little sad,
And have a sense of being had,
It might be worse, but still it's bad,
For endless dollies will not add
One Supervisor.

Though Dolly Dyes we all may use
To brighten up our hats or shoes,
It surely is most painful news.
However old, they still refuse,
To die—these dollies!

She'll do her work, this dear, dumb dolly,
And never show a trace of folly,
Nor suffer any melancholy,
But neither will she joy of holly
And mistletoe time.

Subscribers, too, may bless her advent,
Though some may just a trifle sad, vent
Their sense of loss, for all we had meant.
We're not machines, and may I add, lent
A human aspect.

"FRANCISCO."

Telephone Jokes of a Contemporary.

278*th Telephone Joke*:—

"It will soon be possible to telephone to Sweden." The mail steamers, however, will still run for urgent messages.

279*th Telephone Joke*:—

"A man recently ran from London to Brighton." We understand, however, that he tried to telephone first.

280*th Telephone Joke*:—

"It seems to me that here I can get in touch with nobody." We're on the telephone, too.

281*st Telephone Joke*:—

"I'd like to live completely cut off from the world." Then get a telephone installed.

We are keeping a record of them—and each one is more original, subtle, sumptuous, and side-splitting than the last!

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

LONDON TELEPHONE SERVICE NOTES.

Armistice Day.

THE sixth anniversary of Armistice Day was solemnly observed throughout the service. The full significance of the observance can perhaps be best realised in any of the large busy switchrooms. Shortly before 11.0 a.m. the traffic, which has kept everyone busy, rapidly dies away, the pulse becomes feebler and feebler until absolute stillness reigns. Follows the two minutes silence, broken only by the half-minute thuds of the electrically-controlled clocks. Then everything comes to life again as business and industry get their stride again.

At Head-quarters the principal officers and many of the staff assembled in the Public lobby and were grouped around the Rolls of Honour. A chaplet composed of poppies and laurel leaves decorated the men's Roll and a beautiful bouquet of red and white carnations were placed before the women's. The two minutes silence were reverently observed in memory of those who had not come back. Later Mr. Valentine, accompanied by Miss Bouttell and Mr. E. S. Abbott, representing the staff, proceeded to the Cenotaph and placed at the foot a wreath as a tribute from the whole of the staff to the memory of the fallen.

* * * *

London Telephonists' Society.

The November Meeting of the London Telephonists' Society, may certainly be considered one of the most successful and popular meetings in the history of the Society; there being a very large attendance—considerably over two hundred.

As usual the first half hour was devoted to a very enjoyable musical programme, kindly arranged by the Staff of Clissold exchange.

The great attraction was a paper read by Mr. F. W. Thwaites entitled "The Advent of Automatics," which was illustrated by a number of excellent diagrams. Mr. Thwaites dealt with the subject in a manner which very clearly explained all those aspects of automatic working, which will in the near future so closely concern the Exchange Staffs throughout London. The paper was much appreciated and Mr. Thwaites is to be congratulated on its success.

The Committee regrets any discomfort caused by the limited accommodation. For the benefit of those who could not gain admission, or were unable to attend, it may be possible—if members so desire—to arrange with Mr. Thwaites to read his paper again on a future occasion.

Members of the Society are reminded that Monday, Dec. 15, is now the date fixed for the December Meeting, when Miss J. M. McMillan's "Telephone" Musical Play is to be produced in the King George's Hall.

Tickets for the Annual Dance to be held at Bishopsgate Institute on Saturday, Jan. 3, 1925, are now on sale and may be obtained from the Hon. Secretary, 32, St. Bride Street, E.C.4.

MR. E. A. C. SANDY.

Retirement of Mr. E. A. C. Sandy.

On Monday, Oct. 20, there was a large gathering of friends at 32, St. Bride Street, on the occasion of the retirement of Mr. Ernest A. C. Sandy. All sections of the office were represented, also the Engineering Department. Mr. Sandy is one of the small band of men who can claim to have grow up with the telephone from its infancy, having entered the service of the Bell Telephone Company in 1879. He commenced as an operator (all the operators were boys in those days) at the Leadenhall Street Exchange, on what was known as a Bell Slipper Board. This exchange was the second to be opened in London. He then migrated to the Mincing Lane exchange and thence to the first trunk exchange at Oxford Court, Cannon Street. Later, the United Telephone Company took over and Mr. Sandy was appointed Inspector to the General Manager. Followed a period as Chief Clerk to the London Manager and then, under the National Telephone Company, he was Chief Clerk to the Metropolitan Superintendent. At the time of the transfer to the Post Office Mr. Sandy was in charge of the correspondence department at Salisbury House. At this time he was attached to the Traffic Branch, where he remained until his well-earned retirement.

Mr. Sandy will be remembered all over the country in connection with his valuable work as secretary of the N.T.C. Staff Transfer Association.

Mr. Sandy can truly be said to have carried on his work on all occasions in perfect harmony with all around him, and it was fitting that his colleagues should present him with a handsome cabinet gramophone, and a collection of records.

Mr. Pink, the Assistant Controller, made the presentation in felicitous terms, remarking on the recipient's many good qualities. Reference was made to Mr. Sandy's apparent eternal youth and the wish expressed that he would have many years of vigorous life still before him. Mr. Sandy charmed everyone with a graceful speech in reply, and with much handshaking and many congratulations a pleasant occasion ended.

* * * *

Presentation to Mr. F. Gray.

A presentation was made to Mr. F. Gray, District Superintendent, East District, London, on Sept. 17, in the Avenue Refreshment Club, to mark the occasion of his approaching marriage to Miss E. M. Hull, who, it will be remembered, was formerly in the Controller's Office, L.T.S., prior to her transfer to the Ministry of Pensions. The gifts, suitably inscribed, consisted of a full canteen of cutlery and plate, together with a Westminster chiming clock, and a smaller timepiece.

The presentation was made by Mr. W. B. Benham, who was supported by a large number of Mr. Gray's friends and colleagues in the London Telephone Service, and in an appropriate speech wishing Mr. and Mrs. Gray's complete happiness, touched on Mr. Gray's long service in the L.T.S., and distinguished War service, making humorous reference to the fact that it was an unusual pleasure to have to make a presentation in such circumstances to so senior an officer.

Mr. Gray, in thanking the staff for the warm manner in which they had signified and expressed their good wishes, replied to Mr. Benham's reference to his War service by saying that during that period he had not felt so overwhelmed as he did at that moment.

* * * *

L.T.S. Annual Dinner.

It is announced that the Second Annual Dinner will be held on Saturday, Jan. 31, 1925. In anticipation that there will be a larger attendance than last year, the Connaught Rooms have been engaged. It is the intention on this occasion to have a fuller musical programme and this should be an added attraction. The tickets are 10s. each and can be obtained from the Hon. Secretary, Mr. R. C. Atkins, Traffic Branch, 32 St. Bride Street, E.C.4.

It is important that those intending to be present should signify accordingly as early as possible.

* * * *

Culled from the Exchanges.

Central.—A very successful Whist Drive was held on Nov. 6, at Slater's in Cheapside. There was a large attendance and it was pleasing to see so many friends from other Exchanges; also a number of colleagues from the Engineering side. A special welcome was extended to Miss Forge and Miss Davenport, both of whom emerged from their retirement for this occasion.

* * * *

City.—The first dance of the season was held at the Bishopsgate Institute on Saturday Nov. 15. Over 200 revellers attended and twice that number of feet twinkled to all the latest popular airs. It is regretted that there was not room for all who wanted to attend, but those who were disappointed on this occasion should make a note of Feb. 7, and make early application for their tickets.

GOLF.

SECRETARY'S OFFICE *v.* LONDON POSTAL SERVICE.
At Sudbury, on Sept. 29, 1924.

RESULT.

S.O.		SINGLES.	*L.P.S.*	
R. A. Little (2) 2/1	... ...	1	J. R. Steedman (6)	 0
C. L. K. Peel (5)	... ...	½	A. B. Cooper (6)	 1
W. E. Weston (8)	... ...	0	W. T. Muir (9) 4/3	 1
P. F. Apted (9)	... ...	½	L. J. Manogue (10)	... ... ½
D. G. Gavey (12) 1 up	...	1	L. V. Cox (12)	 0
R. W. Roadknight (12)	...	0	W. G. Burns (14) 5/4	 1
W. R. Birchall (14) 4/3	...	1	E. J. Adams (14)	 0
A. Gordon (18)	... ...	0	W. Green (14) 4/3	 1
		4		4

HALF HOURS WITH STANDARD AUTHORS

WHERE TO STAY.

The attention of our Readers is directed to the following list of Boarding and Apartment Houses.

HASTINGS AND ST. LEONARDS—"THE WALDORF," 58, Warrior Square, overlooking sea. Board Residence from £2 2*s*. 0*d* Highly Recommended, Tennis (free). Separate Tables. Special terms parties sharing large bedrooms.—Phone 609, Proprietress.

HERNE BAY.—"Cleddau" faces pier. Balcony, Roof Garden and reception rooms overlook sea. Central for amusements. Board Residence. Dinner 6.30. Terms Moderate. Every Comfort.—Miss Peters.

SHANKLIN.—Glenavon Private Hotel. Comfortable Brd.-res. Electric light and gas fires all bedrooms. Free billiards, splendid cuisine (separate tables). Highest recommendations.—T. Geere, 'Phone 37.

SHANKLIN.—Try "Plean Dene." Board Residence. Two minutes sea. Lovely garden, thoroughly sheltered. Best food obtainable. Real comfort. Special terms now.—Mrs. Spalding.

FOURSOMES.

Little and Peel	0	Steedman and Cooper, 4/3 ...	1
Weston and Birchall, 3/2 ...	1	Muir and Adams	0
Apted and Gavey	0	Manogue and Cox, 5/3 ...	1
Roadknight and Gordon, 3/1 ...	1	Burns and Green	0
	2		2
TOTAL	6		6

SECRETARY'S OFFICE *v.* ENGINEERING DEPT.

At Sundridge Park, Oct. 6, 1924.

RESULT.

SINGLES.

S.O.		*Eng. Dept.*	
J. D. Macnair (5) 7/6	1	R. A. Weaver (8)	0
C. L. K. Peel (4) 10/8	1	J. Bertram (18)	0
W. E. Weston (8)	0	J. M. Shackleton (9) 1 up	1
P. F. Apted (9) 8/7	1	—Hambro (18)	0
F. Hardwick (12) 4/3	1	A. Fraser (18)	0
H. H. Kilby (16)	½	H. Wager (16)	½
	4½		1½

FOURSOMES.

Macnair and Apted, 7/6 ...	1	Bertram and Hambro	0
Peel and Weston, 2/1	1	Weaver and Shackleton... ...	0
Hardwick and Kilby, 2 up ...	1	Fraser and Wager	0
	3		0
TOTAL	7½		1½

MISS WILLIAMS (REGENT).

LONDON TELEPHONE SERVICE SWIMMING ASSOCIATION.

On Nov. 4 at Australia House a successful dance was held in connexion with the above Association, when the prizes for the competitions described in our last issue (p. 33) were presented by Miss Cox. It was refreshing to hear the hearty cheers from the representatives of the various exchanges as the successful competitors stepped up to take their trophies. The Dance in which Mr. Pounds officiated as M.C. and in which he joined with indefatigable zeal was enjoyable from start to finish as these functions usually are. We give a portrait of Miss Williams (Regent) winner of the diving championship of the Civil Service, and of the L.T.S., and winner of the 100 yards swimming championship L.T.S. Portraits of other prize winners appeared in the November issue.

PERSONALIA.

LONDON TELEPHONE SERVICE.

Resignations on account of marriage :—

Miss R. N. FERRIER, Telephonist, of New Cross Exchange.
Miss D. S. J. NEILSON, Telephonist, of Park Exchange.
Miss J. E. BRIGHTMAN, Telephonist, of Park Exchange.
Miss B. M. WARNER, Telephonist, of Holborn Exchange.
Miss E. A. GURR, Telephonist, of Holborn Exchange.
Miss D. E. EARWAKER, Telephonist, of Paddington Exchange.
Miss A. WARD, Telephonist, of London Wall Exchange.
Miss A. M. HOPKINS, Telephonist, of London Wall Exchange.
Miss E. L. SMITH, Telephonist, of Museum Exchange.
Miss E. E. SPOONER, Telephonist, of Victoria Exchange.
Miss L. R. MORRIS, Telephonist of Regent Exchange.

The following promotions have taken place :—

Miss M. E. SWEETSER promoted Supervisor at East Exchange.
Miss B. D. ALEXANDER, promoted Assistant Supervisor Class III, at Toll Exchange.
Miss D. F. HATFIELD, promoted Assistant Supervisor, Class II, at Mayfair Exchange.
Miss N. F. YULE, promoted Assistant Supervisor, Class II, at Victoria Exchange.
Miss N. HAMMERSLEY, promoted Assistant Supervisor, Class II, at Hop Exchange.
Miss L. FERRYMAN, promoted Assistant Supervisor, Class II, at Trunk Exchange.
Miss D. R. GARLICK, promoted Assistant Supervisor, Class II, at Lee Green Exchange.
Miss A. PARKER, promoted Assistant Supervisor, Class II, at Kensington Exchange.
Miss M. V. SMITH, promoted Assistant Supervisor, Class II, at Kensington Exchange.
Miss D. G. WOOD, promoted Assistant Supervisor, Class II, at Museum Exchange.
Miss M. F. HUME, promoted Assistant Supervisor, Class II, at Mayfair Exchange.
Miss E. M. ING, promoted Assistant Supervisor, Class II, at Park Exchange
Miss I. E. MOORSE, promoted Assistant Supervisor, Class II, at Holborn Exchange.
Miss L. E. E. THORN, promoted Assistant Supervisor, at Trunk Exchange.
Miss N. E. MOUNTFORD, promoted Assistant Supervisor, Class II, at Museum Exchange.
Miss M. L. WARNER, promoted Assistant Supervisor, Class II, at Paddington Exchange.
Miss E. L. Almond, promoted Assistant Supervisor, Class II, at Chiswick Exchange.
Miss A. E. ROBERTS, promoted Assistant Supervisor, Class II, at Hampstead Exchange.
Miss M. A. BLACKWELL, promoted Assistant Supervisor, Class II, at Gerrard Exchange.
Miss C. L. STEVENS, promoted Assistant Supervisor, Class II, at Hamp stead Exchange.
Miss B. L. WEBB. promoted Assistant Supervisor, Class II, at Trunk Exchange.

The following promotions have been made at the Central Telegraph Office with effect from the dates shown :—

INLAND GALLERY.

Name.	*Rank.*	*Promoted to*	*Date of promotion.*
MR. J. E. Sayers	Overseer	Asst. Supt.	7 Oct. 1924.
MR. J. W. THOMPSON	Telegraphist	Overseer	9 Oct. 1924.
MR. C. P. BURCH	Telegraphist	Overseer	9 Oct. 1924.
Miss E. E. HAMPSON	Asst. Supvr.	Supervisor	9 Oct. 1924.
Miss E. Harrowing	Telegraphist	Asst. Supvr.	9 Oct. 1924.
Mr. C. H. MOSELY	Telegraphist	Overseer	21 Oct. 1924.
Mr. G. JESSUP	Telegraphist	Overseer	26 Oct. 1924.
Mr. W. T. COUSINS	Overseer	Asst. Supt.	29 Oct. 1924.
Mr. W. R. G. BELL	Telegraphist	Overseer	29 Oct. 1924.
Miss E. F. DUNCAN	Asst. Supvr.	Supervisor	15 Nov. 1924.
Miss A. M. HODGSON	Telegraphist	Asst. Supvr.	15 Nov. 1924.

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CONTENTS.

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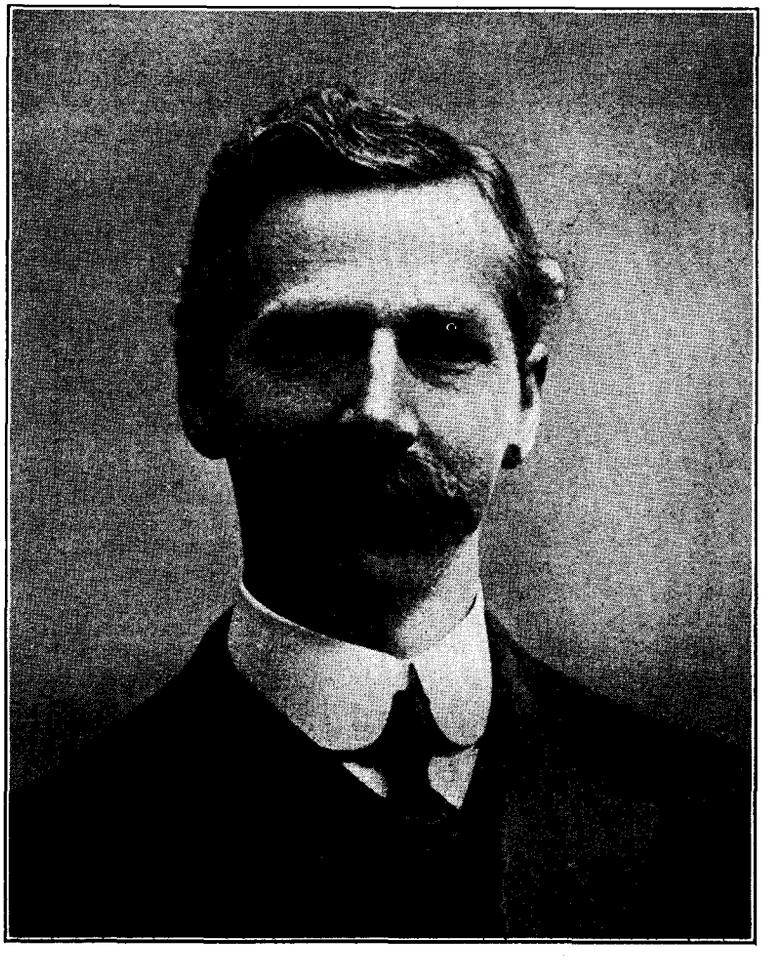
All correspondence relating to advertisements should be addressed to MESSRS. SELLS, LTD., 168, *Fleet Street, London, E.C.*4.

TELEGRAPH AND TELEPHONE MEN.

XII.—MR. F. T. WADLEY.



MR. FRANK TALBOT WADLEY has spent all his official career in the Central Telegraph office, passing from the manipulative staff to the clerical staff until he reached the rank of Principal Clerk and in 1918 Assistant Controller, Foreign. Thus he came to take charge of the Cable Room after the dislocating influence of the war, when various foreign communications had to be restored and the normal process of international telegraphy had to be re-established. He has seen big developments in the six years, including Government-owned Transatlantic cables and the inauguration of long-distance wireless. He is an enthusiast for international telegraphy, far-seeing in his grasp of its potentialites, and he has shown a wide vision of the opportunities which are being opened for the development of the service in various directions. He has an even temperament, a cool judgment, and a sense of loyalty to his responsibilities which give him exceptional influence as a leader. In his private life he has a number of hobbies, being addicted to motor-boating, and excelling in carpentry, and his gifts in the direction of thoughtful and kindly hospitality, in which his wife shares abundantly, endear him to friends of all ages.

NOTES ON TELEGRAPH PRACTICE.

BY G. T. ARCHIBALD.

I—*Introduction.*

To Mr. John Lee belongs the honour and credit of writing the first book on British telegraph practice. This work* is a wonderfully complete record of telegraph practice as it was at the time of its preparation, but so many of the changes it foreshadowed have come to pass that the time is ripe for the publication of a mass of information concerning them.

If Mr. Lee's book has a defect it is that it deals merely with current telegraph practice. Something in the nature of a history of the subject is long overdue, and it is a matter for regret that none of the prominent and responsible officials of the service since 1870 have attempted the task. I cannot lay claim to the title of a prominent or a responsible official, but it is my intention to attempt to fill the breach so soon as time and opportunity offers.

The series of articles which I have been invited to contribute to the *Telegraph & Telephone Journal* will deal mainly with the changes of practice since 1917, but before commencing the main task before me I propose to claim one of the prerogatives of those who write upon subjects with which they are supposed to be familiar and indulge in a few general observations on telegraph matters in general.

The present generation, inheritor of a great and efficient telegraph service, is apt to be hypercritical. It is so accustomed to the smooth working generally associated with the system that it is inclined to regard telegraphists as super-men and women, and fails in consequence to make due allowance for human fallibility. Nor does it take into account the meteorological disturbances which interfere with the proper working of lines and the mechanical faults which upset telegraph apparatus from time to time. Public complaint may sometimes be unreasonable, and public praise conspicuous by its absence, but complaints may be regarded as compliments if only we look at them in the right way. Upwards of 70,000,000 telegrams involving about 90,000,000 transmissions are dealt with in a year, and complaints are made in the ratio of 1 in 1500, a small percentage, it may be argued, having regard to the variety and complexity of telegraph traffic, but too high for the peace of mind of the official jealous for the good name of the service.

Our patrons have been taught to rely upon an exceedingly efficient service. The business man advising his wife by telegraph that pressure of business at the office will prevent his return home before midnight, the merchant confirming a big business deal, and the provincial lawyer instructing his London agent by the same means, do not stop to ask themselves whether the telegraph staff is familiar with their particular type of telegram or the peculiarities of their handwriting. They know that British telegraphists are expected to have a rudimentary knowledge, at least, of an infinite variety of subjects and that the most illegible handwriting has no terrors for them. They know, too, that British telegraphists are careful and conscientious, comparing more than favourably with their professional colleagues of any other nation in the world. It is not to be wondered at then, that a mutilated telegram comes as a shock to the trusting recipient.

In its consideration of telegraph matters Parliament has consistently sought to conserve the rights of those who live in rural areas. It is largely because of this legislative solicitude for our "country cousins," if one may use the term without offence, that the hours of business at the smallest and most remote offices are similar to those in operation at fairly large towns such as Blackburn, Blackpool, and Tunbridge Wells. Nor is this the only way in which the convenience of the rural population is considered, for it is one of the features of the service and one of which we may justly be proud, that there is no differentiation between large and small offices in the matter of quality of service. Contrast this with the practice of other administrations and it will be at once apparent that the public in this country is indulged to an extent not usual elsewhere.

In America telegraph facilities are graded on the traffic possibilities of the individual route and not, as in this country, on the organism as a whole. An excellent service is given between New York and Chicago, and between New York and Boston, but very small offices are served by what are known as "way" or "omnibus" circuits comprising anything up to 20 offices. In France facilities are deliberately limited to those places where the traffic may be expected to be profitable. In Germany not only are facilities restricted as in France, but certain offices are only open for restricted periods and the quality of service is therefore seriously affected. In this connexion it is worthy of note that on a recent date 526 telegrams handed in at 500 of the smallest offices in Great Britain reached the Central Telegraph Office, London, within 21 minutes of the time of handing in.

The fundamental characteristic of modern British telegraph practice is its simplicity and this is in accord with the public conception of the service. To the average man, the picture of telegraphy includes only the handing in of a telegram at a Post Office, or its dictation over the telephone, and the messenger delivering the familiar orange coloured envelope. There is probably an indistinct background consisting of a mass of weird-looking apparatus, wires and telegraph poles, but the organisation necessary to ensure that a telegram handed in at Penzance shall reach Wick within a reasonable period is unknown to him. He expends no more time and energy in sending a telegram than in purchasing a packet of cigarettes, and the *modus operandi* is so delightfully simple that he does not give a moment's thought to the treatment of his telegram after he has affixed the stamps to the form. But while it can be asserted without exaggeration that simplicity is the key note of the system, it would be wrong to convey the impression that it is all a matter of lines, apparatus and operators. The provision of these essentials is not the beginning and end of telegraph practice. Simplicity is attained through the perfection of organisation which involves the most careful study of day by day conditions in telegraph instrument rooms, the elimination of all unnecessary processes, and the use of the most up-to-date and efficient apparatus and appliances. Indeed, it is only because the hundred and one minor details in the treatment of telegrams receive such careful attention that efficiency is maintained, and that the British telegraph service, like the London policeman, is the admiration of the world. As Mr. Lee justly pointed out "there is no small thing in a telegraph organism: the merest detail is of enormous significance when regarded cumulatively."

The administration is ever ready and willing to consider suggestions for improvements and to try new and promising types of apparatus, and although it is true to say that the British telegraph service is not "a mere growth adapting itself to the circumstances of the time with that reluctance which is ascribed to Government departments—again I quote Mr. Lee—it would not be right to assume that it owes nothing in its progress to public criticism, suggestion, and demand. The mere fact that so much care is exercised in dealing with even the most trivial complaint is evidence to the contrary if that were needed; moreover, the knowledge that Parliament lies behind the administration, ready to visit the sins

* *Telegraph Practice*, Longmans, Green & Co.

of every minor official upon the Postmaster General, with the usual consequence for the delinquent, is a stimulus to efficiency.

It may not be out of place at this point to make some reference to the finances of the telegraph service. It is a well-known fact that, judged on a purely commercial basis, the service does not pay, the annual loss at the present time being in the region of £1,250,000. This calls to mind one or two points deserving of attention because they have a very important bearing on the question here at issue. It has frequently been urged that the system should be placed on a sound business footing in order that it should become a financial success. The proposition sounds reasonable; there is not the slightest doubt that the service could be turned into a revenue earning concern, but the consequences from a public point of view no less than from the point of view of the telegraphist would be calamitous. Hundreds if not thousands of small rural and semi-rural areas would probably be deprived of the facilities which they have enjoyed without question for many years; it would be necessary to reduce the number of suburban telegraph offices, to abolish free delivery up to three miles from the delivery office, and to review many other concessions granted in recent years. It is conceivable that revolutionary tariff charges would also be introduced, and that in consequence it would no no longer be possible to send a telegram from Penzance to Wick at the same rate as from Birmingham to West Bromwich, in other words the tariff would follow the telephone lead and be fixed on a mileage basis. So long, however, as telegraph tariffs are decided by Parliament it is doubtful whether any change in the traditional method of charging will ever be made. The great changes in tariff were discussed by Parliament, and the general tenor of the debates, except in the case of the two increases due to war costs, has always been that the telegraph service should be regarded as an aid to trade and as a public necessity which should be partially subsidised by the tax-payer. This is exemplified by the extension of the free delivery area in 1897 on the occasion of the Diamond Jubilee of Queen Victoria. The Government of the day had a surplus of about £80,000 to dispose of, and notwithstanding the loss on the telegraph service they decided to extend the free delivery area from one mile to three miles. No private company in the pursuit of dividends would have given such a valuable concession to a class of customer which spent so little with it; they would have taken care to see that any concession benefited their best customers. In this particular case a small section of the public participated in a valuable concession at the expense of the better paying user of the telegraph service.

Parliamentary control of tariffs has undoubtedly been a determining factor in the development of the telegraph service, and although the deliberate policy of subsidising it may be open to question by the purist the fact remains that it has never demoralised the administration which has endeavoured throughout the history of the service to reduce the loss, consistent with efficiency, to a minimum. It is perhaps merely stating the obvious to record the constant efforts of responsible officers to obtain newer and better types of apparatus and appliances and never in the history of telegraphy have so many changes taken place as during the past six years.

The rapidly-growing telephone system, as might have been expected, has not only prevented telegraph expansion, but has attracted to itself a vast amount of traffic formerly dealt with by telegraph. Every telegraph man deplores the loss of telegraph traffic and realises the immense possibilities in the further development of long-distance trunk telephone facilities. What, then, is to be the future of the telegraph service, and what steps can be taken to encourage the telegraph habit? With so serious a competitor as the telephone in the field it seems unlikely that telegraph traffic will ever again reach the record of 1920 when 94,000,000 telegrams were dealt with. Immediately the suggestion forces itself upon us "Why not advertise?" Traditionally the British Post Office sets its face against advertising as do most foreign administrations largely, so it would seem, because advertising is held to be not in keeping with the dignity of Government control, but partly for the reason, no doubt, that there is no rival. So far, then, advertisement has been confined to a few inconspicuous and commonplace notices indicating sub-telegraph offices. The issue of even these small items was abandoned a few years ago, but curiously enough it was decided at the same time to issue telephone call office signs on the grounds that they helped to attract traffic.

It may be that the official attitude in the matter of telegraph advertising is too conservative, and with so serious a competitor as the telephone in the field, it might be well to reconsider this question.

There is an impression abroad amongst telegraph men and women that the Post Office is so busily occupied in pushing the telephone service that the telegraph service is neglected. That the impression is erroneous goes without saying, but the use made of commercial advertising by monopolistic concerns such as gas and electric power supply companies seems to indicate that there may be a field for telegraph advertising. Commerce will make greater and still greater use of the telephone system, and the most likely field for telegraph expansion is the domestic and social world. In these realms the possibilities of the telegraph service are not fully appreciated, and the first great work to be done is to remove the prevailing impression that the rat-tat-tat of a telegraph messenger is the forerunner of bad news.

Is there nothing to be gained by encouraging the Christmas greeting message, the wedding and the birthday greeting, written or typed on special and appropriately printed forms as is done in Belgium and other European countries. Is there no field for the exploitation of the urgent inland telegram at a higher rate? Could a non-urgent telegram at a lower rate be made to pay; all such telegrams to be held over for disposal during the slack hours. Is it not possible to popularise the night letter telegram? When it is remembered that the average value of telegrams is 1*s.* 3*d.* and that the cost of dealing with it reaches 1*s.* 9*d.* it will be realised that the tariff question is one which requires very careful handling. These figures may alarm the uninitiated. The service, is however, a public utility service deliberately run at a financial loss in the interests of the community.

(*To be continued.*)

REVIEW.

"*Radio Year Book.*" (*Sir Isaac Pitman & Sons Ltd., London.* 175 *pp.* 1*s.* 6*d.*)

This flourishing annual now contains, in addition to the usual technical and commercial section, an extensive portrait gallery of people connected with the broadcasting world. There are the "uncles" and announcers of the various centres; there are bands, orchestras and quartets in groups; there is Dame Clara Butt, Mr. Harold Samuel, Mr. Eugene Goossens, Sir Edward Elgar, Sir Landon Ronald, and numerous pianists, violinists and vocalists. The broadcatcher who knows them only by their voices may now form an idea of what they are like to look upon.

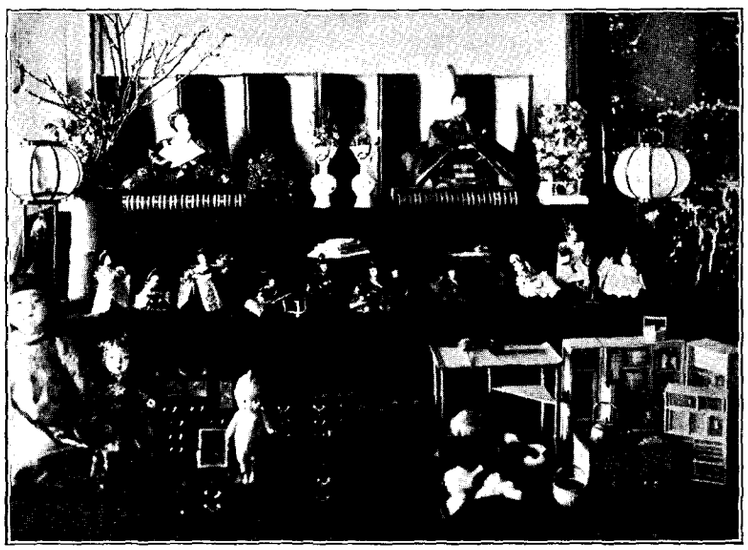
The annual contains instructive articles on wireless television, death-rays, the wireless beam system, the use of valves, how to get the best results from crystal sets, mercury rectifiers, and a host of other interesting subjects. It is an excellent eighteen-pennyworth.

JAPANESE GIRLS' DOLL FESTIVAL.

MR. S. KADA, Superintendent of the Contract Branch, Kyoto Telephone Office, Japan, sends us the following interesting communication :—

These two pictures show that the Japanese telephonists are now celebrating " Girl's doll festival " at the resting room of the Kyoto Central Telephone Office in Japan. This festival which takes place on March 3 is one of the most graceful customs observed in Japanese homes that have daughters. On this day various kinds of dolls are arranged in imitation of the Imperial Court sitting in state, and a girl dressing herself very beautifully invites her intimate friends to her private room and serves them with tea and feast. Just in this season the peach flower is in full bloom, so this festival is also called " Spring Festival."

In ancient times people drank a kind of wine called " peach wine," in which the beautiful peach petals were floating, but at present instead of " peach wine " they use the white Japanese wine called " Shiro sake " in Japanese, and eat the dough-cake which is made of the leaves of artemisia and a kind of rice.



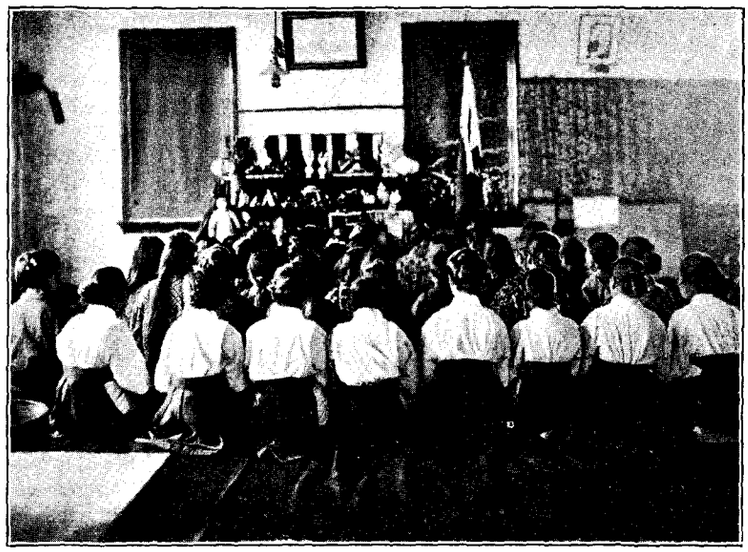
This festival has been celebrated since the Tsuchi Mikado period (about 350 years ago) in the Japanese Imperial Court, but afterwards the people in general imitated the Imperial Custom and it has now become most popular among them.

The origin of this festival is as follows :—

In olden times terrible epidemics such as small pox and cholera prevailed throughout the whole country, and numerous people suffered from these diseases.

Consequently the people did their best to avoid these diseases, and at last they made dolls which were quite different from the present ones and threw them in rivers, believing that the evil spirit of disease would go away with the dolls. Moreover, at the same time they enshrined the spirits of the gods in their homes, offering them various kinds of foods. But afterwards this original and primitive thought was quite forgotten, and dolls being very beautiful and elegant, instead of throwing them in rivers, they left the dolls to their girls for play.

Nowadays, the people of Japan spend a great deal of money in purchasing dolls for their girls, and this custom has become quite the female festival on account of its grace and elegancy.



Before I stop my pen, I will write a little more about theJapanese telephonists. They always wear the white cotton dress and crimson skirt in the office, and when they are in their resting room in the office they sit just like these pictures.

The average age of girls is something like 17 years old, and they qualify for engagement by graduating at the elementary school. They work eight hours a day and are paid about two shillings a day at the beginning.

TELEPHONIC DEVELOPMENT OF THE WORLD AT DECEMBER 31, 1923.

BY W. H. GUNSTON.

TELEPHONE progress during 1923 followed much on the usual lines, although over a million and a half telephones were added to the world's total, instead of the usual million or so. Of this increase of 1,589,000, the following table shows that about a million was furnished by North America and about 440,000 by Europe. This also is in accordance with precedent. Of Europe's increase, about 168,000 telephones were provided by Germany, 103,000 by Great Britain, and 55,000 by France, Russia, according to the only information obtainable, having suffered a loss of some 60,000 telephones in 1922, the effects of which appear for the first time in the tables for 1923. It would perhaps be more accurate to say that Europe showed an increase of 500,000 in 1923, and that the total for 1922 was only 5,840,000.

	Total No. of telephones. 1922	1923
Europe	5,900,000	6,341,000
Asia	680,000	781,500
Africa	122,000	136,150
North America	15,557,000	16,532,000
South America	325,000	345,500
Australasia	389,000	426,000
	22,973,000	24,562,000

Of these figures, about 24,000,000 are based on the official returns for 1923 (or in some few cases on those for 1922) and the remaining 500 thousand odd on estimates obtained from older data.

The total for Asia applies more properly to Sept. 1, 1923, on which date the great earthquake put the majority of Japan's 500,000 telephones out of action, and it is doubtful whether more than a quarter of this total was in working order by the end of that year.

EUROPE.

It will be seen from the annexed table that there is now 1 telephone to every 75 inhabitants in Europe. As indicated in previous years' reports, the backwardness of Southern and Eastern Europe affects the whole so unfavourably as to give no just idea of the development of the Northern and Western States. Of the 6,341,000 telephones in Europe no less than 5,490,000 are situated in an area comprising Scandinavia, Germany, Austria, Switzerland, Holland, Belgium, France, Great Britain and Ireland. The population of these States is about 181 millions, yielding an average of 1 telephone to every 33 inhabitants, whilst the other 294 millions have only 857,000 telephones amongst them—and of these probably one-twelfth are in Finland. Expressed in terms of telephones per 100 inhabitants the development of the respective Western and Northern States (excluding Iceland, Luxemburg and the Free City of Danzig) is as follows :—

Denmark	8.8
Sweden	6.7
Norway	6.2
Switzerland	4.5
Germany	3.7
Holland	2.8
Great Britain	2.6
Austria	2.2
Belgium	1.5
France	1.4

The ratio of inhabitants to telephones in all the European States is shown in the following table :—

	No. of Telephones.	Population (Thousands)	Inhabitants per telephone.
Austria (129,564)	135,839	6,067	45
Belgium (96,516)	114,807	7,677	66
Bulgaria (6,218)	7,283	4,861	675
Czecho-Slovakia (94,020)	99,000	13,588	137
Danzig (Free City of)	13,000	356	26
Denmark (264,413)	288,439	3,283	11.4
Esthonia	5,500	1,250	209
Finland	75,000	3,402	45
France (324,622)	579,418	39,209	67
Germany (2,073,612)	2,242,332	59,858	27
Great Britain (1,045,928)	1,148,095	44,150	39
Greece	5,000	6,800	1,360
Hungary (70,816)	74,619	7,482	101
Iceland	2,500	94	37
Ireland	20,762	3,139	156
Italy	142,842	38,500	299
Latvia (7,587)	11,332	2,000	182
Lithuania	6,029	2,000	332
Luxemburg (6,126)	6,656	263	39
Netherlands (186,854)	195,057	7,029	36
Norway (138,000)	163,000	2,649	15
Poland (96,602)	110,000	13,000	118
Portugal	18,000	6,399	355
Russia	112,000	136,000	124
Roumania (29,605)	31,615	17,000	538
Serbs, Croats and Slovenes	25,000	11,600	464
Spain (99,188 in 1921)	110,000	21,658	197
Sweden (394,535)	402,389	5,987	14.8
Switzerland (167,440)	177,437	3,888	22.7
Turkey (8,445)	8,483	2,000	238
Total, with allowance for Saar Region	6,341,000	475,000	75
Last year	5,900,000		
Increase	441,000		

The figures in brackets refer to last year's total number of Telephones.

Austria.—The system has increased by over 6,000 telephones during the year. Vienna has 87,440, Graz 5,926, Linz 4,196, Innsbruck 2,742, and Salzburg 2,368 telephones.

Belgium.—An increase of over 8% was reached in 1923. Brussels has 39,117 telephones, Antwerp 17,392, Liége 6,424, and Ghent 3,820.

Denmark is telephonically the most highly developed country in Europe. There are 153,700 telephones in the island of Zealand alone (operated by Copenhagen Telephone Company), upwards of 97,000 in Jutland (chiefly Jutland Telephone Company), and 23,000 in Funen (Funen Communal System). Copenhagen and its suburbs with three quarters of a million inhabitants has 118,682 telephones, and although there are no other towns in Denmark with 100,000 inhabitants, Aarhus has 6,231 subscribers. Odense 5,681, and Aalborg 4,480.

Finland.—No recent official information has been received from Finland. The service at Helsingfors, Abo, and Wiborg is in the hands of private companies and comprises about 25,000 telephones. As these companies do not serve one quarter of Finland, the total development of that country has been estimated at 75,000.

France showed an increase of 55,000 telephones during the year under review. Paris increased its total by 18,000 to 203,731. Marseilles has 15,986 stations, Lyons 14,736, Bordeaux 9,568, Strassburg 9,565, and Lille 7,574.

Germany's telephones increased by 168,000 in 1923. Greater Berlin has now 381,291 telephones and there are 23 other towns with upwards of 11,000 telephones, amongst which Hamburg-Altona has 120,756, Munich 54,716, Leipzig 50,232, Cologne 46,593, Frankfort-on-Main 40,383, Dresden 43,841, and Breslau 33,348.

Great Britain's total increased by nearly 103,000. Greater London possessed 401,065 telephones, Manchester and suburbs 54,648, Glasgow 45,540, Liverpool 42,525, Birmingham 32,464, Edinburgh 18,014, and 9 other towns exceeded a development of 10,000 telephones.

Of the 1,148,095 telephones in Great Britain, 1,129,123 were connected with the Post Office system, 14,114 with that of the Hull Corporation, and 3,215 and 1,641 respectively with the Guernsey and Jersey State systems.

Hungary.—The total has increased by nearly 4,000. Budapest has 31,998 telephones, and Szeged, Debreczen and Pecs each over 1,000.

Italy.—As readers of the *Journal* are already aware, the local telephone systems in Italy are being sold by the State to private companies. The present development of the principal cities is as follows : Milan 17,992 telephones, Rome 14,261, Genoa 8,347, Turin 7,953, and Naples 6,786.

The system in *Latvia* shows a considerable increase rising from 7,587 to 11,332 telephones. 7,301 of these are in Riga.

Netherlands.—The Amsterdam (35,360 telephones), Rotterdam (28,692) and The Hague (26,399) systems are worked by the municipalities. The largest State systems are those of Harlem (5,895) and Utrecht (5,716).

Norway.—About 78,000 stations belong to the State system and 67,000 to private companies. In addition there are 17,000 private lines connected to the State system for long distance service. Oslo (lately Kristiania, State) has 35,937 telephones, Bergen (Company) 8,662, and Trondhjem (State) 6,642.

Poland.—The total given in the table has been estimated from the official figures for 1922. About 45,000 of the telephones belong to Companies operating in Warsaw, Lodz, Lemberg (Leopol), Lublin and other places. About 65,000 are on the State system.

Portugal.—All the telephones in this country except about 1,000 are in the hands of the Anglo-Portuguese Telephone Company which had 12,446 stations in the Lisbon district and 4,203 in Oporto.

Russia.—No recent official information has been received from Moscow, but a recent American report estimates that the Russian telephone system decreased by about 58,000 during 1922 and now

contains no more than 112,000 telephones. The number of telephones in Moscow is said to have decreased from 54,000 to 25,000 and in Leningrad (Petersburg) from 40,000 to less than 10,000.

Serbs, Croats and Slovenes.—The total has been estimated on the basis of the progress of development in previous years.

Spain.—The system like that of Italy and Greece is about to be reorganised by a private company. Spain had 99,188 telephones in 1921 and may now have 110,000.

Sweden, the most highly developed country in Europe after Denmark, increased her total number of telephones by about 8,000. Stockholm has 100,063, Göteborg 26,372, Malmö 13,544, and Norrkoping and Helsingborg each over 5,000.

Switzerland increased her total by about 10,000 telephones. Zurich numbers 22,976, Geneva 14,639, Basel 13,428, Berne 16,985, Lausanne 7,680, and St. Gall 5,876.

Turkey's development is in the hands of the Constantinople Telephone Company. Despite many drawbacks the Company now controls 8,483 telephones, mostly in Constantinople.

(The telephone systems of Europe are, generally speaking, owned and worked by the State.)

ASIA.

Ceylon	5,500*
China	90,000
Hong Kong	8,095
French Indo-China	2,500*
Japan (Sept. 1 before the Earthquake)	520,000
Chosen, Manchuria, Formosa, etc. ...	45,000*
India (37,467)	40,000
Iraq	780
Netherlands Indies (38,029)	37,700
Palestine	1,537
Persia	2,347
Phillippine Islands	15,000
Singapore	4,364
Straits Settlements	1,484
Federated Malay States	3,000
With Siam, Syria, Turkestan, etc. say	4,000
	781,500

* Estimated.

The figures for *China*, *Japan* and the *Phillippines* are obtained from American sources. In the first-named country Peking is estimated to have 32,000 telephones, Shangahi 18,000, and Tientsin about 8,000. The earthquake in Japan on Sept. 1 wrecked the telephone system and several of the exchanges in Tokio and elsewhere were destroyed by fire. Of 115,000 telephones in that city, only 28,000 had been restored by last summer, and of 10,000 in Yokohama only 2,500. It may be judged from these figures that the number of telephones working in Japan at the end of 1923 did not exceed 150,000, but at the beginning of September of that year the total was probably upwards of 520,000.

India had 40,084 telephones on March 31, 1923, and 39,885 in March, 1924; probably, therefore, there were about 40,000 by the end of 1923. About 15,000 were connected with the Government systems and 25,000 with Company systems. Calcutta had about 10,300 stations, Bombay 9,100, Rangoon 3,500, Madras 2,300, Simla 1,343, and Delhi 1,247.

Dutch Indies.—The total number of telephones shows a slight reduction compared with the previous year; 35,795 were connected with the State system and about 2,000 with private systems. There were 8,146 telephones in Batavia, 6,578 in Soerabaia, 2,889 in Semerang, and 2,547 in Bandoeng.

Persia.—The new Telephone Company has increased its total to 2,347 and possesses 1,305 telephones in Teheran, 238 in Isfahan, and 227 in Shiraz.

Of the 780 telephones in *Iraq* 466 are in Bagdad and 273 in Basrah. Such telephones as remain in Siberia, Georgia, Azerbaijan and Khiva may be assumed to be included in the total for Russia-in-Europe; but of this there is no certainty.

AFRICA.

Algeria (16,300)	17,500
Egypt (27,727)	31,000
Gold Coast	359
Mauritius	1,136
Morocco (est.)	5,000
Nigeria	1,214
Portuguese Guinea (est.) ...	6,000
Southern Rhodesia	1,748
Union of South Africa ...	65,674
Tunis (est.)	6,500
	136,130

Egypt (State system).—Telephones have increased from 27,727 to 31,000. About 12,000 of these are in Cairo and 9,000 in Alexandria.

South Africa shows an increase from 60,304 to 65,674. These are all connected with the Post Office system except 5,487 telephones connected with the Durban municipal system. Johannesburg has 15,922 telephones, Cape Town 11,343, Pretoria 3,986, and Durban 5,487.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

AUSTRALIA.—The Amalgamated Wireless (Australia) Co., in which the Commonwealth holds a controlling interest, has accepted the tender submitted by Marconi's Wireless Telegraph Co. Ltd., for the erection of beam wireless stations having an aggregate capacity three times that guaranteed for the high-power station. The British Postmaster-General contracted, on July 28, with the Marconi Co. to erect a wireless telegraph station on the beam system capable of communicating with Canada and of being extended to South Africa, India, and Australia. The company was to erect reciprocal stations in those countries on behalf of its associated companies.

CANADA.—Reuter's Quebec correspondent states that the erection of the new Marconi radio station at Drummondville, Quebec, has been begun. One 300 ft. tower is now being erected, and 14 more are expected to be completed by the end of next year.

CAROLINE ISLANDS.—The Tokio correspondent of the same agency states that the War Office has decided on the erection of a wireless station on Yap Island (in the west of the Caroline group) in accordance with the Japan-American Yap agreement.

CZECHO-SLOVAKIA.—A German publication stated last month that English representatives of the Marconi Company were recently in Prague in connexion with negotiations for the acquisition of a portion of the share capital of the Radioslavia Aktien Gesellschaft. Hitherto a French group has owned 40% of the company's capital, but as the company refused to sanction an increase of the foreign share, an agreement has been come to whereby the Marconi company will take half of the French interest. The Radioslavia was formed in 1922 by the Krizikwerke.

FRANCE.—Experiments in sending radio time signals will shortly take place at the Eiffel Tower station in Paris. The London *Daily Mail* gives the following interesting description: "The light of a star" will be used as it crosses the eyepiece of a telescope to excite a photo-electric cell, which will automatically operate a transmitter and broadcast a musical note. Listeners will thus actually hear the star, and the time signal will be broadcast without human intervention and with an error of less than a millionth of a second."

FRENCH WEST AFRICA.—Radio-telegraph stations were officially opened on Nov. 27 at Bammako, in French West Africa, and Antananarivo, in Madagascar. They form part of the general scheme of communication between the various colonies of France. Prior to this, France could only communicate with these places but messages in the opposite direction could not be sent.

GERMANY.—SHORT-WAVE TRANSMISSION.—A Berlin organisation is to broadcast concerts and lectures on a 100-metre wave length. Two new broadcasting stations are to be built at Cassel and Dresden. There are three already in operation in Hanover, Bremen, and Nurnberg. It is not

however clear from the information at present to hand whether the last paragraph.

HUNGARY.—The monopoly for the broadcasting service in Hungary has been secured by the Hungarian Telegraph Correspondence Bureau. The first broadcasting station will be set up at Csefrel, near Budapest. The 200-watt telephone transmitting station in the latter city, constructed by the Berlin firm of Dr. E. F. Huth & Co., is used exclusively for Press news. An order for a 2-kW transmitting plant has been given to the Telefunken Co.

INDIA.—The *Times* and *Daily Telegraph* convey the following Radio information. The Government of India is considering an application from an Indian company, directed by a board of prominent Indian business men, for a licence to erect a beam telegraph station forthwith for a commercial service with the United Kingdom. Provided that there were no undue delay in granting the licence, the promoters of the scheme believe that the Indian station would be open to the public in six or eight months. The service would begin with a reduction of 30% on cable charges.

The Indian Radio Telegraph Co. is understood to be acquiring the Indian patent rights of the Marconi Co., and also those of American, French, and German companies. Sixty % of the capital will be offered for public subscription.

IRISH FREE STATE.—In reply to a question in the Dail drawing attention to the lack of telephone facilities in the West of Ireland, the Minister of Posts and Telegraphs said that the opening of a telephone exchange at Athenry had been sanctioned, and the work would be carried out at an early date. It was proposed to erect trunk-line circuits to Tuam, Roscommon, and Castlerea, and to establish exchanges in those towns if the number of subscribers should justify the expense. Owing to the limited engineering staff available, the development of the telephone system throughout the Free State in any one year must necessarily be restricted. It was hoped to consider extensions to other places in Connaught during the next financial year.

ITALY.—By regulations which have been issued, foreign men-of-war and the aeroplanes which accompany them are required in fortified maritime ports and naval bases in Italy and her colonies to obtain leave from the local commanders to use their radio-telegraph and radio-telephone apparatus, intimating at t e same time the system employed, the length of wave used in transmission, and the intended hours of use. In non-fortified ports it is forbidden to use waves above 600 metres for transmission, except for distress signals and answers. Care should be exercised to avoid interference with national wireless stations, mobile or fixed, and transmission should be stopped on request of naval authorities or fixed national stations. Lengthy signalling by apparatus which does not transmit with a pure steady wave should also be avoided. Before arrival at any port, intimation should be conveyed to the local commander of the intention so to do.

LONDON.—PRESS DEPUTATION.—A deputation was received by the Pacific Cable Board, London, on Nov. 24 from the Empire Press Union to discuss the reduction of the rate for Press messages exchanged with Australia and New Zealand. The deputation was headed by Viscount Burnham, president of the Union. Reference was made to an assurance given by the Commonwealth Postmaster-General, Mr. Gibson, during his recent visit to London, that arrangements had been made for the reduction of the Press rate. It was represented that the facilities for the exchange of Empire news by cable were inadequate, and it was suggested that capacity for carrying additional Press traffic could be provided by a modification of the conditions of accepting week-end telegrams.

The chairman of the Pacific Cable Board, in reply, stated that the minutes of the meetings which were attended by Mr. Gibson proved that modification of the Press rate was at no time contemplated. The Pacific Cable was occupied to the limit of its capacity, and it would be impracticable to handle any additional traffic. Accordingly, further reductions of rates could not be made until the cable had been duplicated.

ALL-RED CABLE ROUTE.—A message addressed by the King to the Governors of Barbados, Trinidad, British Guiana, and the Leeward Islands was the first sent over the all-British cable route to the West Indies, on its opening on Dec. 1.

Reduced rates for telegraphing to Australia, New Zealand, and the Pacific Islands, came into operation on Dec. 1, as announced by the Pacific Cable Board, the Commercial Cable Co., and the Eastern Telegraph Co. Marconi's Wireless Telegraph Co. has issued an announcement on similar lines, and in order to effect economy in cable working, agreements are being made between the Eastern Telegraph Co. and most of its controlled companies in the group of Eastern Associated Companies. An agreement with the West African Co. has been sanctioned by the shareholders. The working of the three chief members of the group, the Eastern, the Eastern Extension, and the Western, will not be changed.

MOROCCO.—A Madrid correspondent advises that the new telephone company in Spain, which is under American management, is to lay a cable between Algeciras and Ceuta—which will probably be ready by the end of the year—so as to provide telephonic communication between Spain and Morocco, principally in the interests of the Spanish Government and the families of the officers and men serving in the protectorate.

NEW ZEALAND.—Reuter's Trade Agent, Melbourne, states that in the public works statement presented to the House of Representatives, the Minister stated that it was proposed to spend this year £900,000 on telephone and telegraph extensions and £400,000 on departmental buildings, &c.

PARIS.—Those of the international cable craft should study carefully the following information and watch the trend of telephone development abroad. The three sub-committees of the International Consultative Committee for long-distance telephone communication which has been sitting in Paris have concluded their labours, and a report of their recommendations is to be prepared for submission to the general meeting of the committee, which will take place in June next. According to the *Morning Post*, a feature of the discussion was the proposal for the adoption of varying tariffs according to the hour at which a call is taken, the reduction proposed ranging from 25 to 50% of the normal rate. Another proposition concerns the possibility of enabling the public to obtain international calls at fixed hours, either on a regular subscription basis, or by ordering a call in advance for use at a prescribed moment. The possibility of devising means by which a person named may be called to the other end of the line at a determined hour to take a communication, and also the possibility of enabling information of various kinds to be gathered from a distant point by ringing up the town in question were also considered. In order to develop long-distance communication as speedily as possible, the sub-committee proposes that certain categories of subscribers, such as newspapers, banks, and large businesses, shall in the near future be invited to make use of free international communication during the slacker hours of the day between London and Rome, via Paris; London and Berlin, via Amsterdam; London and Stockholm, via Hamburg; Vienna and Paris, and Paris and Stockholm, via Berlin.

In this connexion, too, it is noted that the Danish State telephone undertaking has announced the establishment of telephonic communication between Copenhagen and Prague at certain times of the day, that a telephone communication was established between Copenhagen and Switzerland on Nov. 25, and that according to *Commerce Reports* there is now a plan under way to provide a telephone service between Angora and Constantinople.

PORTUGAL.—The Anglo-Portuguese Telephone Co. has obtained from the Government a decree which allows it to establish two rates of subscription for the telephone; the first by a fixed yearly sum, as at present, and the second by paying for calls. A distinction will be made between telephones in private houses and those in offices; both classes may now choose whether they will remain on the yearly system, or change on to the call system, but once they have changed, they are not at liberty to go back again to the yearly system.

SOUTH AFRICA.—The *Cape Times* reports that direct radio communication between Poldhu in Cornwall and the South African receiving station at Milnerton, near Cape Town, was established at 12.5 a.m. on Dec. 3, Milnerton receiving a message from Sir Edgar Walton (South African High Commissioner in London) to General Hertzog. The experiments reveal greater success as the wave-length is shortened. The tests were started on a 92-metre wave. The experimenters are now working on 60 metres, and it is probable that even shorter lengths will be tried. On Dec. 5 the *Cape Times* received the first Press message direct from England from Senatore Marconi.

SWITZERLAND.—The Military Department of the Swiss Government has made a grant towards the cost of establishing a radio transmission and receiving station at the Basle aeroplane station.

The Swiss Marconi Co. has recently made considerable improvements and extensions at its Munchenbuchsee-Riedern radio telegraph station. The old 25-kW transmission set has been supplemented with a modern one working with a primary capacity of 15 kW, the former operating on a wave-length of 3,000 metres and the new one on 5,270 metres.

UNITED STATES.—It is reported that London will be in telephonic communication with America by wireless this time next year. Mr. G. H. Nash, of the Western Electric Co. Ltd., which is making all the apparatus, told the *Daily Express* that water-cooled 10,000-watt valves will be used and special plant will be installed at the Government station at Rugby for communicating with Rocky Point, Long Island, New York.

WEST INDIES.—Marconi's Wireless Telegraph Co. Ltd., announced that on Dec. 1 a new tariff came into force for messages between Great Britain and the West Indies, involving reductions of between 4*d.* and 6*d.* per word for places in the British West Indies, and between 9*d.* and 1*s.* 5*d.* per word for the French West Indies.

As was anticipated in these columns, the number of broadcasting licences issued for Great Britain and Northern Ireland has now passed the million.

Many thanks to a Manchester correspondent for his kindly letter in connexion with the mention of the name of Mr. Yerbury, the Deputy Electrical Engineer, Sheffield. The letter itself would have been acknowledged privately but the signature of the writer is so distinctive as to be beyond me!

The gradual spread of the metric system has been mentioned on several occasions in these columns as an interesting topic to all telegraph and other engineers, and the following notes condensed from the *Commercial and Industrial Gazette*, on the introduction of the decimal system in the Soviet Union, will no doubt be an acceptable item. By the beginning of July next year, says the *Gazette*, the Gosmeter will have completed the inauguration of the metric system in all branches of national industry, including the retail selling apparatus in the provinces of Moscow, Leningrad and Nizhni-Novgorod. The rapid introduction of the system has resulted in great pressure on the works belonging to the Gosmeter, and arrangements have been made with

the largest works in the Union for the casting of weights for the Gosmeter. By this means the huge demand can be fully met. The shortage of scales is felt acutely. The Gosmeter is planning to organise a new large production of scales by re-installing the Bachmanovski works. The lack of scales does not threaten to hinder the introduction of the metric system, as the old scales can, of course, be used with metric weights. The textile industry has already gone over entirely to the metric system. In the country districts progress is somewhat slower.

Sir Richard Gregory, presiding over the annual meeting of the Decimal Association at Stationers' Hall, in his address called attention to the spread of the metric system throughout the world, the latest adherents being Japan, Russia, and Siam. Reports from all three countries showed that the change was making rapid progress.

Our contemporary, the *Electrical Review*, referring to the speech of Sir Robert Donald at the annual meeting of the Empire Press Union, after animadverting on the politicians who were "permitted to hamper its (wireless *telegraphy) progress,*" *suddenly turned round and declared that,* "*The strong* hand is needed to put an end to the obstruction, *and to curb the ambition of the Post Office*—to liberate wireless communication from the bondage in which it has been chained ever since the Post Office policy of absorption was framed."

Apart from whether it is to be classed as a crime for a public department to be ambitious, that is, to have initiative—whereas public critics are for ever girding against the Post Office because of its supposed lack of this same quality, it may be permissible to ask whether this same branch of the public service is to be blamed for the quick succession with which the several Postmasters-General have passed into and out of St. Martin's-le-Grand. No one in the Post Office would blame the politicians for their ill-luck, which could not but have an unfortunate and retarding reflex upon the necessary negotiations. After all, wireless has been developing meanwhile, and it may not be all to the bad for the public that circumstances have held back matters and prevented a headlong rush into hastily conceived plans.

This is an individual opinion, of course, and will no doubt be accepted for what it may be worth—the expression of an obscure writer.

The chairman of the Pacific Cable Board, in reply to a deputation from the Empire Press Union for cheaper Press rates to Australia and New Zealand, made, amongst other matters, the following interesting statement, the italicised portion of which will not escape the attention of our cable subscribers :—"The Board would be happy to co-operate in increasing the existing facilities if circumstances permitted, but the Pacific cable was occupied to the limit of capacity and it would be impracticable to handle any additional traffic. Accordingly the Board had decided that further reductions of rates could not be made until the cable had been duplicated. *The Board intended to call for tenders in the near future for duplicate cables and had no reason to doubt that these cables would be in use by the end of the next* 18 *months.*"

A most interesting account of experiments made by the G.E.C. of America to audibly prove the molecular theory of magnetism.

In the research laboratory of this company, says the *Electrical Review*, apparatus has been made whereby a magnet brought near a piece of iron, causes a roaring noise to issue from a loud speaker. A piece of soft iron is inserted in a coil of 17,000 turns of three-mil wire. The coil is attached to an amplification set, which in turn is connected either to head 'phones or to a loud speaker. When a magnet is brought near the iron a rustle is heard. If the approach is rapid, the noise is loud and abrupt ; if slow, the sound is softer and lasts longer. While the magnet is being removed a similar sound is heard. If the magnet is quickly removed and quickly brought back to its former position, only a little sound is heard. If it is brought still nearer the iron, there is more sound. If, after the magnet has been been brought near the iron bar and the noise has subsided, the poles of the magnet are reversed, a very loud and abrupt noise is heard.

It is suggested that the phenomenon results from the motion of the unit magnetic particles within the iron. Thus, when the magnet is brought near the iron, groups of the atoms turn round to face in the same direction. The stronger the magnetic influence the larger the number of particles that turn round, the greater the effect, and the louder the noise. Similarly, when the magnet is removed, the atoms gradually become disarranged. When the magnet is quickly brought back to its original position, the noise is slight since only a few of the particles have become disarranged. When the polarity of the magnet is reversed the particles turn round quickly, and thus the noise is much louder.

Sir John Denison Pender, chairman of the Western Telegraph Co., made three especially interesting statements at the annual general meeting of the company, quite apart from the announcement to the shareholders of a 10% dividend !

"The expenditure on capital account," said Sir John, "had been made during the year under review, amounting to a total sum of £25,291. The principal item in this amount was £12,812, being the cost of 1,500 new ordinary shares of 50 Argentine dollars each, in a telegraph and telephone company in Argentina with which the company had a working traffic agreement. It was a successful concern. In July last all stations abroad and the cable steamers were asked to form committees from members of the staff to consider and suggest means by which further economies in working expenses could be effected, and within the last few days the results of meetings had been received, and he was much impressed with the support and loyalty to the company which were evidenced by the suggestions made not only by the British, but by the native staffs of all the countries which they served. In conjunction with the other associated companies, the whole matter was being considered.

The Argentine Transradio station at Monte Grande, near Buenos Aires, had been opened. The wireless communication in Brazil, which had been established for a number of years, continued to function without material injury to the company.

At the last meeting he had referred to the concession granted to an Italian company to lay a cable to Azores, joining Italy with North and South America. Certain negotiations took place between those concerned, viz., the Western Union Telegraph, the Italian company and themselves, which resulted in an agreement whereby the Western Telegraph Co.'s South American traffics were protected at Azores, not only at the outset but later on when the projected direct Italian-South American cables became interrupted. Within the last two months the second section of the concession, the Italian cable from Malaga to Azores, had been laid, and the first section between Rome and Malaga, to complete the connexion with Azores, was in course of manufacture. When the Italian through line was completed it would serve Rio de Janeiro, Montevideo, and Buenos Aires, and would compete with the company at those points. The company could rely upon being as efficient, if not more so, owing to the experience which it had gained and the Italian company had to gain. If that was the case, although it would take traffic away from the company, he thought that the company would be able to hold its own at any rate.

The Cuba Submarine Telegraph Co. Ltd. has offered to purchase the undertaking of the W. India and Panama Telegraph Co. Ltd. from the shareholders. The closing down of the W. India company would no doubt affect the Cuba company's earnings, and the latter company hope that, by placing the former under one management, it may be possible to carry on the W. India organisation which deserves a much better fate after all its struggles.

We are indebted to the London *Times* and Reuter's New York correspondent for the following brief but well-condensed account of the recent Radio Telephotos. The transmission of radio telephotographs between London and New York was successfully carried out by the Radio Corporation on Nov. 29 and 30. All the photographs were recognisable.

The transmission in this country took place from Radio House in London, but the apparatus required for reception has not yet arrived in England. The transmission of a half-plate film by the process occupies about 20 minutes. The method employed is that a photographic film is placed in a revolving drum and an electric transmitting circuit is affected by a beam of light shining through the film on to a photo-electric cell. By this means the ordinary radio telegraph circuit is operated and the illustration is reproduced by a fine pen at the distant station. Transmission was on a basis of a movement of one 128th of an inch for each revolution, but for ordinary reproduction the photograph might be moved one 64th of an inch. Reproduction is apparently obtained by a succession of lines, in which detail is conveyed by varied shades of markings influenced by the degree of light passing through the film to the photo-electric cell.

The invention has been developed by Mr. D. H. Ranger, of the Radio Corporation of America, which acts in association with Marconi's Wireless Telegraph Co., which holds the patent rights for Great Britain and the British Dominions and Colonies. There have already been many experiments in the transmission of photographs by wireless and line telegraphy, but the demonstration was the first of its kind across the Atlantic to be tried publicly. The impulses modulated and amplified passed over 220 miles of land lines and across the Atlantic and were picked up at the end of Long Island by antennae nine miles long. At the Radio Company's station they were once more amplified and sent over 70 miles of land lines to New York. There a specially constructed fountain-pen actuated by the electric waves reproduced on a paper cylinder in dots and dashes of varying thickness a picture of the negative in London. At the same time photographic apparatus made a new negative.

The closing weeks of 1924 saw the departure from our midst in the C.T.O. of yet two more members of the now fast-dwindling staff of the former Submarine Telegraph Co. In one case this was by the sad and sudden death of Mr. J. Barrow, who passed away in his sleep.

Mr. H. A. Wooley, it is pleasant to record, spent his 60th birthday in the Cable Room and then went on to the retired list after over 40 years of faithful service to the State, followed by the good wishes of all his colleagues into what we may sincerely hope to be a series of happy, restful years.

A week or two later, Mr. T. Almond (Brother Tom), Superintendent on the Inland staff, bright and cheery, almost literally skipped out of the G.P.O. West building, bearing his three-score years with a lightness that some of his juniors might well envy. What could his best friends wish him more than a continuance of these happy, healthy conditions for many a year to come ?

Speech and Song.—Nay, all speech, even the commonest speech, has something of song in it ; not a parish in the world but has its parish accent, the rhythm or tune to which the people there *sing* what they have to say ! Accent is a kind of chanting ; all men have accent of their own—though they only notice that of others . . . The speech of a man even in zealous anger becomes a chant, a song. All deep things are song. . . . Poetry we will call musical Thought. See deep enough and you *see* musically ; the heart of Nature *being* everywhere music if you can only reach it !—*Hero-Worship*, Carlyle.

J. J. T.

The
Telegraph and Telephone Journal.

PUBLISHED MONTHLY IN THE INTERESTS OF THE TELEGRAPH AND TELEPHONE SERVICE, UNDER THE PATRONAGE OF THE POSTMASTER-GENERAL.

Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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PROGRESS IN 1924.

FROM the telephonic point of view we are able to look back upon the year 1924 with considerable satisfaction. In the year 1923 the number of telephones in Great Britain and Northern Ireland showed an increase of nearly 103,000, or a shade less than 10% on the previous year. This was the largest increase theretofore recorded, but during the year just closed we have done even better. At the time of writing we learn that there were 1,233,400 telephones in existence on the Post Office system at the end of November, and, on a conservative estimate, the total at Dec. 31 should have reached 1,243,000 or 10.2% increase on 1923. If we add 20,000 in respect of the telephone systems of Hull, Guernsey and Jersey, we obtain 1,263,000 telephones or a total increase of 115,000 during the year. The number of Post Office telephone exchanges open at the end of 1924 may be estimated at 3,750 (it was actually 3,701 at the end of October) or a gain of 280 during the past twelve months. In the London telephone area alone the increase in stations during the eleven months to the end of November amounted to 34,000 (more than three times the increase for the whole of Great Britain and Ireland in 1921 !) and the total at that date reached 435,000.

During the year automatic exchanges were opened at Swansea with an initial capacity of 3,200 lines, at Sketty with 300 lines, at York with 1,700 lines, at Dundee with 3,500 lines, and at Broughty Ferry with 600 lines. At Gloucester the installation of automatic equipment is now proceeding, and similar installations at Ipswich and Kirkcaldy have been commenced.

As regards the telephone service to the Continent, a second Anglo-Dutch cable was laid in September and four additional circuits between England and Holland were brought into use in October. There are now 4 working to Amsterdam and 3 to Rotterdam. Two additional London-Paris circuits were brought into use in March and one in April, bringing the total up to 14. It is expected to have 3 more working in the early months of 1925.

With regard to the telegraph service, the best we can say is that, if there has been no revival of traffic, there has at least been no appreciable decline. The conditions of trade during 1924 were much as they were during the previous year and, as we said last year, there can be little or no reaction in telegraph traffic until trade revives. The development of the telegraph service in regard to the extension of its facilities and the improvement of its machinery, however, continues, and the past year has been one of considerable progress in these repects.

AND SO ON *AD INFINITUM.*

AMERICAN journals are fond of asserting that within the boundaries of New York city there are more telephones than in the whole of Great Britain and Ireland, which we must regretfully admit is indeed the case. We may seek an exiguous consolation in the fact that there are at present in the London telephone area 435,000 telephones, or more than in the whole of the highly-telephones country of Sweden. Sweden again may console herself with the knowledge that Stockholm with 100,063 telephones has 33% more than the whole of Hungary; whilst Budapest, with 31,998, has more telephones than the whole of an aggrandized Roumania with 31,651. Nevertheless, Bucharest in Roumania with 8,940 telephones has more than the whole of Greece with about 5,000. Athens, we dare to aver, has more telephones than the whole of Persia with 2,347. Still, Teheran, the Persian capital, with 1,305 telephones, can boast more than the country of Iraq with 780, while this does not prevent Bagdad, the House of Peace, the city of Haroun-al-Raschid and the capital of Iraq, which has 466 telephones, from beating the South American state of Paraguay with 450. We have not pursued our investigations so far as to discover what State Asuncion could surpass in telephonic development—probably New Caledonia, whose capital could perhaps beat Senegal—whose capital in its turn could almost certainly beat Abyssinia.

The moral of these chance comparisons is not, of course, that a country which is poorly developed should seek consolation in the fact that others are worse—a consideration which in any case does not apply to Sweden. It is rather that having something on which to congratulate themselves, they should strive to do better. We are glad to record that this country, as the foregoing article shows, seems to be on the way—if not to reach the American and Danish standard—at least to overtake some of its competitors.

VISCOUNT WOLMER, M.P., ASSISTANT POSTMASTER GENERAL.

HIC ET UBIQUE.

DR. FRANK CRANE in one of his ebullient hortations says: "*A man who hasn't a telephone isn't in business* ! A man who fails to make the maximum use of his telephone *doesn't stay* in business. America has many claims to distinction among the nations, but none more clear and undeniable than this: We USE the telephone !" All this is very sound and commendable, but *Telephony* in commenting on it points out how Americans abuse the telephone. In 18 months, for instance, in the State of Virginia subscribers lost 67,000 hours—2,790 days—of service by forgetting to hang up the receiver when they had finished conversation and thus remaining in each case aloof and unapproachable by telephone some twenty minutes.

The new telephone company in Spain, says a report, has just installed direct telephonic communication between Madrid and Tetuan. We have no official confirmation of the report; the line, if actually in existence, would form the first telephonic link between Europe and Africa.

The *Liverpool Post*, in remarking that the Liverpudlians often know less of the marvels of their city than does a visitor—a remark which might apply to the citizens of many other cities—advises them to pay a visit to the telephone exchange.

Here then, it says, is a golden opportunity for our own citizens, as well as our visitors, to expound their knowledge of Liverpool's wonderful variety of activities. It is a chance of getting out of water-tight compartments. A fellow-feeling makes us wondrous kind, which is to say that if we go and watch other people doing work which is quite different from our own we shall widen our sympathies as well as our knowledge. Nothing but good can come, for example, from the throwing open of two of our *busiest telephone exchanges*. There is another side to every story, and the telephone subscriber who declares once per day that he could get his message through more quickly per the post than over the wire owes it to himself as well as to the busy operator to go to *Central or Bank and see just what the* proposition is, and how near to perfection the arrangements are. And so on right through the piece.

The Annual Prize Distribution and Students' Conversazione of the Northampton Polytechnic Institute was held on Dec. 5 last, when the Marchioness of Northampton distributed the prizes and certificates, and an address was given by the Marquess of Northampton.

A very successful Conversazione for members and students was continued on Saturday, Dec. 6, when the building was thrown open to the whole of the members and students and their friends.

A correspondent writes expressing surprise that so much space was given to the Gerrard Swimming Club (the winners of the Pounds Challenge Cup) in the November issue, and thinks that more mention might have been made of the Regent Club. We are glad to record that this club gained the shield given for obtaining the most points during the season and has held it every year since it was instituted. We would point out that in the years when Regent won the Challenge cup we gave them full credit for their achievement in the *Journal*, and hope these explanations will satisfy our correspondent.

In a telephone district, many of whose clients live and have their being "far from the madding crowd," the following plaintive request was lately received by the District Manager :—

Dear Sir,—I shall have to ask you to allow my quarters account "now dew" to stand over until the end of this month. I had a stroke of bad luck the other day, lost my best sow, she died 14 days after farrowing leaving 13 young and I have had to use the money I had for the telephone bill to buy milk for them—please let me know if this will be in order.

Also as I have no night calls now I should be glad if you would have the bedroom extention removed at the end of the year, and oblige,—Yours faithfully,

No humanitarian could doubt that it was "in order" to postpone paying a telephone account with the object of saving thirteen young lives.

Christmas Day in my home, writes "Traditional" in the *Daily Mirror*, has come to be a day of "going back."

All utterly modern things are forgotten for twenty-four hours: the telephone bell is prevented from ringing; the wireless set and the gramophone relegated to a dark corner; mah-jongg and cross-word puzzles hidden away; electric light even is replaced by candles.

And none enjoy more the old card games, the simple piano playing of ancient tunes, the old-fashioned dances and dishes than my eighteen and seventeen-year-old children and their young guests.

A correspondent of ours who signs himself "Irrational" writes: "We go further in our ancestral halls. On Christmas Day we fling the kitchen range out into the garden and roast the turkey on a roasting jack at an open fire. Of course cigarettes are taboo on that day, and tea and coffee are forbidden—malmsey and sack take the place of cocktails. My guests, including my fifteen and sixteen year old nieces, breakfast on venison pasty and a quart of old ale. Phyllis is un-shingled and Doris de-bobbed for twenty-four hours. Foxtrots, five-steps, six-steps, and seven-steps are debarred to them, and as they and their young friends know about as much of 'Sir Roger' as of the waltz, they *do* enjoy themselves in the dance-room !"

We take the usual opportunity of wishing all our readers a happy and prosperous New Year.

DEATH OF SIR ANDREW OGILVIE.

WE deeply regret to learn, as we go to press, of the death of Col. Sir Andrew Ogilvie, K.B.E., recently Joint Second Secretary of the Post Office and Director of Army Signals (Home Defence) during the War.

WIRELESS TELEPHONY, WITH SPECIAL REFERENCE TO BROADCASTING.*

BY CAPT. P. P. ECKERSLEY, M.I.E.E.

It is always very difficult to sense the mentality of one's audience. How many of you understand all about resistance capacity, etc. ? How many of you, on the other hand, never really realised how it worked at all, except when it did work sometimes ?

The trouble, therefore, in my synopsis was to find something equally acceptable to the technical people who I knew would be here—the people who were interested in communication over wires—and how many would want to know exactly what was wrong with their sets. I have tried to steer a middle course and I may fall between many stools.

I have on my synopsis the first principles of wireless telephony. You will know that Hertz showed that communication by wireless was possible and how we came to the first great achievement which made it a practical possibility when Marconi instead of having the diode, thrust one plate into the earth and the aerial into the earth, and thereby found his efficiency of transmission was greatly increased ; how, after that, it was possible with more and more power, to send signals over greater distances, and how in the end it became a commercial possibility.

The introduction of wireless telephony however did not come immediately. In the beginning transmission was by spark, that is to say waves were created in the ether which were of impulsive character. Little jags of waves were sent out which, arriving at the receiver, jagged the aerial at time intervals very largely compared to the frequency of the emission.

It was the desire of experimenters to find some way of producing continuous waves, that is to say waves that went on regularly with reference to the ether.

The arc was able to produce 12, 15, 20, 60 or even up to 500 amps in the aerial ; we could in fact handle very many kilowatts with the arc (worse luck). We then had in some way to modulate the intensity of these continuous waves by the voice, which is the whole essence of wireless telephony. We produce continuous waves which make currents in our aerials at, shall we say, a million frequency ; and then superpose on to those frequencies a lower frequency which is produced by the variations of the voice making the sound wave hit a diaphragm.

Obviously, with enormous energies to deal with direct as we had in the old arc days, it was necessary to construct a transmitter which directed by the voice would be able to vary the intensity of the oscillations in the aerial.

There were all sorts of inventions in those days, and very interesting reading they make, but they would not be exactly suitable to broadcasting. One of these consisted of a large cask of acid which would hardly be suitable for one of our studios. There were other devices of all sorts, but none in the least practical, and although the human voice was carried over large distances in 1906 or 1907, the thing was wholly impracticable, and consequently there was no other type of receiver except the crystal set which is not sensitive and does not possess the powers of other receiving sets at the present moment.

It was the invention of a thermionic valve and afterwards the modification by Dr. Lee Forest, that gave us a practical means of effecting wireless telephony. People are inclined to forget that it is the whole corner stone of broadcasting, euphemistically termed the " bottle " by the amateur, but by the better people—like myself—the valve. This valve is the be all and end all of broadcasting ; it gave us three great things. In the first place, it gave us a means of producing continuous waves efficiently without the use of arcs, which are more trouble than they are worth ! It gave us also a method of producing waves at any frequency at 10 to 1 still with the valve responding and still without time lag.

The whole principle of a valve is—that it is a valve ! There is nothing new in a valve. We know that a child pulls the lanyard of a gun and blows up people 15 miles away ; that the engine driver can start an enormous train by placing his hand on a lever. We can do all these things, but we cannot do them as with the valve, without time lag whatsoever, and here is the whole beauty of the valve—that it operates absolutely without any time lag and will produce oscillations up to two hundred million per second if we want it to.

We have a microphone equipped with a small coil which is hit by the variations of the voice of the announcer, but it never moves more than a thousandth of an inch and the energy is so small that you could not hear a single sound if you connected telephones across it. And yet consider what we have at Chelmsford.

Now, in turning to the more practical methods, what methods could we adopt of actually controlling these variations in the air ? We have a continuous wave oscillator which is sending out variations of frequency into the ether. There are several methods which can be adopted. In general, these resolve themselves under two separate heads : the first is a trigger method. We may, on the other hand, have a system where actually you vary the power to the oscillator, i.e. when a strong impulse from your voice hits the microphone, and so controls the output of the oscillations. As a matter of fact, at the present moment and in the present state of the art, there is no doubt that the transmission gives a reproduction, I might call it, or at any rate a faithfulness to an agreed scale far in excess of any receiver so far made.

The great problem is how to produce an instrument which, having finally received our nearly perfect transmission, will convert those impulses received on the aerials and will finally put them into a device which will reproduce them as faithfully as they are received.

I am convinced that the next great advance in broadcasting must come in the receiver. I may say we are only awaiting the production of some new loud speaker before we shall be able to say that it will be very difficult indeed to tell the difference between the noises made in the studio and the noises that come out of your loud speaker.

It is a fascinating problem, but one with which I cannot deal at present, because this has to be a general survey. That, however, is the next great advance. At the present moment I am convinced there is no receiver in the world that is an adequate criterion of advancement for the transmitter.

Now, having got a method of transferring sound from a small place to any of your homes, let us for a moment examine the potentials and see the problems inherent in broadcasting.

You know that in the beginning this country decided that there should be one single control of broadcasting and I was put in charge of the technical side. I was able, thereby, to see the whole problem as one concrete whole, and with advice from other people to serve the public better in the end.

The difference between broadcasting on a monopolistic basis and broadcasting where the broadcaster puts up the station for his own pocket, is that in the case of the monopoly the public is studied first, whereas the individual studies himself first.

In the beginning, I was confronted by a large number of stern-looking people who said : " Go and give us broadcasting in England." My mind leapt towards the idea of power, nothing but power, because it had to be democratic and any body would be able to receive on anything (the latter part is largely done !). My mind, therefore, went towards the idea of high power stations to cover England with broadcast from three stations, a hitherto unheard-of power.

Unfortunately the Postmaster General said " No," and we were limited in the beginning to eight stations with too little horse power. These stations had to be more frequent, and one questions really whether it was the wisest decision, because obviously the jamming situation is one to be considered, and naturally it was thought that these high power stations would do more jamming than the lower power. They would ; but inasmuch as there will have to be a greater number of low power stations, the emission has to be spread over a larger wave-length.

From the point of view of broadcasting, however, the division of the stations into different areas was a very much better one, because each locality was able to be served with what it liked best (or least). The idea of a station in Scotland was to broadcast haggis frequently ; in the south-west possibly to deal with matters interesting to the south-west ; in London, a station to deal with matters connected with London. I think the scheme was a wise one. I thought I should be able to go back to my office, have a padded chair, put my feet on the table, enjoy myself and enjoy my salary. It was been more like a padded room I have needed.

You may be interested to see how we have solved the problems which were put to us by our many correspondents. A man, say, has lived at Brighton and has written us—" Dear Sir, (or more frequently " Sir,")—Your magnificent concert the other night (by the way it is always ' magnificent ' if they have not heard it) was entirely ruined by the irritating dots and dashes of the morse code. Will you have it stopped at once.—Yours truly."

One then asks the Postmaster General if the broadcast can be kept free from jamming ; but the French trawlers go out with a long wave length, and every time they catch fish they send a message home.

We have been met very sympathetically by the Post Office, but possession is nine points of the law, and it is a little difficult all at once to shift the interfering stations off the wave band, and it was decided that two purposes would be served by our new policy, which was not to move these stations but to make our broadcast so large that other transmissions would not be heard. So the idea of relay stations was developed.

It began with a man from Sheffield. He said it was like an insurrection in Hell to listen-in in Sheffield. I went up and listened, and he was quite right. The trouble was that the signals were too weak ; there was jamming and the people had not been able to afford sets which gave an adequate factor of safety, and were oscillating.

It was decided then, to erect in Sheffield a small relay station, which should repeat what a main station was saying. We first of all put up the wireless relay—that is to say, outside Sheffield we put up a wireless receiving set, and we received from Manchester. The receiving set was connected by a short land wire and we had to be careful of reaction which was overcome in time. We found that the wireless relay was nothing like so reliable or so efficient as a land line and we eventually installed a land line between

* Report of a lecture before the London Telephone and Telegraph Society.

the two towns. That went on for about three days, until they said they were 'fed up' with each other. That is the idea of the relay station—to take the London programme down the ordinary lines for commercial use. We guarantee the relay stations, which are 400 watt power as against 1,500 watt power of the main station, to have a range of about five miles.

We erected 11 during this year—in fact one a month—and in each case we laid a land wire from London out to these various towns (Plymouth, Dundee, Bradford, Sheffield, etc.). The idea is for these stations to allow each town and city to enter into broadcast for the amusement and interest of the people, especially in connexion with their own particular areas. Now, at the end of this year, 60% of the population of the British Isles is able to receive broadcasting on an instrument not costing more than £3, which is fairly good work.

Later on it was realised that our ideals of democracy of everybody receiving on anything anywhere were not quite fulfilled. We realised that the country people as well as the town people should be able to enter into the system, and so we experimented with a high power system at Chelmsford which was of 25 k.w. power. With that station we got 100 miles to a crystal set, about 200 to a single valve set with reaction, and anywhere in the British Isles on a two-valve set. That gave us 80% of the population able to receive on a crystal.

However, this multiplicity of stations renders possible a multiplicity of programmes.

When I went to America I was struck above all things with the possibilities of variety in the programmes. In New York there are 12 stations working all at once, and it is possible by turning a condenser to get 12 different programmes. That all the programmes are the same does not alter the fact that it might be varied under one central head. I heard the song "Because" sent from three different stations on the same night in exactly the same city on the same wave-length. Rather redundant, I thought!

The next trouble experienced was what we call "fading," but this again is solved by the multiplicity of stations. Somebody, who thinks that there might after all be something in this wireless, has set to work to make himself a set. The great moment has arrived when he is going to connect his set to his aerial and about to demonstrate to his family the marvels of wireless. He starts to hear something and is about to turn his head to anticipate this marvel, when all at once the signal suddenly fades to nothing. He then turns his head and it goes up and down the whole time. He does his best; he oscillates, but in the end it is just the same, and next morning a letter arrives addressed "Sir," which asks why the Engineers in London should think it necessary to swing on the controls. For once it is not his fault, but ours.

Theory indicates that during the day the air is electrified; at night it ceases in the lower part of the atmosphere, but above, a layer of electrification forms which is variously estimated at 15 or 20 miles above the earth's surface. At night the waves are reflected downwards. There is no assurance that the waves reflected downwards will be in phase with the waves received directly. It is just a casual electrification between the two points which determines whether the waves shall be in phase with the direct waves, and so you get the possibility of no signals or a much louder signal.

The existence of this Heaviside layer is extraordinarily interesting. You have read in the press how, with the high tension derived from a rotary brush and a small valve, people have been able to signal across the Atlantic to friends in America. I have not so much wondered at the skill of the transmitter or the receiver as at the extraordinary discrepancy of calculated results actually received.

You have possibly listened to the station KDKA and you may have heard it re-transmitted from our stations; you may have heard the American voice transmitted over 3,600 miles, with an expenditure of energy of less than 20 k.w. It is certainly a wonderful achievement, and the last results show that during favourable times the whole trouble with these transmissions is that you get this night distortion—that curious restrained tone—the curious blurring and lack of intelligibility, and the lowness of tone. These factors have all been noticed by observers. I think this is explainable by the reflections; the jumbling of phases so to speak, due to some waves arriving direct and others via the Heavside layer.

We have at 2L.O. an oscillator or independent drive, which is designed to keep the wave absolutely constant, and I think we can guarantee that it is constant. We took this away and substituted a method by which any swing in the aerial would be manifest, and immediately it was reported from places such as Norfolk, Northumberland, and in the West Country, that our speech had wholly deteriorated and resembled nothing more than KDKA.

Capt. Round, who has in many cases suggested the right theory, did at this time suggest that the phase shifting was sufficient to produce these distortions. We have asked KDKA to substitute an independent drive; they swore, however, that their wave-length never varied a cycle. They said they would try a method of keeping their wave-length absolutely constant, and it will be interesting to see whether their system will change to one of more clarity. It will certainly be an interesting experiment.

We have at this moment in England a system whereby 80% of the population are able to get clear, clean and unjammed broadcasting, and there is no reason why this should not obtain in every country. The question, then, would be to connect the various systems. It is possible to telephone to America by wireless. I have indicated to you the great difficulty of serious distortion, but let us suppose that this has been overcome, and that the link between England and America is perfect. The beam system gives us this advance—that it conserves the power and sends it in one direction. Let us imagine a moment that there is going to be a big speech delivered in our own Parliament, which for reasons best known to themselves the Americans want to hear. We would have a microphone somewhere in the Houses of Parliament which would be connected by a land wire to our Headquarters here, and it is not inconceivable that a wire should run down to England's radio west, which is situated somewhere in Cornwall. In America the emissions would be received, taken to New York, broadcast and taken to other stations throughout the United States. Not only that; Canada might be linked up as well and furthermore, from the west coast of America it would be possible to take these transmissions on to Asia (what good that would be I do not know, but I merely indicate the possibility).

I would indicate that wireless comes forward as a means of communication where it is impossible to maintain a land line. It is obvious that at the present stage of development we could not get a land line to India, and so a wireless link might be necessary. But my whole point is that by connecting wire and wireless together we shall have an adequate means of communication.

We are doing a lot of work on this simultaneous broadcasting, and I would like to say that our work would not have been anything like so successful had it not been for the loyal co-operation of the Post Office Engineers. They have been splendid in maintaining the wireless free from distortion. So wonderful has the Post Office helped us that on nearly all occasions can one hear a public speech given in Aberdeen, which is a wonderful achievement and entirely due to the Post Office officials.

I am going to show you, before I sit down, the future that I see on this side for ordinary wire telephony in connection with wireless.

You realise that in the transmission of ordinary speech the requirements of a line are very different from the requirements of a line for the transmission of music. I think speech frequencies below 3,000 are fairly adequate for communication. I imagine all tendency now is towards the burying of cables and the introduction of repeaters, using the valve. That may be easy for your purposes, but what we shall have to stick to all the time is open wires. We have to design the whole thing to be equally efficient between practically 8,000 a second up to 13,000.

Transformers have got to be re-designed and also methods of putting in relays in order to make the emissions loud compared with the possible interference we get.

In America the problem is easier; their scheme has grown up from later beginnings and they are not troubled by reflections from different types of circuits used everywhere. I must say that the American transmissions were extraordinarily good, and I am perfectly sure that with your co-operation we shall soon have just as good, even if we have not got it now.

THE KNIGHT OF THE BURNING PESTLE.

The whole of the proceeds of an excellent performance of the above old English play presented by the Interkom Klub, C.T.O., and assisted by that able little orchestra, The Berkeley, were devoted to the Elizabeth Garrett-Anderson Hospital, Extension Fund.

The cosy little Cripplegate Theatre was comfortably filled on Friday, Dec. 19, despite the many and pressing calls which the nearness of Yuletide must have made upon many of those present.

The scene of the play is an Elizabethan stage, and the action begins at a moment when the Prologue, preparing to announce a performance of "The London Merchant," suffers interruption from a citizen grocer and his wife, who, seizing the custom of a spacious time, mount the stage. Under the spell of "Don Quixote" and such extravagant romances as were the vogue of the day, they insist that knightly deed and bold adventure be superposed upon the story of the play, in order that their apprentice, Ralph, bearing a noble shield quartered with the grocer's pestle burning, may act the hero's part.

The Citizen grocer and his wife were perfectly impersonated by Miss Gertrude Matheson and Miss Margaret Murdoch, as were the parts of Mistress Merrythought, Michael her younger, and Jasper her elder son, by Miss Ephrosyne Wheeler, Miss Maguerita Priddis and Miss Hilda Stock respectively. Miss Elizabeth Dawe made a capital husband and well maintained the character of Master Merrythought throughout in spirit and in detail. Venturewell, by Miss Dollie Atterbury and Luce by Adelaide Norris, were also well represented, Ralph the grocer's apprentice was not perhaps the best character for Miss Nellie Nichols, whose excellency in other characters and on other occasions has fixed an exceptionally high standard for this talented lady. Miss Tynan and Miss Luffman who were the responsible stage managers, the former also having arranged the dances are to be congratulated upon a very successful production. The staging was good and the Elizabethan spirit well maintained throughout, but was it possible to light a "churchwarden" pipe with a petrol lighter in the days of Shakespeare? J.J.T.

IS TELEPHONY OUSTING TELEGRAPHY?

BY J. J. T.

(*Continued from page* 43.)

THE replies to Query No. 3, "To what causes do you attribute these decreases?" may be epitomised as tabulated below:—

Tabulated Statement by 23 *Administrations regarding Telegraph traffic since* 1920, *and the cause or causes of any Decrease in the number of Internal and/or Foreign telegrams dealt with during the years* 1921-23.

NAME OF STATE. (1)	Due to the abnormal economic situation. (2)	To Extension of Telephone. (3)	To Increase or heavy Telegraph Charges. (4)	To other causes. (5)	REMARKS. (6)
Belgium ...	—	Very largely ...	—	—	Internal traffic only affected.
Bulgaria ...	Partly	In a small measure	Partly	—	Internal and Foreign.
Denmark ...	Wholly ...	—	—	—	Internal and Foreign.
Egypt: 1st and 2nd Region	Partly	Very largely ...	—	—	
Egypt: 3rd Region	Partly	—	—	Improved postal service	Internal only shows decrease, Foreign shows increase.
France	Almost entirely	To a small degree	—	—	Internal and Foreign.
Germany ...	Principally ...	—	—	Military occupation	Foreign traffic increased 1921 and 1922, decreased 1923. In 1924 again apparently rising. As regards (2) the result of paralysis of industry in the Ruhr district.
Great Britain ...	Partly	—	Partly	—	Internal only affected.
Holland... ...	—	Principally ...	Partly	—	As regards (3) and (4) Inter-urban telephone calls of 3 minutes now cost less than telegram of 10 words and cost less than average telegram of 13.6 words.
Hungary ...	Entirely ...	—	—	—	Internal and Foreign affected.
Italy	Partly	—	Partly	—	Internal only.
Lettonia ...	—	Entirely ...	—	—	Internal only.
Luxembourg ...	Partly	Partly	Partly	—	Principally Internal.
Morocco ...	Very largely ...	Very largely ...	—	Aerial post ...	As regards (3) refers to Internal traffic only. As regards (2) refers principally to International traffic, and (4) refers only to traffic with France and Algeria.
Norway... ...	Partly	Partly	—	—	——
New Caledonia...	—	—	—	High cablegram rates	——
New Zealand ...	Partly	Partly	Partly	—	(3) Has a certain relation, so far as the Inter-urban extensions concern internal traffic, but 1920 was an abnormal and artificially prosperous year. This was followed by severe depression; comparisons thus difficult.
Poland	Entirely ...	—	—	—	Internal and Foreign traffic affected.
Roumania ...	Partly	—	Partly	—	As regards (4) the return to normal conditions of post and telephones refers to Internal and Foreign.
Sarre Territory	—	Entirely ...	—	—	Internal and Foreign industrial and commercial circles prefer telephone.
Sweden	Principally ...	Partly	—	—	Internal and Foreign.
Switzerland ...	Partly	Partly	—	Improved postal rail and road facilities	(5) Refers more specially to frontier traffic, but both Internal and Foreign traffic affected.
Tchecoslovakia	—	Principally ...	—	—	——
Union of Soviet Socialist Republics	—	—	—	Decrease of traffic due to the inauguration of payment for telegrams instead of free use of telegraphs	Foreign telegraph traffic increase due to amelioration of technical means and economic re-establishment of the country. If telegraph traffic has not attained pre-war level, fact is due to the detachment from Russia of several industrial districts.

To the specific Question, No. 4, "Has the increased telephone traffic influenced the decrease?" the *Journal Télégraphique* says: "Nearly all the replies to this question are in the affirmative," and gives "the most characteristic," which are those received from Belgium, France, Luxembourg, Sweden, and Switzerland respectively. These form an interesting study, but as four of the five countries quoted are of small area and population, while two of them were not directly affected by the war, the study would appear to be incomplete.

We will, however, postpone the condensed reproduction of these reports and proceed to analyse the above tabulation in which it will be noted that, while of the 23 administrations quoted, 14 state that in varying degrees the telephone has detrimentally affected the telegraphs, 19 direct attention to the abnormal post-war economic condition, or its effects, as a very serious factor in the situation.

(*To be continued.*)

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

TELEPHONE statistics for the month of October show some recovery, after the falling off for the two preceding holiday months.

The net gain in the number of telephones working was 9,337, the best figure for several months, notwithstanding that, under the present quarterly method of accounting, cessations are heaviest in the first month of the quarter.

A table of the general statistics for the month showing the growth in the various branches of the telephone service is shown as follows :—

	London.	Provinces.
Number of Telephone Stations working :—		
Total	431,449	791,330
Increase for month	2,917	6,420
Residence Rate Subscribers :—		
Total	75,717	129,652
Increase	1,066	1,897
Exchanges :—		
Total	103	3,598
Increase	1	18
Call Office Stations :—		
Total	4,099	14,291
Increase	13	62
Telephone Street Kiosks :—		
Total	41	794
Increase	4	37
Rural Party Line Stations :—		
Total	—	9,103
Increase	—	98
Rural Exchanges opened under 1922 Development Scheme :—		
Total	—	589
Increase	—	15

The further table appended of exchange telephones, divided according to the type of equipment installed at their respective exchanges gives some indication of the progress made during the past two years, and also since March 1914, in replacing the older Magneto type of exchange with the more up-to-date C.B., C.B.S., and Automatic types :—

At end of	Magneto.	Central Battery Signalling	Central Battery.	Automatic.	Total.
March 1914 ...	321,654	35,361	369,694	974	727,656
Sept. 1922 (after loss of Southern Ireland) ...	281,985	83,825	574,154	29,162	969,126
Sept. 1924	278,337	133,847	719,458	47,391	1,179,033 excluding 4,145 electrophone stations.

Trunk traffic, both inland and international, continues to make strides. The number of inland trunk calls dealt with during August, the latest available date, was 6,163,518, or an average of 241,707 calls per working day. The former is ahead of the figures for August last year by 437,973 calls or nearly 8%, notwithstanding the fact that August 1923 had one more working day.

Further progress was made during the month of November with the development of the local exchange system. New exchanges opened included the following :—

LONDON—Franklin, Woolwich.
PROVINCES—York (Automatic), Hertford.

And among the more important exchanges extended were :—

LONDON—Addiscombe, East Ham,	Walthamstow.
PROVINCES—Ashford (Kent).	Knock (Belfast.
Chesterfield.	Sheffield (Trunk).
Chorlton-cum-Hardy.	Stockport.
Didsbury.	Sutton Coldfield.
Erdington.	Wilmslow.

During the month the following additions to the main underground system were completed and brought into use :—

Wigan—Ormskirk,
Durham—Bishop Auckland,
Oxted—Westerham,
Sheffield—Chesterfield,
Chester—Wrexham,
Tunbridge Wells—Eastbourne—Hastings,

while 87 new overhead trunk circuits were completed, and 73 additional circuits were provided by means of spare wires in underground cables.

GHAZAL.

[*Telegraph Service.*—In the Khartoum north section, white ants were found to have eaten away the inside of the poles, leaving only an outer shell of approximately one inch in thickness, where the wood had been treated with creosote. Between Sennar and Roseires, the majority of the poles had rotted round the bolts by which the iron bases are attached, whilst woodpeckers had made holes clean through the poles immediately under the cup-arms. Between Roseires and Shamea Omar the line had to be practically rebuilt owing to the continued damage by elephants. Of a total of 450 days upon which communication was interrupted on some part or other of the system, on 211 days interruption was due to storms, on 136 days to elephants and giraffes, and on seven days to fires. Cmd. 2281. Sudan No. 2 (1924).]

Those engineers who in the East keep watch and ward o'er telegraphs,
Have oft to do with half a zoo, since elephants and tall giraffes,
White ants and woodpeckers combine to make the upkeep of a line
An enterprise which may give rise to early-written epitaphs.
For tapping woodpeckers make holes through the circumference of the poles
Would Allah they would tap the wires and not their stout supporting staffs !
Those ants to whom the sluggards turn, true Solomonic lore to learn,
Devour the woodwork with more zest than toper choicest vintage quaffs.
And then the wires, however high they stretch in that sub-tropic sky,
They hang within the easy reach of stray omnivorous giraffes.
The route from Shamea Omàr which carries circuits to Sennàr
Was recently rebuilt again by most long-suffering of staffs,
For elephants in herds and packs alleviate their itching backs
Against the poles—and when they push, though firm as marble cenotaphs,
The poles are splintered, and the sands are strewn as though with lifeless bands
Of tribesmen fallen in a fray unchronicled by biographs.
With pachyderms so much to blame, the hazards of the daily game
Are manifest, and those rebuffs at which the unreflecting laughs
Have moved a poet of these times in (more or less) undying rhymes
To sing the triumphs of Sudan's directorate of telegraphs.

W. H. GUNSTON.

SCIENTIFIC PEDDLING.

A NEW AMERICAN DEVELOPMENT.

From "Business Management" (by permission).

THERE is a development of house-to-house salesmanship in the United States which is of interest and possibly of significance. It is the result of very careful study and organisation. The salesman is taught in thorough fashion. He attends a course of lectures, and during the course he is given actual practice in handling more or less obdurate housewives who may be imagined as answering the door. Once on the road, all he takes with him consists of samples. He does not sell anything on the spot. He books an order and the goods come by the cash-on-delivery system. He does not carry many samples, for it has been found wiser to concentrate on a few articles. There is psychology in this, for the lady must not be kept long at the door. The method is quick and to the point. The trained salesman can present his appeal in a few seconds. He knows how to put it as a swift-passing opportunity which may never come again. He is never depressed, and he is never anxious for a sale as if his life depended on it. The idea is that he represents the manufacturer direct, and that the chance to deal with a manufacturer direct should not be missed.

Accordingly we read amazing accounts of vast businesses which have been built up in this way. There is a factory for silk underwear, which sells all its product by means of scientific pedlars, who are carefully trained and sent out, and brought back for revised training and sent out again. It is astonishing to read that this factory sells nearly a quarter of a million pairs of silk hose daily. The salesmen interest their clients in the method of manufacture and explain everything to them—except the mass production of salesmen. They are highly paid. A leading American financial journal estimates the payment as between thirty and forty pounds a week.

The psychology of it goes even deeper than we might expect. The clients get to look upon the scientific pedlar as a friend. His visits come to be welcomed. He is asked for advice as to the purchase of other things. He gives the advice, but he notes the questions in a special column in the information section of his order-book. Then when he returns to the factory he sums up this information and presents it to his employers in a summary form. Then the employer considers the possibility of sending his agents on a round with the article for which a demand seems to exist. By this means one manufacturing house came to extend its plant threefold within the space of two years.

The retailers have tried to check this movement, and we need not be surprised. It seems that in towns of a certain size, women like to shop at home ; at any rate, that is what the scientific pedlars say. What is probably nearer to the truth is that the art of salesmanship has been more highly developed by these "scientific" pedlars than by the retailer. It was said in a local law case that more raincoats were sold on one day by a pedlar, working on this plan, than in all the retail shops of the town in a week. That was the basis of a contention that "hawking" should be stopped. The manufacturers' reply was that nothing was "hawked." All that his 20,000 representatives did was to present themselves for the favour of an order just as the butcher and baker called.

But the retailers' reply is even more extraordinary. They are trying "scientific peddling" by telephone. In the American journal I have mentioned, a case is given where a retailer employed fifty-six telephone girls to sell various articles over the telephone. These girls are paid 10% commission, and the average earnings are 35 dollars a week. The persons in the telephone directory are divided up among the girls, and each house is rung up in turn. Here is a model approach as quoted in the paper referred to : "Our superintendent requested that I call you on the 'phone to explain the Blank soap that we are selling at four dollars a case. With each case purchased this week, we give away a case free of charge. We sell to many people of this city, and undoubtedly you know Mrs. So-and-so, who lives in your block, who purchased a case of our soap yesterday receiving another case free of charge." So the subtle suggestion is made and the telephone operator is 40 cents the richer.

It is all very surprising, and points to a piquant contest. There are experts who have given themselves to the study of the house-to-house market, and who are prepared to show both the wholesale manufacturer and the retail dealer how they can use it to their advantage. There is also an agency with a body of "scientific pedlars" to command, each member of which has his own constituency, and this agency is quite ready to take fresh ventures either for wholesaler or for retailer. The point is that, given suitable article to "peddle," these scientific salesmen aver that each has a hundred thousand potential purchasers. It is a wonderful and intriguing prospect.

J. L.

RETIREMENT OF MR. E. WILLIAMSON, DISTRICT MANAGER, GLASGOW.

THROUGH the retirement under the age limit of Mr. Edgar Williamson, District Manager Telephones, Glasgow, the Department has lost a valuable servant and one of the few remaining early telephone pioneers. Born at Kerridge in 1864, Mr. Williamson entered the service of the Lancashire and Cheshire Telephone Company as a Junior Inspector at Blackburn in 1881, and was later promoted to be Local Manager there. On the amalgamation of the Lancashire and Cheshire Company with the National Telephone Company in 1889 he was transferred as Local Manager to Hull. Mr. Williamson was responsible for fitting the switchboard with self-restoring drops and bridging indicators, which it is believed was the first of the type brought into use in England. He also carried through an underground scheme which presented exceptional difficulties in crossing the tidal river (Hull) and various dock basins. About the same period trunk lines were erected between Hull and Goole, and between Grimsby and Thorne for Doncaster, iron masts, some of them 115 feet high, being arranged to carry the lines clear of the shipping on the Ouse and Trent.

Subsequently, Mr. Williamson occupied the position of District Manager for the East Yorks District, and in 1898 was transferred to a similar position at Nottingham. He was in 1907 appointed to the Birmingham District and in 1912 took over the management of the Glasgow District.

In order to mark the occasion of his retiral he was, on Dec. 5 at a representative gathering of the Staff in the Postmaster's Room in the Head Post Office, Glasgow, the recipient of a handsome Westminster chime grandfather clock.

The presentation was made by Mr. S. G. Forsythe, Postmaster-Surveyor, who in the course of his remarks referred to the good work which Mr. Williamson had done for the Department in Glasgow, and assured him that he carried with him the best wishes of the Staff in his retiral. In replying Mr. Williamson was in reminiscent vein and gave a few of his recollections in connection with early telephony. He thanked the meeting for the handsome gift and remarked upon the cordial relations which had always existed between himself and the Staff.

Mr. Forsythe read a resolution which has been passed by the Glasgow and West of Scotland Advisory Committee on Telephones and Telegraphs at their last meeting. The resolution was in the undernoted terms :—

> "The Advisory Committee on Telephones and Telegraphs desire to record their regret at the retiral of Mr. E. Williamson, District Telephone Manager, owing to the age limit. They desire to record their appreciation of the ability, energy, tact and courtesy he has displayed in the important office which he has held in Glasgow during the last thirteen years. They also desire to put on record the excellent relationship which has existed between the Advisory Committee and himself since its establishment in 1913, and the ready manner in which he has at all times supplied information and generally assisted in its work. They thank him for his valuable services and desire that he should carry their best wishes with him in his retirement."

Representatives from the Engineering Department and Postal, Telegraph and Telephone Branches, also spoke.

At the conclusion of the proceedings a hearty vote of thanks was accorded to Mr. Forsythe for having presided.

A RETROSPECT.

LIVERPOOL TRAFFIC SECTION.

BY S. J. SWINNERTON (*Liverpool Traffic Office*).

IN an article written some time ago, respecting the Budget of 1924, a leading writer adverted to the reduction of telephone rates as being satisfactory, particularly as it coincided with a steady improvement in the efficiency of the service throughout the country. This favourable comment led me to look backward to 1919 when the service was the subject of much public criticism and of many complaints, albeit often unjustified, and to consider the causes which have led to the undoubted improvement.

I think the Traffic Section can claim a fair share of whatever credit may be due. The Provincial Traffic Organisation can hardly be considered as having had its being until post-war times. Certainly the nucleus was formed in 1914, but the war intervened, and until 1919 the Section can hardly be regarded as having commenced to function in its proper sphere. The personnel had been much depleted during the war period; at Liverpool, for example, only 3 Traffic Officers remained of a staff of 10.

To maintain or bring the Service to a high state of efficiency in the circumstances was impossible, and it was not until very late in 1919, when staffs began to assume their normal Establishment, that progress could be made. The work and the problems that then had to be faced seemed apparently overwhelming and almost without end. In the Liverpool District little had been done during the short period —1913 to 1914—except to carry out the fusion of the National Telephone Co. and the Post Office Services, the introduction of a "No-delay" service between Liverpool and Manchester, and to amalgamate the trunk and local exchanges at those towns where under the divided administrations two separate exchanges existed. Amalgamations of this sort were carried out at Warrington, Widnes, Runcorn, St. Helens, and Prescot. In 1915-16-17 a little progress was made in extending "No-delay" services, and Ormskirk, St. Helens, Chester and Ashton-under-Lyne were brought into the scheme.

In 1919 the urgent problem appeared to be that of service efficiency and the displacement of obsolete equipment, but the trade boom happened and emergency steps had immediately to be taken to provide additional equipment, and to train a large number of additional telephonists. It was, however, realised that the Liverpool Service generally could not be improved to any great extent, whilst the main exchange and routing centre had obsolete and very old equipment; therefore, the transfer of the Central exchange to a new building equipped with up-to-date facilities was the first work of importance taken in hand. Fortunately a suitable position for an operating room, engineering requirements, and telephonists' quarters was available in the Bank exchange building, and this enabled the work to be commenced in a remarkably short time, with the very satisfactory result that in October, 1920, a change-over was made and the transfer successfully carried out. The result was at once reflected in the service, and complaints were materially lessened. The position at the old Central exchange had given rise to much anxiety and it was, therefore, a great relief to have the "Key" exchange of the district in good working order.

Coincident with this transfer some extraordinary effects were being felt from the remarkable trade boom of 1919, 20, and 21. The traffic increased rapidly and attention had to be given to the possibility of increasing the "A" and "B" capacity at a number of exchanges where the equipments and the calling rates permitted, and of adding switchboards where the traffic increase was in excess of the equipment capacity. Part of the work had been carried out, when in 1921 a trade slump occurred. After a while it became evident that a return to boom traffic was not an early probability; that conditions had become stabilised for a period, and that furture development could, with a fair degree of safety, be based on these conditions.

This assumption has to a great extent been justified, and although during the past year a very encouraging development has occurred, probably greater than for some time past, the likelihood of little more than a steady and normal development can, at any rate, for the present, scarcely be looked for.

Anyhow, the trade slump entirely changed the conditions from a traffic aspect. Proposals for equipment in hand had to be revised and estimates reviewed. It was found that the traffic life of the exchanges would be increased and the drop in the calling rates would permit of additional answering equipment being installed to provide for the traffic capacity.

The decrease of traffic led to the consideration of the possibility of extending the area covered by the "No-delay" service, and, after due thought, it was decided that advantage might be taken of this factor, with the result that the extensions which had been held up pending the provision of additional lines and the completion of underground cable schemes were proceeded with. In 1921 the Prescot area was added, followed in 1922 by Warrington, Runcorn, Blackpool, Bolton, Preston, and Wigan, while in 1923 Oldham, Rhyl, and Northwich were added, leaving only Llandudno, Colwyn Bay, Wrexham, and possibly Crewe, to be dealt with.

The introduction of a "No-delay" service over such an area has undoubtedly been of advantage to the business community and, from the point of view of the Department, the remarkable growth of traffic which has resulted has fully justified the policy. When it is recollected that the original "No-delay" trunk system was established between 28 Liverpool exchanges and 22 exchanges in the Manchester area, and that the facility is now available between over 300 exchanges, the progress made in this direction must be recognised as remarkable.

It has already been stated that in 1919 the problems to be faced were many and important, and an initial review of the conditions showed that one of the chief problems was that of the provision of new exchanges to replace obsolete and worn-out equipment, and also to provide for future development with the ultimate aim of making the best use of the up-to-date equipment to be installed at the main exchanges, the Central, and already in use at the Bank exchange. Obviously, an entirely efficient service could not be given whilst most of the subsidiary exchanges were equipped with magneto apparatus, nor was it sound policy to have costly and up-to-date equipment at the Central exchange and not to co-ordinate the other exchanges in order to obtain the fullest efficiency of this equipment; a review had also to be made of the life and capacity of the existing exchanges where new switchboards could not be justified, bearing in mind the possibility of extension, if necessary, on the existing equipment, and on the premises.

This work involved an enormous amount of time and research, and its scope can perhaps be best shown as given below :—

WORK CARRIED OUT IN 1920.

Exchange.	*Nature of Work.*
Lymm	Additional 50 line switchboard installed.
Central	Exchange removed to new premises. C.B. switchboard installed with capacity for 3,960 lines.
Bank	Extension with capacity for 1,660 lines installed.
Central & Bank ...	Transfer of 1,200 lines from Central to Bank.

WORK CARRIED OUT IN 1921.

Exchange.	*Nature of Work.*
Walton	Increase of "A" capacity by 100 lines.
Ramsey	Additional 50 line switchboard installed.
Wallasey	Exchange removed to new premises. C.B. switchboard installed for 2,880 lines.
North	New Magneto Exchange with capacity for 1,700 lines installed.
Rainhill	Exchange removed to new premises. C.B. switchboard installed for 60 lines.
Garston	Minor work. Additional answering equipment installed.
Heswall	Extension of answering equipment and multiple to provide capacity for 160 additional lines.
Hightown	Removal of Exchange to new premises. Magneto switchboard for 100 lines installed.
Castletown	Additional 50 lines switchboard installed.

WORK CARRIED OUT IN 1922.

Exchange.	*Nature of Work.*
Bootle	Two "A" Positions converted to "B."
Grappenhall	Minor work. Additional answering equipment installed.
Service Branch Exchange	New C.B., P.B.X. installed with 4 positions.
Gateacre	New magneto switchboard installed with capacity for 400 lines.
Royal & North ...	Transfer of 200 lines from Royal to North.
Hoylake	Two additional 100 line magneto switchboards installed.
Mossley Hill	Re-arrangement of area, approximately 170 lines transferred to other Exchanges.
Neston	Additional 50 line magneto switchboard installed.
Old Swan	Extension of switchboard capacity by 120 lines.
Anfield	Extension of switchboard capacity by 80 lines.
Birkenhead	Extension of switchboard capacity by 100 lines.
Runcorn	Exchange removed to new premises. New magneto equipment installed for 360 lines.
Widnes	Additional 50 line with capacity. Magneto switchboard installed.
Willaston	New Exchange opened with capacity for 150 lines.
Bank	Increase of capacity by 820 lines.
Bromboro'	Increase of capacity by 80 lines.
Central	Increase of capacity by 720 lines.
Mossley Hill & Wavertree	Transfer of 162 lines from Mossley Hill to Wavertree.

WORK CARRIED OUT IN 1923.

Exchange.	*Nature of Work.*
Warrington	Exchange removed to new premises. C.B. equipment installed with capacity for 1,066 lines.
Waterloo	Exchange removed to new premises. C.B. equipment installed with capacity for 960 lines.
Rock Ferry	Exchange removed to new premises. C.B. equipment installed with capacity for 940 lines.
St. Helens	Increase of switchboard capacity by 120 lines.
Helsby	New switchboard installed for 80 lines.
Lark Lane	Removal of Exchange to new premises. C.B. equipment installed for 760 lines.
Aston	Minor work. Additional Calling equipment installed.
Royal & North ...	Transfer of 377 subscribers from Royal to North.
Douglas	Increase of switchboard capacity by 200 lines.
Peel	Removal of Exchange to new premises.
Ellesmere Port ...	Removal of Exchange to new premises; new C.B.S. equipment installed with capacity for 180 lines.
Formby	Removal of Exchange to new premises; new C.B.S. equipment installed with capacity for 460 lines.
Kingsley	Minor work. Answering equipment increased.
Anfield	Increase of switchboard capacity by 60 lines.
Kirkby	New Exchange opened with capacity for 40 Subs. lines.

WORK CARRIED OUT IN 1924.

Exchange.	*Nature of Work.*
Royal	New C.B. equipment installed for 6,140 lines.
Upton	Capacity increased by 50 line new Magneto switchboard being installed.
Walton	Exchange removed to new premises. C.B. equipment installed with capacity for 1,060 lines.
Manley	New Exchange opened with capacity for 30 lines.
Grappenhall	New C.B.S. equipment installed with capacity for 160 lines.
Old Swan	Removal of Exchange to new premises. C.B. equipment installed with capacity for 1,080 lines.
Newton-le-Willows ...	Removal of Exchange to new premises. C.B.S. equipment installed with capacity for 180 lines.

The installation of the new equipment at the Royal exchange was an intricate operation, as the new C.B. boards had to be installed in the existing switchroom, without interruption to the service. The work had to be done piecemeal, sections of subscribers being transferred to the new equipment from time to time, in order to enable the installers to dismantle the old boards and instal the new. The transfer took over 9 months to carry through.

In addition to this work, the staffing positions at all exchanges had to be carefully watched, the staffs had to be drastically reduced when the slump occurred, and the increasing traffic due to the subsequent revival of trade had to be continually kept in view, in order to maintain the staffing standard.

The staff work entailed in the first instance to meet the trade boom, and then to carry out the reorganisation consequent on the slump, was extremely heavy. The staff reductions were further added to in consequence of the transfer of a considerable number of lines from the Trunk exchange to the Local exchanges to establish "No-delay" services. These later transfers permitted a reduction of the Trunk exchange staff by approximately one-third with a proportionate reduction of supervisory posts.

Although the retrospect is now almost complete it does not by any means represent all the work which has been undertaken; one might mention the efforts which have been made to better the average call and clear; the inquiry into the Call Valuation; the introduction of the new telephone rates in 1921; the introduction in 1924 of a system whereby subscribers passed their long distance calls direct to the trunk record telephonist; the provision of additional junction and the junction and trunk forecasts for new cable schemes, and special inquiries of varied nature, all having in view a constructive and progressive policy.

As a matter of interest figures are given below showing the number of originating local and junction calls—unvalued—at Liverpool exchanges with over 300 exchange lines according to the quarterly operating statistics in July, 1921, and July, 1924, also the number of telephonists employed in the respective periods.

	1921	1924
No. of Exchange lines	25,048	29,234
No. of calls dealt with :—		
Originating local traffic ...	64,240	61,655
,, trunk & junc....	99,507	143,837
Totals ...	163,747	205,492
No. of Telephonists present ...	446	467

In conclusion, one ought to say that but for the loyalty and co-operation of the staff, the schemes could not possibly have been carried out. Only those who have been directly concerned know how hard has been the work. Not only has the organisation had to be built up afresh and inexperienced officers trained, but the staff has for long periods not even been up to the establishment. It is hoped that it will not, in future, be necessary to undertake such important services under similar staffing conditions. Mistakes may have been made, but I am not aware of any serious consequences having arisen; one often wonders sometimes how it has been possible to make such progress.

In the period under review, the difficulties have been added to by the loss of experienced clerical officers, such as Mr. H. J. B. Woodward, Mr. E. B. Lord, now of Exeter, Mr. G. K. Geill, lately of Norwich now returned to Liverpool, and Mr. Moseley now of Leeds; and also by changes which have occurred in the clerical personnel. The deaths of Messrs. F. S. McGraw and W. H. Ward, both Asst. Traffic Superintendents, have also to be recorded, and I cannot refrain from remarking that the loss of these two officers was keenly felt, both of whom will be remembered as enthusiastic and competent colleagues. Mr. F. S. McGraw died in 1921 and Mr. W. H. Ward in 1923.

I also desire to add that progress made had been due to the fact that the officers initially responsible for the work have been afforded every assistance and every facility possible in their duties. Confidence has always been placed in their ability to undertake the work, and this in turn has been justified. They have not been harassed or unduly worried whilst working under conditions of strain. An undue amount of correspondence has been avoided by mutual help on all sides and by conferences, with the result that consideration of the main issues has never been delayed at the expense of minor details, because everyone has had a clear understanding of each other's outlook and aims.

In this respect special thanks are due to our respected District Manager, the Headquarters Traffic Section, and to the Engineering Officers, for their co-operation which has materially assisted the very successful carrying out of the work during a period of stress ; the Survey Staff are to be congratulated on obtaining for new premises most excellent buildings, mentioning specially the Rock Ferry, Waterloo, and Lark Lane Exchanges, where the staffs are housed under ideal conditions. To our manipulative staff an appreciation must also be extended for the very able manner in which they have adapted themselves to C.B. conditions after so long being used to working on the Magneto system. The spirit of co-operation and mutual goodwill has been pronounced at all times, and to this fact must be attributed in a large degree the wonderful all-round advance of the service in this district.

EVOLUTION—NOT REVOLUTION—IN TELEPHONE SERVICE.

AUTOMATIC Telephone Service, which is now replacing manual switchboard-operation in large cities, has nothing revolutionary about it, we are told by H. B. Thayer, president of the company, in an article entitled "Evolution—Not Revolution" in *The Bell Telephone Quarterly* (New York). The change is simply a phase of the substitution of machine for manual operation which has been taking place in telephone service ever since it was first introduced. It has been foreseen and prepared for, during a period of twenty years, Mr. Thayer tells us ; and its adoption is due to economic pressure resulting from the war. Writes Mr. Thayer :

"Machine switching is a remarkable achievement of engineering and mechanics. It accomplishes what would seem to be almost impossible. When completely installed in a city like New York, for example, it will make possible, without the assistance of any telephone operator, other than private branch exchange attendants, a telephone connexion between the individual station of any telephone user and that of any one of over a million other telephone users, served by over a hundred central offices.

"Furthermore, in the transition period, while some of the central offices are operated manually and some by the machine-switching system, it will provide interconnexion in both directions between the manual and machine-switching telephones without the necessity for any differentiation on the part of any subscriber."

In fact, the development of the machine-switching program will be an evolution, not a revolution, Mr. Thayer insists. Telephone engineers have always been alive to the necessity of substituting automatic devices for manual operation wherever this could be done without impairment of service and with economy. Such substitutions have been going on from the beginning. The development of the present type of manual switchboard is an example. Little by little many of the functions performed by the operators have been transferred to the apparatus itself :

"At one time the operator had to ring each called station individually, by turning a magneto generator crank. This is now done by machinery. On the earlier type of magneto switchboards the signals were given by the falling of 'drops' controlled by electric currents. These drops had to be restored to their original position by hand, so as to be ready for another call. Of course, the present type of common battery board, with electric bulb signals, does away with all this manual effort on the part of the operators.

"These changes and many others have all tended to overcome the operating difficulties encountered as the system grew, substituting mechanical for manual operations and so reducing the operating effort and improving service.

"The development of machine switching is in line with this well-established general policy. About twenty years ago it was concluded from a study of the trend of conditions that the time would ultimately come when machine-switching operation would replace manual operation in some places and for some kinds of service.

"It early became apparent that the introduction of machine switching would mean an increase in carrying charges and maintenance with a relatively lower pay-roll. The time to undertake the change, of course, would be when the balance between the increases and the decreases was such as to show a lower net annual cost.

Up to the beginning of the World War conditions were not such as to justify the adoption of a machine-switching program. The war and its after-effects, however, produced a higher wage scale, which affected both sides of the balance, since it increased the cost of plant on the one hand and the cost of operating on the other. Another factor was the increased cost of obtaining capital. A third was increased taxation, and its indirect results.

"The fourth new factor was the diminished supply of operators. The war opened up to women many fields of occupation that had been previously monopolized by men. The result was that fewer young women were available for work at the switchboard. The use of the telephone was increasing more rapidly than the population. The percentage of women available for work at the switchboard was decreasing.

"It was apparent that in some of the large cities we could not maintain much longer by the manual method the high standard of telephone service we had been providing. It was clearly indicated that the time for the orderly introduction of machine switching in cities when such conditions existed had arrived.

"Our continuous study of the problem during the previous twenty years had made us ready. Adapting ourselves to changed conditions called for no revolutionary steps. The process of evolution, begun years before, was simply extended in scope. Nor was this extension in the scope of our program carried out along revolutionary lines. Orderly introduction of machine switching simply meant that some of the growth of the business and some of the replacement of worn-out equipment in some places should be provided for by machine-switching apparatus. It was not then and is not now contemplated that any manual apparatus is to be replaced by machine-switching apparatus until it is worn out, or for other reasons uneconomical to continue in service.

"When the New York Telephone Company announces that its expenditures for machine-switching apparatus up to the end of 1927 will amount to $65,000,000, this announcement simply means that in the ordinary course of business a large part of additional equipment will be of the machine-switching type. When the Company announces that the change will not be completed in New York until 1940, it simply means that this will be brought about by this same process of evolution.

"But neither on that date, nor at any period between now and then, will operators become unnecessary. Many will always be needed to handle toll and long-distance calls, and to give information and to act in cases of emergency or service irregularity.

"There is nothing sensational or revolutionary about our policy in regard to machine switching. The only feature of the situation which approaches the sensational is the extraordinarily rapid increase in the cities' telephone-using population. This growth is the feature which makes it necessary to approach this problem exactly as we are approaching it.

"We might drift along with the current, only to awake suddenly to the realization that we must make a radical and drastic change in our course in order to avoid disaster. Such a sudden and sweeping change could be made only at enormous expense, with unnecessary inconvenience and with the probabilities against efficient service. Such a change I should call a revolution.

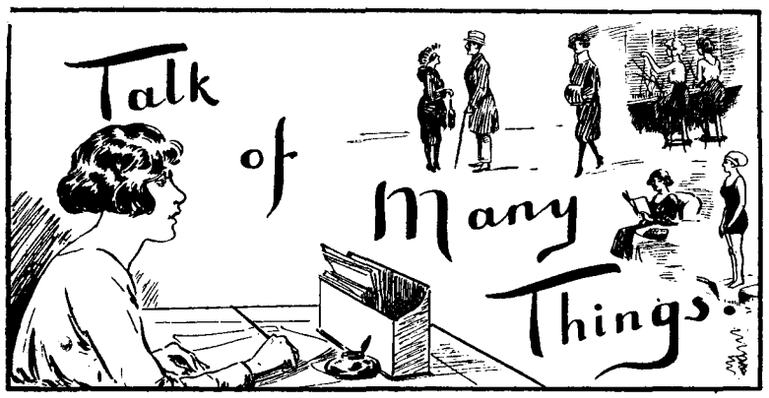
"On the other hand, if we foresee the probabilities of the future in ample time to prepare for them, the necessary changes may be made with the least disturbance and at the least expense. Such a process of change is an evolution."

AUTOMATIC TELEPHONES IN INDIA.

THE new 1,000 line Automatic Public Exchange built and installed by The Relay Automatic Telephone Company Limited, of Marconi House, for the Indian Government was opened on Saturday, October 25, at 3 o'clock. The change-over was an excellent one, being accomplished in ten seconds, establishing a new record for this operation. There was the usual rush of traffic just after the cut-over. The installation, which is working excellently, is the seventh of a group of eight Relay Exchanges being supplied to the Indian Government for public exchange service in India.

Other Relay Public Exchanges in India are Conoor, Ootacmund, Allahabad, Rawal Pindi, Nagpur, and Quetta.

WE TELEPHONISTS



Meal Beliefs.

TALKING of dinners—for of course you were, in view of the staff dinner on the 31st—reminds me of a remark once made to me by a friend. He said "Beware of the hatless vegetarian who wears horn-rimmed spectacles and drinks china tea without sugar. He may look as harmless as a cabbage, but he is probably a 'red.'" The truth of this is evident, for if a man have original ideas about food he may well have original ideas about all other solemn things. It is considered, shall I say, unusual to eat peas off a knife, but such an unconventionality is a virtue compared with the sacrilege of calling a mess of nuts a cutlet, and the person who would persuade us into such a diet would, with equal cheerfulness, undermine our British constitution. What says Chesterton ?

"Nebuchadnezzar, King of the Jews,
Suffered from new and original views;
He crawled on his hands and knees, 'tis said,
With grass in his mouth and a crown on his head."

Now I have nothing to say against vegetarians—indeed I have a great respect for them, particularly horses and cows—nor do I object to vegetarianism, but I cannot bring myself to think that they and their cult are in keeping with the character of breakfast, lunch, tea, and dinner. I could wish that they had chosen other names for their meals, although I might perhaps allow them to retain lunch. Lunch is an effeminate thing, polite but unsatisfactory. It has an air of unreality and of pretence. No one who wants to be anyone would descend to the plebeian practice of eating dinner at mid-day, although they may partake of lunch with perfect dignity.

As for the meal called tea, it is a scandalous institution, fitted only to be the occasion for inquests in camera held on friends, and for this reason I should hate to part with it. Moreover, if it were handed over to the vegetarians entirely might they not make it an opportunity to hatch deep plots for the subjugation of those who delight in the flesh-pots ?

Breakfast is a solemn festival, set in an atmosphere of irritable gloom, snappy reserve and general uncommunicativeness. No great event can ever be celebrated at a breakfast. It is true that there is the wedding-breakfast, held ostensibly to symbolise joy. Yet is there not always a feeling of tension and enforced gaiety on these occasions, and are there not moments when even the happy pair appear almost as victims rather than victors ? Leave us our British breakfast with its leathery fried egg, its curly chipped bacon, and its depression. Time has hallowed it and lack of time shall preserve it.

But dinner—dinner is a meal of jovial expansiveness, of bright lights, of freedom, of comradeship, of judicious appeal to discriminating taste. The terrors of the day are dispelled by the glory of the night. Events, seen at breakfast as insurmountable obstacles, become glorious achievements which flatter our powers and increase our self-esteem. We shed our little dignity and eat, not so much for duty as for pleasure. Dinner must be preserved to us as an inviolable institution, as an oasis in the desert of business life. So let us all go to the L.T.S. Staff Dinner on the 31st.

PERCY FLAGE.

We re-print below an article from *The Telephone Review* of New York.

"Are you There ? "

Some Interesting Variations of "Number, Please ? " in the Telephone Habits of Foreign Countries.

One of the fundamental realities of American life, like riding in street cars and having coffee for breakfast, is that when we lift up the telephone receiver a smiling voice replies, rising inflection, proper accent, "Number, please ? "

Telephone service in many corners of the world, however, is not such a necessary part of every-day life, although becoming more and more important.

In England, for instance, a country where our own language is spoken, there are many baffling telephone habits, the most well-known of which is the expression "Are you there ? " which seems quite superfluous to us Americans but very natural to the English. Nor can the Englishman, on the other hand, understand some of our telephone habits.

Sir Herbert Tree, a famous English actor, was remarking about the peculiar telephone habits of the American. "Americans seem to do nothing but sit about with a telephone in their hands, calling one another up," he said. "They say 'Hello,' a very violent, nerve-racking word, instead of the much softer and more pleasing 'Are you there ? ' I attempted to introduce this expression while I was in America," said Sir Herbert, "but the first time I said it over the 'phone, the man at the other end replied, 'Say, where the ———— do you think I am ? ' "

There are other illustrations of the "softer and more pleasing" expressions of the English "telephonists." Instead of saying "The line is busy," the formula in Great Britain is "I am sorry, the number is engaged."

London telephone girls do not like to be called operators ; they are "telephonists." One English central office has an unusual scheme of decoration, with bowls of flowers and ferns placed about the room between switchboards. London long distance operators are very accomplished young women, for they must not only speak both French and English, but understand it over long distance telephone wires, which is no small feat.

In nearly all European countries the telephone system is owned and operated by the governments. Telephone equipment is not as advanced as in America, and the phrases used by foreign operators are rarely as simple and economical as our telephone phrases.

Thus, in Italy and France, for instance, countries which have the reputation of being talkative nations, the simple process of calling a telephone number of ten involves lengthy conversations between operator and subscriber, which makes each call take up more time of both operator and subscriber.

Although the telephone phrases of foreign countries follow generally along the lines of our phrases, there are many peculiar expressions to be found "over there."

In Sweden, for instance, which has one of the best telephone systems in Europe, the operator announces herself with a number as "Four seven" in the Swedish equivalent.

This may be somewhat perplexing to the American traveller at first, until you know that the operator is not playing a game, but giving the number of her position at the switchboard.

In Paris the operators generally announce themselves with "J'écoute," which means, "I am listening."

In calling telephone numbers in Germany, instead of giving the number of single digits, they have a habit of giving it in blocks of two. Thus, 2578 would be "twenty-five, seventy-eight." That seems simple enough in English, but try it out in German and it becomes "funf-und-zwanzig, acht-und-siebenzig." Another expression used by the German operator is "Teilnehmer antwortet nicht," from which, if you know the language, you will infer that the subscriber does not answer.

In Switzerland, both French and German are languages commonly spoken. For this reason the telephone operator must know both languages, and learn two ways of saying each phrase. In reporting a "don't answer," for instance, the versatile operator may say either "Nummer 0000 antwortet nicht," or "Le numero 0000 ne répond pas."

Telephone habits in the land of the rising sun are more in the nature of ceremonies, and "Number, please ? " becomes more complicated. The Japanese operator, in answer to your humble supplication, says "Moshi, moshi " as a sort of greeting, and then "Nuban," corresponding to "Number, please ? "

Regent Exchange.

A small Social and Bazaar was held on December 5 in aid of the Blue Triangle Forward Movement.

A very enjoyable evening was spent, the musical part of the programme, which was excellently chosen and much appreciated, being supplied by the staff.

The sum realised was £15 10*s.* which, added to previous donations, made a total of £20.

Telephone Jokes of our Contemporaries.

282*nd Telephone Joke* :—

"A gramophone which repeats 'Engaged, engaged' is being tested at the Paris telephone exchanges." We doubt if this would find favour with the London operator as she would have to lay aside her knitting and re-wind the machine.

This is specially commended for originality.

283*rd Telephone Joke* :—

"There are 433,320 telephones in the London area, says a statistician. But, with the approach of the festive season, why not look on the bright side of things?"

284*th Telephone Joke* :—

Britain possesses only 24 telephones per 1,000 of the population. The joke about this paragraph is that I've given the wrong number.

The correct number is 26. About 8% of this arithmetic is therefore joke.

A Happy New Year!

As 1925 draws nigh our friends with one another vie to wish us gaiety and joy and health and wealth without alloy; and so, although we may not meet, we take this chance our friends to greet, and very gladly thank anew contributors and readers too—all those who've helped in any way to make our column bright and gay. We wish you, whether far or near, a joyous and a bright new year, and, if in 1924 we felt our troubles more and more, well then, in 1925, let's all be glad that we're alive! All luck to you and happiness.

Yours gratefully,

The EDITRESS.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

MANCHESTER TELEGRAPH AND TELEPHONE SOCIETY.

"SOME Reflections on Post Office Finance" was the subject of Sir Henry Bunbury's address on Nov. 18 at a meeting which was well attended by members and friends from the Exchanges and from the District Manager's, Engineering, Postal and Telegraphs Branches, and Head-quarters Audit Staff of the Acct. General. He explained how the commercial account was now the standard by which Post Office finance must be judged, and that the Post Office Accounts could now be regarded as among the best published by business concerns. The account was one of the biggest in the world, representing a turnover at Head-quarters of £1,200,000,000 per annum. After dealing with the surplus on the postal and telephone accounts and the deficiency on telegraphs, the lecturer dealt with the steps necessary to develop the services. He thought the greatest commandment for the Post Office was "Don't stand still." Having accepted that, the business of the department was to fix any new rate very carefully, charging not less than the economic cost of the service, and not more than the traffic would bear. It was expedient to carry a fringe of unremunerative traffic provided that there was a reasonable prospect of the fringe becoming self-supporting within a reasonable time, and that the fringe did not at any time bear too large a proportion to the whole. He thought the Post Office might with advantage advertise a little more, but did not see the need for any extensive scheme of advertising; still the motto for all Post Office administrators must be "Enterprise, Enterprise, and again Enterprise."

Replying to an interesting discussion, contributed to by the several branches of the service, Sir Henry amused his audience with a trenchant exposure of the fallacies with which a certain newspaper was advocating an excellent cause—the return to penny postage.

Votes of thanks to the lecturer and the chairman of the evening (Jas. G. Maddan, Esq., Postmaster Surveyor, Manchester) concluded an interesting and popular evening. A very enjoyable paper was also given before the Society on Dec. 9 by Miss E. L. Pickering of the Manchester Telegraphs on "British East Africa through the eyes of an English Woman."

Her reading and passing comments were well illustrated by many lantern slides, most of them from photographs taken by herself and, on occasion, with some risk. She carried her interested audience of members and friends charmingly away from the climate of Manchester to a land of sunshine—sunshine sometimes not without its drawbacks—among all the tropical beauty she so well described. A description of Post Office official life in Africa, with its incidents of the War—and its compensations, was also ably and feelingly given.

Mr. G. F. Staite, who presided over the meeting, which showed a good and improving attendance, voiced the thanks of every one present to Miss Pickering; this was supported by Mr. A. C. Godfrey and Mr. Arthur Smith, and heartily carried.

The next meeting is announced for Jan. 20, when papers will be read by Mr. G. F. Staite and Mr. F. E. M. Markin.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

ON Monday Dec. 15th, at King George's Hall, Caroline Street, Tottenham Court Road, the London Telephonist's Society presented, under the direction of Mr. Pounds, Miss McMillan's Telephone Musical Play: "As you'd like it, or, Much Ado about Something,"—an event which had been looked forward to with keen interest by all members of the Society.

An audience of between six and seven hundred members—easily a record for the Society—listened with great delight to the Play; which in two Acts of clever and delightfully humorous verse, a large part of which was set to well chosen music, depicted two stages of the "Pilgrim's Progress" of the subscriber. Act I deals with his arraignment, for high crimes and misdemeanours, before a Jury of Telephonists; while Act II presents him as a reformed character at a Telephonist's Meeting.

The chorus of Telephonists—surely as fair a group of winsome maidens as the London Telephone Service has ever staged—presented a charming spectacle in their pretty frocks, prepared and arranged under the artist's eye of Miss Clayton, Mistress of the Robes; and sang with real beauty of tone and excellent precision and point the tuneful music allotted to them; ably accompanied on piano and violins by the Misses Garvey and Woodman and Mrs. Larcombe.

Where all gave of their best one hesitates to particularise; but mention should be made of the really fine singing of Miss Blair-Street in the principal soprano part; of Mr. Beale, who, as Judge, showed himself to be a real comedian as well as an accomplished singer; and of Mr. Beck as the Superintendent with "the simple child-like mind," whose curtly expressive "No" to the agonised question "What, not a sound?" from the subscriber confronted with the soulless precision of the automatic system, "brought down the house" in triumphant vindication of the dictum "Brevity is the soul of wit." Last, but certainly not least, there was Mr. Cracknell, whose fine tenor voice was heard to great advantage in the exacting rôle of the much tried subscriber, whose woes and virtues he recounted with tuneful point.

Encores were numerous and deserved, the "Little Telephonist," duet delightfully sung by Miss Frances Howard and Mr. Cracknell and the well-rendered "A & B Telephonist" duet by the Misses Atkinson and Eastlake being especially enjoyed. Perhaps the most enthusiastic was reserved for the "Excelsior" Chorus; where the singing of the words "Ni-ne fife th-r-ree fo-er" to one of its most dramatic musical phrases achieved that touch of the unexpected which marks humour at its best. There were enthusiastic calls for Author and Producer when the curtain fell on the last act.

The fact that the production was in the able hands of Mr. Pounds, made its excellence a foregone conclusion; and the Society owes him, Miss McMillan, and the artistes of the Company a real debt of gratitude for one of the happiest evenings in the Society's history.

Probably not a few listened to the fresh young voices of the chorus on Monday, looked forward with mixed feelings to the time so graphically described by the playwright, when:—

"If you want perfect freedom from voices that trouble you,
Accents that irritate, brogues that annoy,
The strain of rememb'ring just when to say double—you
Quickly shall learn just what means to employ.
That you will protest is a sad probability,
You will be wishing for days past recall,
For soon there'll be no one to stir your tranquillity,
Nobody—humanly speaking—at all!
You can take off your hat as you near the transmitter, and
Ask for your number with courtesy rare,
Sue humbly for pardon with tear-drops a-glitter and
Find to your horror that no one is there.
None to reply to your orders imperious,
None to respond to your yearnings mysterious,
To smile when you're glad or to sigh when you're serious,
No one to weep when your dividends fall.
Oh, never again such refining society
Speaking in tones of such varied variety
No one to blame when your business grows slack;
Nothing whatever to answer you back.
Coldly efficient, but spoiling the scenery,
Close to your hand you will find the machinery.
This—and deep silence—and wormwood—and gall—
Nobody human—a dial—that's all."

* * * *

Annual Dinner.

Arrangements are well in hand for the Second Annual Dinner, which is to be held at the Connaught Rooms on Saturday, Jan. 31. A large attendance is expected and in deference to the ladies who may be unattended by mere man

a slight amendment has been made in the price of the tickets. They are now 10*s.* 6*d.*, this amount including gratuities to the waiters. The staff of the L.T.S. is being well canvassed, but anyone desiring to attend may obtain tickets from the Hon. Sec., Mr. R. C. Atkins, Traffic Branch, 32 St. Bride Street, E.C.4.

* * * *

Trunk and East-Central Districts Carnival.

The Trunk and East-Central Districts have conspired together in arranging a Carnival Dance at the Horticultural Hall, Vincent Square, on Friday, Jan. 23. Enough tickets have already been sold to ensure the success of a big undertaking. The issue of tickets is limited to 800, so that those wishing to take part in the largest service frivolity of the season should make their arrangements without further delay. An excellent orchestra has been engaged and refreshments will be served throughout the evening. The tickets are 4*s.* 6*d.* inclusive and can be obtained from Mr. Gerrard, Traffic Branch, 32 St. Bride Street, E.C.4.

* * * *

Culled from the Exchanges.

Avenue.—AVEN SWIMMING CLUB.—Having been so fortunate to obtain the use of the Exchange, we and our service friends enjoyed a very pleasant evening on Friday, Nov. 21.

Our spacious dining room served splendidly as a dance hall, and the small rooms for refreshments which were obtainable throughout the evening.

The programme was very varied, and in addition to dancing included a musical monologue, song, duologue, competitions, and the annual prize distribution. The prizes given, excluding those for the aforementioned competitions, were competed for during the year at the club headquarters.

Short speeches were made by our president, Miss Ashmead, and vice-presidents, Messrs. Gray and Collins, to all of whom we are greatly indebted for their interest in the club; also to Mrs. F. Gray for kindly presenting the prizes.

Mr. J. E. Collins was a great asset as master of ceremonies. His pleasant manner and general adaptability was much appreciated by all. The evening proved so successful that a general request has been made for a repetition at an early date. Jan. 16 has been chosen, so if any service people would like to come the invitation is extended to all.

City.—The second dance will be held at the Bishopsgate Institute on Saturday, Feb. 7. There was a long list of disappointed people who were unable to secure tickets on the last occasion so early application for tickets is advised.

TRANSFER OF MR. BARCLAY.

IN the Bon-accord Hotel, Aberdeen, on Saturday, Nov. 29, a representative gathering of the telephone staff of Aberdeen District met to do honour to Mr. Barclay, Traffic Superintendent, prior to his departure to take up the position of Traffic Superintendent at Blackburn. Mr. W. Davidson, Assistant Traffic Superintendent, presided, and Mr. A. E. Ruddock, District Manager, presented Mr. Barclay with a handsome gold watch, chain and pendant, and a handbag for Mrs. Barclay. He paid a high tribute to the work performed by Mr. Barclay, and referred to the happy relationship that existed between him and the staff.

Mr. Ord, the Postmaster, Mr. Clow, Chief Clerk, Mr. Coulsell, Contract Manager, Mr. Donald, Superintendent, Mr. Eaton, Telegraph Superintendent, Mr. Kerr, Engineering Department, and Miss Murray, representing the telephonists, also spoke in appreciative terms of Mr. Barclay's work and worth.

Mr. Barclay acknowledged the compliments, and afterwards a pleasant evening was spent playing whist, and with music and dancing.

GERMAN GOVERNMENT BUYS BRITISH AUTOMATIC TELEPHONES.

THE Relay Automatic Telephone Company Ltd., of Marconi House, has received an order from the Minister of Posts & Telegraphs, Berlin, to supply private branch automatic exchange apparatus built to the same specification as the relay installation supplied to the British G.P.O.

PERSONALIA.

LONDON TELEPHONE SERVICE.

The following promotions have taken place :—

Miss J. E. MOORE, Assistant Supervisor, Class I, London Wall.
Miss A. M. KINSEY, Assistant Supervisor, Class I., Ealing.
Miss A. M. RUFF, Assistant Supervisor, Class I., City.
Miss E. E. VENUS, Assistant Supervisor, Class I., Tottenham.
Miss E. P. JUDD, Assistant Supervisor, Class I., F.E.S.

Resignations on account of marriage :—

Miss ALDRIDGE, Assistant Supervisor, Class II., City.
Miss M. H. PATON, Telephonist, City
Miss S. M. MULLINS, Telephonist, Park.
Miss D. PENNELLS, Telephonist, London Wall.
Miss M. A. POPE, Telephonist, Putney.

The following promotions have been made :—

Miss M. READING, to Assistant Supervisor Class II, at Park Exchange.
Miss M. A. DOWNTON, to Assistant Supervisor, Class II, at Chancery Exchange.
Miss M. A. BURN, to Assistant Supervisor, Class II, at London Wall Exchange.
Miss H. M. HAINES, to Assistant Supervisor, Class II, at Victoria Exchange.
Miss E. M. WILES, to Assistant Supervisor, Class II, at Trunk Exchange.
Miss C. M. CHIVERS, to Assistant Supervisor, Class II, at Paddington Exchange.
Miss E. D. DAY, to Assistant Supervisor, Class II, at Finchley Exchange.
Miss J. MITCHELL, to Assistant Supervisor, Class II, at London Wall Exchange.
Miss I. V. E. JONES, to Assistant Supervisor, Class II, at Clerkenwell Exchange.
Miss A. JOBSON, to Assistant Supervisor, Class II, at Maida Vale Exchange.
Miss E. M. GRANT, to Assistant Supervisor, Class II, at Clerkenwell Exchange.
Miss K. S. ROCHE, to Assistant Supervisor, Class II, at Langham Exchange.
Miss F. BEDFORD, to Assistant Supervisor, Class II, at Kensington Exchange.
Miss L. S. CHIVERS, to Assistant Supervisor, Class II, at City Exchange.
Miss F. C. PESTELL, to Assistant Supervisor, Class II, at Brixton Exchange.
Miss E. M. HUSTED, to Assistant Supervisor, Class II, at Maryland Exchange.
Miss B. M. CHANNER, to Assistant Supervisor, Class II, at Sidcup Exchange.
Miss Y. M. CAPPELLEN, to Assistant Supervisor, Class II, at Trunk Exchange.

CONTROLLER'S OFFICE APPOINTMENTS.

To be Executive Officers.

Mr. C. D. UPHAM.
Mr. J. W. K. NICHOLS.

THE

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CONTENTS.

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TELEGRAPH AND TELEPHONE MEN.

XIII.—

COLONEL T. F. PURVES, O.B.E.

THE subject of our sketch this month, Colonel Thomas Fortune Purves, the Engineer-in-Chief of the Post Office, entered the Post Office service as a telegraphist at Edinburgh in 1889. His leanings towards the technical aspects of the telegraph service appear to have manifested themselves early in his official life for less than three years later he was transferred to the Engineering Department as a "Clerk." "Clerk" in those days was a sort of generic description for many forms of Post Office employment, and Colonel Purves' activities were certainly not of a clerical nature as that term is understood to-day. However, he came into his rights in the matter of title in 1900 when he became a "Technical Officer." His subsequent promotions followed with the inevitability of fore-ordination, and in June, 1922, to the joy of all his colleagues, he became the head of his department.

There have been in the past some distinguished occupants of the Engineer-in-Chief's chair, but none is likely to be more distinguished than its present occupant, and, of a certainty, no other Engineer-in-Chief has occupied so warm a place in the hearts of his fellow-workers in the Post Office service. There can be no higher eulogy than that.

NOTES ON TELEGRAPH PRACTICE.

BY G. T. ARCHIBALD.

II—*Concerning Rules and Regulations for the protection of the Public the Post Office and its Employees.*

The Postmaster General possesses, under the Telegraphic Acts, the exclusive privilege of transmitting telegrams within Great Britain and Northern Ireland and of performing all the incidental services of collecting, receiving, and delivering telegrams. There are, however, a few small exceptions relating to private telegraph circuits, and these will be dealt with in a later paragraph.

The term "telegram" is held to mean any message or other communication transmitted or intended for transmission by telegraph; the term "telegraph" is held to mean a wire or wires used for the purpose of telegraphic communication, whether worked by electricity or not, and any apparatus connected therewith, and also any apparatus for transmitting messages or other communications by means of electric signals whether involving the use of wires or not. It would be difficult to imagine any form of communication other than an ordinary conversation which does not come within the scope of the Postmaster General's monopoly. This will be apparent from the fact that the term "telegram" includes telephonic messages, whether transmitted by electricity or not, wireless communication, fire alarm circuits between places of public entertainment, etc., and even signals conveyed, according to a preconcerted code, by means of bells, although such bells are worked by wires pulled by hand.

Under the Telegraphic Act 1869 private persons, corporations, or companies may establish telegraphic communication between themselves and their agents or employees for the purpose of transmitting messages relating to their own business or private affairs, but telegraphic communication between two persons having independent interests is not permissible without the Postmaster-General's licence. Private wires will, however, be dealt with more fully in a subsequent chapter. Foreign telegraph communications do not come within the Postmaster General's monopoly.

It is not perhaps generally known or understood that all Post Office officials are expected to make themselves acquainted with these facts and to report any case in which the Postmaster General's monopoly appears to be infringed. If Captain Eckersley of the B.B.C., who brings tears to our eyes on those occasions when he tells us about the "broadcatcher" who is un-British enough to listen-in without paying his licence fee, were to hear of this obligation he might induce the Post Office to call upon its employees to assist in tracing and reporting the wicked poachers.

Innumerable rules and regulations have been framed not only for the protection of those persons who send and receive telegrams but also for the Post Office and its employees, and it is not easy to come to a proper appreciation of all that is involved in dealing with telegrams until the significance of these safeguards is firmly fixed in our minds.

A telegraph service which imposed no pledge of secrecy upon its employees is unthinkable, since such an organism is called upon to cater for conflicting business interests, for Government departments, for persons in domestic and financial distress, &c. The greatest care is taken to ensure absolute secrecy; every Post Office official, down to the boy messenger, employed in dealing with telegrams is required to give an undertaking that he will not divulge the contents of a telegram and is warned that any breach of this promise renders him liable to imprisonment. Absolute privacy is assured at the message writing stalls provided at every Post Office; Counter clerks must not read a telegram aloud to the sender unless requested to do so, and when handing a telegram back to the sender for the stamps to be affixed, must either fold it or turn it face downwards if other persons at the counter are in a position to read it. No telegram may be produced in a court of law except under the authority of a subpoena, or at the request of the sender or addressee under sanction of the Secretary. Local officials are forbidden to exhibit telegrams or to give any information concerning them, although inquiries made by the sender or recipient of a telegram or their authorised representative may be answered at once if the desired information may properly be furnished and is readily obtainable.

Great care is taken to prevent forgery and the fraudulent alteration of telegrams. To this end it is enacted that any person who forges or wilfully alters a telegram or utters, as a telegram, any message or communication which he knows not to be a telegram, is guilty of a misdemeanour, is liable to a fine not exceeding ten pounds and, on conviction on indictment, to imprisonment with or without hard labour. Counter clerks are forbidden to write out telegrams for the public unless (note the proviso) the senders are unable to write themselves. Counter clerks must not rewrite doubtful words but must ask the sender to rewrite them at the foot of the telegram.

Until quite recently strangers could not be admitted to a telegraph instrument room without the authority of the Secretary to the Post Office. This rule has been relaxed, and certain provincial officers are now empowered to grant permission for such visits which are encouraged because of the advantages likely to accrue through public realisation of the working of the telegraph system. But no member of the public is permitted to visit a telegraph instrument room except under the guidance of an officer of the Post Office. Members of the staff are not allowed to enter telegraph instrument rooms when off duty, and when on duty are not permitted to leave their instruments or the building without the authority of their immediate superior officer. Sufficient has been said to convince the most hardened sceptic of the care taken to ensure secrecy: the Post Office deals with 70,000,000 telegrams a year, and it is a matter for pride in the service that very few cases occur where the contents of a telegram are wilfully divulged.

One very important regulation for the protection of the public concerns the subject matter of telegrams. Counter clerks are enjoined to refer to their immediate supervising officer any telegram containing obscene, indecent, abusive, libellous or grossly offensive matter. It is seldom that such telegrams are offered, probably for the reason that the telephone is a better medium, particularly for the transmission of abusive and blasphemous expletives which rely mainly on expression for effectiveness. Apart from the above the only restriction placed upon the public in the subject matter of telegrams is that against the use of Roman numerals; these are not accepted solely because there are no suitable telegraph code symbols for them.

As this chapter is devoted largely to safeguards it seems fitting to refer at this stage to the system of timing telegrams at the moment of handing in and to describe in some detail the arrangements made to defeat the efforts of the small and decreasing number of persons who from time to time endeavour to back the winner after the horses have passed the post. This has been no easy task, but it is now difficult, except with the connivance of a Post Office official, to defraud bookmakers and others in this way. A telegram is not definitely accepted from a member of the public until the charge has been brought to account and the time of handing in is not, therefore, recorded on the form until the sender has affixed the adhesive labels or stamps. Very great care is taken to see that the office clocks are accurate, and they are checked each morning by means of the Greenwich time signal which is telegraphed to every office in Great Britain and Northern Ireland at 10 a.m. every week day. The time placed on a telegram at the point of acceptance must be strictly in accordance with the clock. At 10.0 a.m. exactly the time is 10.0 and remains 10.0 until a complete minute has elapsed, i.e. until one minute past ten, when it becomes 10.1. If it becomes necessary to correct any official entry on the form the original entry must not be obliterated but struck through, leaving the original entry visible. On occasion, batches of telegrams are handed in by the same sender, and it is provided that all of them shall bear the same official time. If the sender subsequently hands

in another batch or even a single telegram, the clock time recorded on the original telegram must not be used; if he desires to amend any telegram included in a batch, or if a telegram is handed back to him for any purpose, a fresh time must be inserted. Furthermore, it is laid down that if the sender of a batch of telegrams requests that one or more of them may be cancelled, those remaining to be transmitted must be retimed. These instructions are so clear and definite that any officer who fails to observe them runs a serious risk of placing himself in an extremely inconvenient situation if fraud is accomplished through his neglect.

Another precautionary measure which it is seldom necessary to put into practice is that which provides that when a telegram is posted from one town to the Postmaster of another for telegraph transmission from the latter point, the words "Posted from....." are inserted in the Service Instructions which are telegraphed free of charge. The object of this rule is to prevent persons, through the agency of the Post Office, from conveying a false impression regarding their movements.

It remains to be said that the Postmaster General is not liable for loss or damage caused by reason or on account of any mistake or default in the treatment of telegrams. From time to time the question of liability has been raised both in Parliament and in the Press, but no good and sufficient argument has yet been brought forward in support of the contention that the Post Office should be held responsible for the mistakes of its employees. As a general rule the cost of a telegram which has been rendered useless through delay or mutilation is refunded to the sender on application: beyond this it is impossible to go under the present Telegraph Acts. In this connexion it is perhaps interesting to speculate on the attitude of the Government of the day in the event of the nationalisation of the railway systems of the country. Under existing private management railway users are well protected and the companies are held responsible for loss or damage to life, limb, and general merchandise. It seems unlikely that any Government would attempt to force less favourable conditions upon the users of a nationalised railway system, and if such should prove to be the case we may yet see the day when liability for telegraphic errors is shouldered by the State. Even under present arrangements the sender of a telegram may ensure absolute accuracy on payment of an extra fee amounting to half the cost of the telegram. The telegram is then repeated from Office to Office in the course of transmission; a form of insurance which is both cheap and effective.

It will be apparent that the builders of the telegraph service laid their foundations surely and well, and that they were not only careful to protect the Post Office but were anxious to protect the public as well as to serve them. This same spirit still prevails.

TELEPHONE PROGRESS IN THE MANCHESTER AND SOUTH-EAST LANCASHIRE DISTRICT.

SINCE October 1923, the continuous and steady expansion of the telephone system previously recorded has been fully maintained. The engineering stability of the service is still being improved by the gradual diversion of overhead wires to underground cables in the main sections, with the result that only light open lines for distribution to subscribers' premises will remain. In the concentrated city areas, underground wires are being taken direct to the telephone instruments, and the open wires will be dispensed with altogether. Long distance communications are being provided for by laying down additional cable plant. Great benefit has already been derived from the application of this policy, since the public inconvenience resulting from damaged lines due to storms has already been very materially reduced, and yet further improvement in this respect is to be anticipated.

NUMBER OF TELEPHONES.

The number of telephones rose from 32,946 in September 1912, to 65,281 in September 1924, an increase of 98% in 12 years. During last year 8,324 new telephones were fitted (an average of 160 per week); deducting cessations, this gives a net increase of 4,905, and constitutes the highest record for 12 years.

UNDERGROUND CABLE EXTENSIONS.

During the past 12 years the total underground wire mileage has risen from 75,476 to 221,505, an increase of 146,029, or 193%. During the past five years the increase has been 98,672 miles, or an average of nearly 400 miles of wire per week.

During the past year underground cables connecting Manchester with other centres have been completed, viz.:—

Manchester—Hanley—Birmingham.
Manchester—Disley—New Mills—Whaley Bridge—Buxton.
Manchester—Denton—Hyde—Glossop.
Manchester—Warrington—Liverpool, with Warrington—Northwich and Liverpool—Chester.
Oldham—Leeds.

With the aid of these the service to the Midlands, Yorkshire, and North Wales has been much improved, and a substantial addition made to the area over which an inter-town "no-delay" service is afforded. What is called the "Manchester Tandem area" now includes some hundreds of exchanges for which calls can be obtained almost immediately, thus eliminating the methods of recording, routing, and timing calls which are inseparable from the working of long distance Trunks.

The following cables are in course of construction:—

Manchester—Atherton—Leigh and Atherton—Wigan.
Manchester—Gatley—Alderley Edge.
Manchester—Altrincham—Knutsford.
Manchester—Sheffield.

And an additional Manchester—Leeds cable will be commenced shortly.

NEW EXCHANGES.

Complete new Exchange equipments have been provided at Radcliffe, Middleton and Failsworth; and, in addition, extensions of the existing equipment at many other exchanges have been carried out, including apparatus for 2,100 additional lines at Manchester Central Exchange. New exchanges to replace old equipment at Higher Broughton and Saddleworth are nearing completion, and buildings for housing new exchanges at Didsbury, Openshaw, and Leigh, are well advanced. New Rural Exchanges at Lower Peover, Bucklow Hill, and Hartington have been opened, and a new Exchange at Culcheth is being constructed.

TRAFFIC MATTERS.

It is of interest to note that for the Manchester District alone the number of effective trunk calls actually brought to account in 1923 numbered 3,895,034—as nearly as possible a million increase from the corresponding 1915 figure. Telegrams received by telephone from the public have increased from 281,637 in 1915, to approximately 400,000. The local effective calls handled and brought to account in the Manchester District in the year 1923-24 have reached the astonishing figure of some 43,000,000. Call Offices have increased from 427 in 1913 to 525 as at September, 1924.

INTRODUCTION OF THE AUTOMATIC TELEPHONE SYSTEM IN MANCHESTER.

A careful study of the telephone problem in Manchester has been made, as a result of which it has now been decided to convert gradually all the exchanges within a radius of seven miles of Manchester Town Hall to the automatic system. This scheme will enable subscribers on all the exchanges within the area, to call each other direct without the intervention of an operator. The Central and City exchanges in York Street are at present equipped with apparatus for 10,000 lines each, and with the normal growth of the system it is anticipated that the spare capacity will be exhausted in about three years. To provide for further growth, a site for a new exchange has been acquired in Chapel Street, near Exchange Station. Equipment in this new building is expected to be ready in 1928, and it will be used for transferring a proportion of the City and Central lines. The relief thus afforded will release the existing apparatus at York Street for conversion to the automatic system. Sites for three new automatic exchanges have also been acquired at Ardwick, Collyhurst, and Moss Side respectively, and this plant will be available within, the next four or five years, to relieve the outer portions of the Central area. The lay-out scheme provides also for ultimately opening new automatic exchanges at Prestwich, Dreylsden, Bredbury, Stretford and Swinton. The complete scheme provides for a total of 31 automatic exchanges in addition to the equipment referred to in the York Street and Chapel Street buildings. A plan of the lay-out is appended.

The long-distance lines will continue to be terminated in the Trunk Exchange at the Head Post Office in Spring Gardens, but a "Toll Exchange" for intercommunication over the shorter lines connecting Manchester with the surrounding centres will be provided in the Chapel Street building. The telephone conditions in Manchester will, therefore, be similar to those which have been decided for London as regards long-distance trunk exchange service, toll exchange service, and direct intercommunication between all subscribers connected with the various automatic exchanges in the local area.

It is not anticipated that the conversion to automatic will give rise to any difficulty as regards the employment of the operating staff. The changes will be effected gradually, and with the growth of the system a considerable body of operators will always be necessary for handling long-distance communications, inquiries, public call office lines, and other special services.

TELEPHONIC DEVELOPMENT OF THE WORLD AT DECEMBER 31, 1923.

(Continued).

BY W. H. GUNSTON.

NORTH AMERICA.

	Telephones.	Population thousands.	Population per telephone.
United States (14,347,395)...	15,369,101	108,000	7.0
Canada (944,029)	1,009,203	8,800	8.7
Mexico (47,929)	49,000*	16,000	326.0
Cuba (41,547)	44,000*	3,000	68.0
Other West Indies (2,500) ...	3,000*	—	—
Central America (17,000) ...	18,000*	—	—
	16,532,000	146,000	8.8

United States.—There are upwards of 57,000 companies and systems operating in the United States, 26 belonging to the "Bell" system and the remainder being "Independent" corporations. The majority of the latter, however, are in connexion with the "Bell" system and are known as "Bell-connected" systems. According to the quinquennial returns of the Census Bureau for 1922, there were 14,347,395 telephones in the United States, 9,514,813 connected directly with the "Bell" systems and the remainder with the "Independent" systems. In 1923 the figures were :—

"Bell" system	10,406,155
"Bell" connected	4,593,946
"Independent" (est.)	369,000
	15,369,101

In the States there are 137 towns (or telephone areas) containing 10,000 telephones and upwards, and 16 of these possess upwards of 100,000 telephones. (*Vide* separate tables).

Canada.—The systems here are operated by 2459 different companies or administrations. "Bell" Telephone Companies predominate in Quebec, Ontario, British Columbia, and Nova Scotia, and State systems in Manitoba, Sasketchewan, and Alberta. The development by provinces is as follows :—

Ontario	440,102
Quebec	180,777
Saskatchewan	97,894
British Columbia	86,178
Alberta	67,108
Manitoba	66,610
Nova Scotia	37,551
New Brunswick	87,414

There are 128,496 telephones in Toronto, 107,459 in Montreal, and 9 other towns in Canada possess upwards of 10,000 telephones.

The figures for *Mexico*, the West Indies, and Central America are estimated on the basis of figures obtained from American sources.

SOUTH AMERICA.

(These figures are based on the Statistics for 1922, prepared by Mr. Berthold of the American Telephone and Telegraph Company).

	Telephones.	Population (thousands)	Inhabitants per telephone.
Argentine (143,093) ...	156,000	8.700	56
Bolivia (2,706)	2,800	—	—
Brazil (90,112)	93,000	30,650	329
Chile (30,920)	31,000	3,800	122
Colombia (9,958)	11,000	—	—
Ecuador (4,280)	4,300	—	—
Guiana (2,400)	2,400	—	—
Paraguay (431)	450	—	—
Peru (8,919)	9,000	—	—
Uruguay (24,397)	25,000	1,400	56
Venezuela (10,326)	10,500	—	—
	345,500	64,000	186

Except in Guiana, the telephone systems are almost entirely in the hands of private companies.

AUSTRALASIA, &c.

	Telephones.	Population.	Inhabitants per telephone.
Australia (270,008)	300,192	5.633	18.7
New Zealand (102,261) ...	106,764	1320	12.6
Hawaii (16,074)	17,000	256	15
Other places	2,000	—	—
	426,000	8,000	19

Australia.—Here there is an increase for the year of over 30,000 telephones. The development of the different colonies is as follows :—New South Wales 119,674, Victoria 91,548, Queensland 36,323, South Australia 27,918, Western Australia 15,581 ; Tasmania 9,148. Of the capital cities Sydney has 73,494 telephones, Melbourne 61,111, Adelaide 19,934, Brisbane 15,523, and Perth 10,038.

New Zealand.—shows an increase of 4,500 stations. Wellington possesses 12,751 telephones, Auckland 11,697, Christchurch 9,238, and Dunedin 6,453.

In Australia and New Zealand, Government systems prevail. In Hawaii the telephones are in private hands.

The following table shows the percentage increase of development in principal countries, 1923 over 1922.

	Per Cent.
Australia	11
France	10
Great Britain	10
Denmark	9
Germany	8
Belgium	8
United States	7
Switzerland	6
Netherlands	5
Norway	4
Austria	4
New Zealand	4
Sweden	2

DEVELOPMENT OF CITIES AND TELEPHONE AREAS WITH UPWARDS OF 1,000,000 INHABITANTS.

	Telephones (thousands).	Telephones per 100 inhabitants.
Chicago	691	23.8
Boston and suburbs	370	22.2
Los Angeles and suburbs	218	21.9
New York	1,186	19.9
Philadelphia	308	16.0
Cleveland and suburbs	162	15.8
Detroit ,, ,, ...	190	15.1
Berlin (Greater)	381	9.4
Hamburg (and Altona)	120	9
London (Administrative)	329	7.4
Paris	203	7
London Telephone Area	(401)	(5.6)
Tokio (before earthquake)	115	5.3
Vienna	87	4.8

	Telephones (thousands).	Telephones per 100 inhabitants.
Buenos Aires	76	4.4
Glasgow 7 mile radius	45	3.6
Liverpool „	42	3.6
Manchester „	54	3.4
Rio de Janeiro	30	2.6
Peking	32	2.4
Moscow	25	1.6
Petrograd	10 (?)	1.0
Calcutta	10	0.8
Constantinpole	8	0.8
Bombay	9	0.8

No information is available respecting Osaka and Canton, which each possess upwards of a million inhabitants.

CITIES WITH UPWARDS OF 75,000 TELEPHONES.

New York	1,186,573
Chicago	691,488
London	401,065
Berlin	381,291
Boston	370,331
Philadelphia	307,964
Los Angeles	218,662
Paris	203,731
Detroit	190,210
San Francisco	187,452
St. Louis	163,720
Cleveland	162,720
Pittsburgh	158,585
Toronto...	128,496
Cincinatti	122,660
Hamburg-Altona	120,756
Copenhagen and suburbs	118,682
Tokio (before the earthquake)	115,000
Washington	110,969
Kansas City	109,770
Montreal	107,459
Minneapolis	106,798
Baltimore	104,618
Milwaukee	103,577
Stockholm	100,063
Buffalo	87,775
Vienna	87,440
Seattle	86,478
Oakland (Cal.)	81,486
Buenos Aires	76,186

CITIES WITH UPWARDS OF 10,000 TELEPHONES. (THE FIGURES IN BRACKETS REPRESENT THOUSANDS.)

U.S.A. :—(The principal cities are mentioned in the foregoing list)...	137
Germany :—Berlin (381), Hamburg (120), Munich (54), Leipzig (50), Cologne (46), Frankfort-on-Main (45), Dresden (43), Breslau (33), Düsseldorf (30), Hanover (27), Stuttgart (27), Nurnberg (27), Bremen (25), Chemnitz (18), Essen (17), Magdeburg (17), Mannheim (17), Königsberg (16), Duisburg (15), Stettin (14), Dortmund (13), Elberfeld (12), Barmen (11), Halle (11) ...	24
Great Britain :—London (401), Manchester (54), Glasgow (45), Liverpool (42), Birmingham (32), Edinburgh (18), Newcastle (15), Leeds (15), Hull (14), Bradford (14), Sheffield (13), Cardiff (11), Bristol (11), Nottingham (10), Belfast (10)	15
Canada :—Toronto (128), Montreal (107), Vancouver, Winnipeg, Ottawa, Hamilton, Quebec, London, Edmonton, Halifax (N.S.), Victoria (B.C.)	11
Japan :—Tokio (115), Osaka, Kyoto, Nagoya, Kobe (before the Earthquake)	5
Australia :—Sydney (73), Melbourne (61), Adelaide (19), Brisbane (15), Perth (10)	5
Switzerland :—Zurich (22), Basel (15), Geneva (14), Berne (12) ...	4
France :—Paris (203), Marseilles (15), Lyons (14)	3
Holland :—Amsterdam (35), Rotterdam (28), The Hague (26) ...	3
Sweden :—Stockholm (100), Göteborg (26), Malmo (13)	3
Belgium :—Brussels (39), Antwerp (17)	2
Italy :—Rome (14), Milan (17)	2
Russia :—Moscow (25), Leningrad (? 10)	2
Spain :—Barcelona, Madrid	2
New Zealand :—Wellington (12) Auckland (11)	2
South Africa :—Johannesburg (16), Cape Town (11)	2
China :—Pekin (32), Shanghai (18)	2
Argentine :—Buenos Aires (76)	1
Austria :—Vienna (87)	1
Brazil :—Rio de Janeiro (30)	1
Cuba :—Havana (30)	1
Czecho-Slovakia :—Prague	1
Danzig :—Free City of	1
Denmark :—Copenhagen (95)	1
Egypt :—Cairo (12)	1
Hungary :—Budapest (32)	1
India :—Calcutta (10)	1
Ireland :—Dublin (13)	1
Mexico :—Mexico City (24)	1
Norway :—Oslo (35)	1
Poland :—Warsaw	1
Portugal :—Lisbon (12)	1
Uruguay :—Monte Video (15)	1
	240

Of these 240 cities, 150 are in North America, 69 in Europe, 8 in Asia, 7 in Australasia, 3 in South America, and 3 in Africa.

REVIEW.

"The Story of Broadcasting," by A. R. Burrows, F.J.I. (Cassell & Co. Ltd. 3s. 6d. net.)

This is something more than an ordinary story. It is an epic, of early struggles, hopes and fears, told with the truest poetic touch, and yet with a selfless suppression of the writer's own part in the building up of the British Broadcasting Company's organisation good to meet. Once or twice only does the ego peep in and then in company, as when the author describes those early days when the fate of the company seemed to be in the balance, and the poor studio it could afford, so small and meagrely furnished, that the staff had to make hat-stands of their umbrellas. Some, not wishing to burn their boats behind them, performed broadcasting duties after office hours on another job! Mr. Burrows is a philosopher. Listen! "Man, with his limited number of senses lives this present life somewhere between the infinitely great and the infinitely small. His senses reveal to him only certain things essential for his earthly wants and safety. They are blind to many things now proven to exist, and probably to countless other things of which we are still completely ignorant."

The chapter entitled "S.O.S." cannot be read without a thrill, as, for example the shelling of the *Ben Ledi* by a German submarine, and the heroism of the eighteen-year-old operator, Gardiner, who broadcasted the special signal again and again, despite the captain's orders to retire from the wireless cabin, but persisted and succeeded in bringing a British destroyer and an American cruiser to the rescue. When, afterwards, the captain visited the wireless cabin he found a complete log of the messages exchanged, but beside it the headless body of the wireless telegraphist.

So we might quote from each chapter, "Pen *versus* Sword," a story of war-time broadcasting, "Aladdin's Lamp," the story of the valve, "Setting the Scene," and "The Fun begins"—from these the initial stages of actual broadcasting by the B.B.C., its ups and downs, on to the account of the splendid team work of engineers, and broadcasters, an account which gives just that outline which enables the reader to visualise something of the patience, the perseverance, and that real enthusiasm, even love for one's work, without which failure would have been as certain as success has now proved to have been sure. The zest shown by the various organisers in their efforts to make the Children's Hour a success at each broadcasting centre is possibly without a parallel in any other country.

There is a generous tribute to the Post Office engineers for their whole-hearted co-operation in obtaining and maintaining the best of conditions on the loaned trunk lines, and what could be more fitting than the following quotation from Henry IV as the closing three lines of a delightful book?

"And those musicians that shall play to you
Hang in the air, a thousand leagues from hence
And straight they shall be here. Sit and attend."

— J. J. T.

TELEGRAPHIC MEMORABILIA.

A fool-proof wireless transmitter for lifeboats was recently on view at the fifteenth annual exhibitions of the London Physical Society and Optical Society held at the Imperial College of Science, South Kensington, London.

The instrument which is the exhibit of Messrs. Evershed & Vignolles was designed to meet the new Board of Trade regulation which insists that every tenth lifeboat on passenger vessels shall have a wireless transmitter and mast-head light. The apparatus has an effective range of 60 miles and any survivor in the boat can transmit continuous S.O.S. in Morse and at the same time illuminate a mast-head lamp by turning a handle in a box about 12 in. square.

On the 3rd of last month at the the same college Professor A. O. Rankine gave an interesting lecture on "Hearing by Light" in aid of the King Edward Hospital Fund. It is by this means that talking pictures have become a scientific fact—light waves produced by the utterance of words and syllables. "The pictures," said the professor, "could be photographed on the centre of a film and the talk vibrations on the edge. Thus complete synchronism of speech and action was obtained when the film was run off.

The lecturer demonstrated how by utilising a gramophone sound box diaphragm, an oscillating mirror, two pairs of lenses and grids, a selenium cell, and headphones or a loud speaker at the receiving ends, the human voice could be transmitted by short light waves just as it was by ether waves in ordinary wireless. The professor made the interesting discovery that when the speaking film was run through backwards the word "man" was heard as "help." Telegraphists will appreciate the analogous effect of running Wheatstone slip in a similar manner.

The professor further demonstrated that the reason why light waves could be concentrated into a beam was because such waves are extremely small, measuring as small as one millionth of a metre.

In these accumulating facts one can see the relationship of the radio beam system on the one hand and a confirmation of Relativity, and that parallel lines are only a matter of degree in the universe, on the other.

The Westminster Gazette gave an interesting column on "Radio in 1924" in one of their early January issues. After referring to the success of Mr. E. J. Simonds of Gerrard's Cross in being the first Englishman to receive Morse signals from New Zealand, and to send out from England the first messages which were received in that colony, to that of Mr. C. W. Goyder of Mill Hill School (2 SZ) who was the first to establish two-way working (12,000 miles) between this country and New Zealand, and also to that of Major Secretan of Barnes, who carried on a two-way communication with an Australian amateur for 80 minutes,—the *Gazette* drew attention to the fact that this same year saw (*a*) Photographs transmitted by Radio from London to New York, (*b*) Wembley Exhibition machinery started from Manchester by radio, (*c*) a war-vessel steered from the shore by wireless off the port of Genoa, (*d*) Wireless messages transmitted from the Olympic 700 miles at sea received at Devizes and printed at 80 words per minute in the G.P.O., London. With reference to paragraph (*c*) my scrap-book shows the following item on the authority of *The Electrical Review* of Aug 11, 1922, which appears to have been overlooked not only by the *Westminster Gazette* but by many others of the British Press:—"*Wireless Ship Control.*—One of the outstanding features of the naval exercises off the Isle of Wight on August 1st, was the control of the 16,500-ton *Agamemnon* by means of wireless at a speed of 15 knots from the destroyer *Truant*. It is said that the ship was not only steered in this manner, but that her engines were also started, stopped, and controlled while running, by the same means, the boilers being fired with oil fuel."

J. F. C., the *Westminster's* contributor, is inclined to agree with Sir Oliver Lodge that television in the sense of giving kinematograph reproductions *of something that is happening* is impossible of accomplishment for another twenty years.

All the humble writer of these lines would dare to say in so august a presence as that of Sir Oliver, is that he would be a rash man who would dare to prophesy concerning the limitations of radio developments for the next twenty *months*, not to speak of *years!*

Les Annales des P.T.T. of Paris state that the underground telephone cable between Hamburg and Munich which has a length of over 1100 kilometres, and is reputed to be the longest telephone cable in Europe, has achieved a great success since its inauguration in January last year.

Thanks to this cable, telephone traffic independent of weather and changing temperatures is assured between the North Sea and the Alps. The route passes from Hamburg to Munich via Hanover, Berlin, Bitterfeld, Plauen and Nuremburg.

Amplifying relays are inserted every 150 kilometres and it is reported that the audition is perfect.

The mention of amplifiers reminds one that the *Journal Télégraphique* in its December number declares that two inventors have just intimated to a certain academy of science that they have found it quite possible to obtain amplifications of the order of 1,000,000,000 by means of a single mercury vapor arc.

AMERICA.—The International Telegraph Office at Berne advises that the Compagnia Italiana dei Cavi Telegrafici Sottomarini opened the first section of the Americo-Italian submarine cable by commencing traffic between Spain and North America via the Azores on January 19. The portion between Malaga and the Italian landing place in the Bay of Naples is still in course of construction.

ARGENTINE REPUBLIC.—The following is a much condensed abstract from a Report of the British Commercial secretary at Buenos Aires: "The high-power station at Monte Grande, built by the Telefunken Co. and operated by Transradio Internacional, commenced service in January, 1924, with services to New York, Paris, and Berlin. By the terms of its concession the radio tariffs were fixed at two-thirds of the cable tariffs existing in October, 1922. This restriction has now been abolished and tariffs were raised in August, 1924, to an average of 20 to 22 per cent. below present cable rates. As the station was still unfinished only deferred traffic was handled. *With one transmitter serving in turn three circuits, there are obvious disadvantages in attempting to handle ordinary and urgent messages in competition with the cables,* but the company appears to have attracted the greater part of the deferred traffic, and is working almost up to its technical capacity. Duplication of the transmitter is now in hand, and great hopes are based on the short-wave system. Senator Marconi carried out tests between Poldhu and Buenos Aires in July last which were reported as entirely successful. The English service will be commenced as soon as the Marconi Co. obtains a licence, and this will place British traders on an equal footing as regards cost of messages with their competitors.

The Argentine Company, "Radio Sud-America," formed by the British Marconi, American Radio Corporation, French T.S.F., and German Telefunken groups has found its policy of sales for joint account unworkable, and the four companies have recovered their independent liberty of sales. The liquidation of the large stock held has demoralised the market. When Radio Sud-America abandoned broadcasting, it was replaced by an association composed of radio dealers which supplies an efficient service, and several other broadcasting organisations are operating, but the standard is not as high as in England owing to the lack of funds and public support.

During 1924 the Italian Submarine Cable Co. made substantial progress with its plans for laying an Italian-South American cable *via* Malaga to Brazil, Uruguay, and Buenos Aires. The company obtained its concession for the section from Montevideo to Buenos Aires in June, 1924, undertaking to present definite plans and specifications within 10 months and to open the cable to public service within two years from the date of approval of the plans. A large part of the capital of 200 million lire was subscribed in Argentina.

CANADA.—Reuter's Agency in Ottawa cables that the radio branch of the Department of Marine issued nearly seventy thousand receiving licences during the first eight months of 1924, being an increase of six thousand compared with the same period in 1923. Approximately seventy-five thousand radio receiving licences are actually in operation in Canada now.

The radio branch of the Department of Marine announces that the wave length of 125 metres is being specially reserved for Canadian amateur transmitting stations for trans-Canadian inter-Dominion radio work.

CHINA.—According to *Indian Engineering* the Woosung Hydrographic Bureau is establishing a number of radio stations along the sea coast. A station at Tungshan (Kwangtung province) is being built and another at Shenkiamen (Chekiang province), a fishery centre in Tinghai.

CZECHO-SLOVAKIA.—A new radio station has recently been completed at Podebrady, in the middle of Bohemia, with a range of 3,000 km., with two secondary stations of 2,000 km. at Bratislava and Kosice respectively, the former for communication with the Balkan States and the latter with the Near East. The installation of other stations of less importance is also in contemplation. The station at the aero port of Kbely was started at the end of 1922; in the year following stations at Karlovy Vary and Ckeb were installed. The station at Bratislava was established in the interest of the navigation of the Danube International Commission. The transmitting station at Podebrady corresponds with Paris, Berne, and Bucharest, while the Kbely station is destined to spread market and newspaper reports from France, Germany, Switzerland, and England, and to serve the aerial lines which meet at Prague.

GERMANY.—Our German notes bulk largely this month but are all of deepest interest. The following on the authority of the *Daily Mail* says that German keenness for research into short-wave wireless transmission has resulted in the Nauen station exchanging messages with Buenos Aires. This is believed to be the first short-wave two-way communication between Europe and the Argentine. Nauen has recently been sending widely on a wave-length of 90 metres, and the reduction to 30 metres is significant. Successful laboratory tests have been made recently in Germany with wavelengths of less than a metre.

Other and more direct information states that the German Telegraph Administration has inaugurated a service of Radio letters, i.e. letter telegrams at 10 pfennigs per word, with a minimum charge of 1 M. 50.

The Electrical Review informs us that a system of "Wired Wireless" is in course of installation in connexion with communication with ships at sea. With the help of the German Government, German steamship companies are to make an effort to keep all passengers in continuous touch with their homes. The newest and largest German liners are being fitted with arc transmitters, and with broadcasting apparatus that will enable passengers on board to have two-way conversation with anyone by a telephone. Broadcast messages from the ships will be received at points on the German mainland, which will be linked with German central telephone exchanges by

land lines. As the Germans will probably apply for Government permission to link up with Britain and the United States in the same way, steamship companies in those two countries are discussing whether they shall make a prior claim for the facilities from the British Government. The United States Government has already given such facilities to the United States liner *Leviathan*, which has communicated with its own land telephone exchange at Deal Beach, 49 miles from New York.

The German radio journal, *Funk*, states on good authority that the principal radio companies of New York announce the creation of a Broadcasting University there.

The course to be followed includes political economy, geology, biology, history, and the development of civilisation, and lectures will be given on these subjects every evening except Saturdays and Sundays. One hundred thousand students are expected to join.

Following on an interruption of the cables between Germany and Sweden the two administrations interested have recently had recourse to an auxilliary radio communication between Berlin and Carlsborg. This circuit was worked by means of high speed apparatus and 1700 telegrams were dealt with in two days.

The communication proved so satisfactory, says our informant, that it has been decided to retain this new radio telegraph link in service from 13 to 22 hours each day in order to permit of the rapid disposal of the correspondence.

The Exchange Agency stated during the early part of January that there was up till then no sign of any falling off in the public interest in broadcasting in Germany. The number of new listeners-in registered with the postal authorities has recently averaged 80,000 daily. If these be correct figures, then presuming the rate be continued until Easter there will be one wireless set for every man, woman, infant and child in the German capital !

IRISH FREE STATE.—The Radio Association of Ireland has decided to call an All-Ireland Conference on broadcasting, to which it is proposed to invite representatives of the Royal Dublin Society, the Institution of Electrical Engineers, the Irish Post Office, and other bodies, to frame a scheme and submit to to the Minister for Finance. At the meeting, Mr. D. O'B. McAteer, A.R.C.Sc.I., said that the Post Office in the Free State had assumed control of all radio telegraphy, largely due to the fact that the Postmaster General himself took a personal interest in the matter, because he believed there was a great future before it. The latter was a supporter of a scheme for starting broadcasting in Ireland by means of private enterprise rather than by the Government, which was in direct agreement with European experience on the subject. In his opinion, the British Broadcasting system was the best broadcasting station in Athlone. There was difference amongst the members as to whether the B.B.C. should be asked to erect a station in the Free State. It was finally stated and apparently accepted as the general principle that any company prepared to make the venture should be encouraged.

PANAMA.—The British Vice-Consul points out that the telegraph service of the Republic has been considerably improved during the past few years; there are 33 telegraphic stations in the principal towns, besides a long-distance telephone service, consisting of 105 stations, which connect the smaller towns with the capital. Practically all the towns of the Republic, except those in the Provinces of Darien and Bocas-del-Toro, are in direct communication with the capital city either by telegraph or by long-distance telephone. The distance covered by the National telegraph lines is 3,687 kilometres, and by long-distance telephone lines, 1,095 kilometres. The old wires have now been replaced by new copper wires on iron posts.

Radio Telegraphy.—The laws of the Republic and the Canal Zone restrict operations to the control of the United States. The system of radio communication operated by the Navy Department on the Isthmus consists of six stations. The only other commercial station in Panama is that of the United Fruit Co. at Almirante, for which a special licence has been obtained. The naval equipment consists of a high-power station at Darien; the two stations at Balboa and Colon, at each end of the Canal; and three outlying stations at Punta Mala, on the western side of the entrance to the Gulf of Panama; La Palma, diagonally opposite, on the Bay of San Miguel; and Puerto Obaldia, on the Atlantic coast, two miles from the Colombian border. The Darien station has three 600 ft. pyramidical towers, standing at the apexes of an equilateral triangle with a base of 900 ft. Its 100 kW plant has a normal sending radius of 3,000 miles, and is employed in the transmission of messages to the Navy Department in Washington, to San Diego, California, and in other long-distance service; this station has been heard in Australia, 7,000 miles distant, and by a ship passing from Colombo to Aden, approximately 12,000 miles away. The Balboa station transmits and receives about 15,000 words of commercial traffic per month, Colon 16,000 words, and the Punta Mala 3,500. No commercial messages between Panama and the United States are accepted by the naval stations.

PATAGONIA.—The projected radio-telephone service between the Argentine Republic and Patagonia has failed to materialise, the government of the Republic having failed to support the scheme or to grant a concession. Latest reports state that Patagonia is nevertheless *not* downhearted !

SWEDEN.—The large new radio station at Vorberg, which recently commenced commercial operation, is intended for transatlantic communication, and uses a wave-length of 18,000 metres. It is equipped with two high-frequency generators capable of developing 200 kW, energy being derived from the hydro-electric undertakings at Yugaredsfors and Trollhättan. The antenna is 2,300 metres in length and is carried on six masts varying from 110 to 130 m. in height. The receiving station is at Kungsbacka, which hands over from New York by wire to Gothenburg. At present the capacity of the installation exceeds all traffic needs, which are about 400 telegrams per day (200 each way). During the first week of Dec. a service of Partially Urgent telegrams was commenced.

Sweden, says the *Daily Mail*, has also its system of wired wireless telephoning between ships at sea and an exchange on the island of Bornholm.

The U.S. Bureau of Standards states that the world-wide establishment of radio has made an international auxiliary language a necessity, and the chief of the Bureau recently forwarded a pamphlet to the editor of the British *Electrical Review* translated into "Interlingua" which, says the editor, is described as "modernised and simplified Latin, without inflection." The Academia pro Interlingua of Turin has evolved this new medium of international expression and the following extract of a technical description of damped waves is a sample of the style adopted: "Nos habe monstrato quod radio-undas consiste de undas de aethere que habe electrostatico et electromagnetico lineas de fortia; et descripto methodo pro produce undas attenuato de isto charactere. Isto undas procede trans spatio et illos es detecto per apparatu speciale." The editor of our contemporary thinks that "Interlingua" is quite easily read, while the writer is of the humble opinion that Esperanto presents perhaps even less difficulties when, for example, *La Interligilo de l'P.T.*, describing some of the British telegraphic exhibits at the Wembley Exhibition can write so easily thus: "Ezkemple, en la Registara Palaco estas unu "eight channel multiplex" telegrafaparato (ok klavaroj, kvar iu direkton, kvar alidirekten). Miniatura telegrafa linio etendigas supre el iu flanko de l'cambrego al la ila, permesante tiele labori antau la publiko kiel dum dejorado. La eltrovanto de tiu aparato estas Baudot, la motinta kaj respektinda franca ingeniero. Gi funkcias per rimedo de "duplex" a aparato arangita de Brita ingeniero ! Ce iu fino de l'cirkuito la transsendantaj sectoroj konsistas el maljunaj Baudot' aj klavaroj, kaj ce la alia fino el automataj transsendiloj elpensitaj de Usonano, kiuj funkcias per paperrubando traborita de traborilo kiu aspektas same kiel skribmasina klavaro; ci-tiu traborilo estas eltrovo de Australano kaj de Usonano !

Oni permesas al la publiko sendi telegramojn el iu fino de la mallonga linio al la alia; tio interesas multe gi, vidante la vortojn de gia korespondajo eliras presataj ce la alia fino ol la fino de deponado. La korespondajo estas gluata sur speciala memora papero (Souvenir telegraf form)."

More examples could be given but there is no desire to plague our patient compositors or over-strain the Lino-type machines !

We regret to hear of the demise of Mr. H. A. Trewinnard, Superintendent of the Cable Room some twenty years ago, who passed peacefully away at his residence, Mary Vale, Dorset Road, Windsor, on the 21st ult.

Born in 1841, he took service with the Submarine Telegraph Company in 1857 as a telegraphist, and was in due course transferred to the Government Service with the absorption of the Company by the British Post Office in 1889, retiring with the rank of Superintendent in 1905.

He was in all respects a capable and scientifically trained official with not only a wide, but a deep knowledge of mechanics. He would doubtless have felt even additional interest in telegraphy had his latter years of service been spent in the modern developments of the machine side of telegraphy.

To Mrs. Trewinnard the few survivors of the "Submarine" extend their sincerest sympathy in the gap made by the loss of so devoted a husband.

A Man's Wish.—To be honest, to be kind, to earn a little and to spend a little less, to make upon the whole a family happier for his presence, to renounce when that shall be necessary and not be embittered, to keep a few friends, but these without capitulation, above all, on the same grim condition to keep friends with himself—here is a task for all that a man has of fortitude and delicacy.—*Robert Louis Stevenson.*

J. J. T.

A MODERN TELEPHONE SYSTEM FOR AN ANCIENT CITY.

STROWGER AUTOMATIC TELEPHONES AT YORK.

ON Saturday Nov. 15 there was cut into service at the Head Post Office, York, a new Strowger Automatic Telephone Exchange which had been manufactured and installed for the Post Office by Automatic Telephone Manufacturing Co., Liverpool. This displaces the old magneto and central battery exchanges, which previously ministered to the telephone needs of the City, and there remain only the trunk switchboard and certain outlying sub-exchanges, which will still require the services of operators to complete and take down connexions.

The Archiepiscopal City of York is the county town of Yorkshire, which is a county in itself in the Ainsty of York, a district wholly outside the three Ridings. York is situated in a fertile vale at the junction of the Foss with the Ouse, and had a population at the 1921 census of 84,039. It is a very ancient place and was known to the Romans as Eboracum, and subsequently became the capital of Bernicia and Northumbria. The city proper is enclosed by walls, pierced by four principal gates or bars. The glory of York is its famous

Minister or Cathedral, other noteworthy buildings being the Guildhall, Mansion House, and Castle.

The Post Office building adjoins the Guildhall and houses, in addition to the new manual Trunk Switchboard, the new Strowger Automatic Telephone Exchange, which is equipped for a present capacity of 1,700 lines, with facilities for extension to an ultimate capacity of 2,100 lines. This gives the inhabitants of York one telephone to every fifty persons, or a telephone density of approximately 20 per thousand, which is a little below the 1924 average throughout Great Britain.

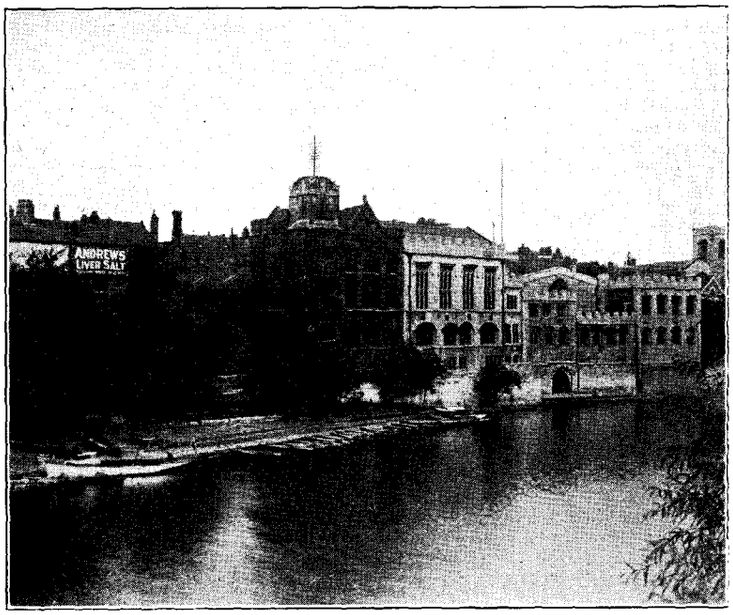


FIG. 1. VIEW OF YORK FROM RIVER SHOWING POST OFFICE.

The Strowger system in York is four-digit, employing primary rotary line switches, with final selectors mounted on the back of the line switch units. The Automatic Exchange is on the ground floor, and the line switch units are disposed in three parallel rows of five units each, and a fourth row comprising two units only. The line switches are mounted on shelves, each of which accommodates ten switches, and the shelves to the number of five are mounted on gates (two per unit), which may be swung out from the centre when necessary, allowing easy access to all cabling. Above the line switch gates is a fuse panel with alarm fuses, through which current is supplied to each section of line switches and signals of the unit. There is also mounted on the line switch side a terminal assembly where the outgoing primary trunks and the incoming final selector trunks terminate. Mounted on the reverse side of each line switch unit are two shelves, each having a capacity for 8 final selectors. The banks of all the final selectors are multipled together, allowing any switch access to any of the lines terminating on the banks. At the left of each shelf is an individual fuse panel fitted with alarm fuses through which current is fed to the final selectors. At the top of each line switch unit is mounted a line intermediate distributing frame, where the incoming line and meter cables terminate. On this frame the final selector banks are jumpered to the line switches. There is also a supervisory lamp strip supporting five signal lamps which indicate by their colour the particular signal with which they are associated, e.g. fuse alarm—red ; release signal—green, &c.

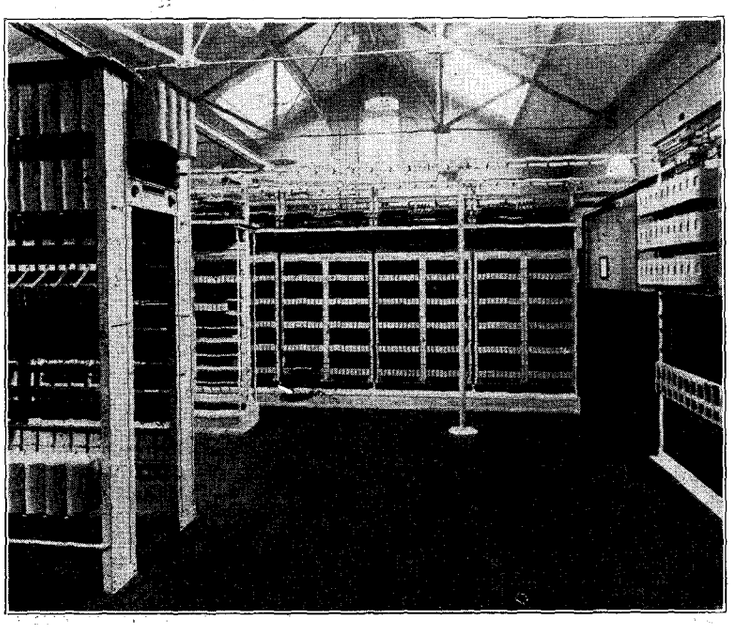


FIG. 2. ROTARY LINE-SWITCH UNITS (CENTRE), SELECTOR TRUNK BOARDS (LEFT), AND REPEATER RACK (RIGHT).

The group selectors are mounted separately on selector trunk boards of which there are two in the York installation. The design of these selector trunk boards embodies improvements which are the result of many years' experience by Automatic Telephone Manufacturing Company in the development of Strowger equipment. The Selector Rack is a substantial steel structure with accommodation for 240 switches, arranged in two bays of 120 switches per bay, 20 switches being mounted on each of six shelves. The shelves are completely self-contained, and can be added to the rack as and when required. The selectors are of standard Strowger type with detachable protecting covers over the relays and mechanisms. Switch jacks on the shelves permit the addition of switches to provide for increase of traffic, or removal for testing purposes. The terminal assembly to which the switch banks are wired provides ample facilities for the "grading" of switch groups.

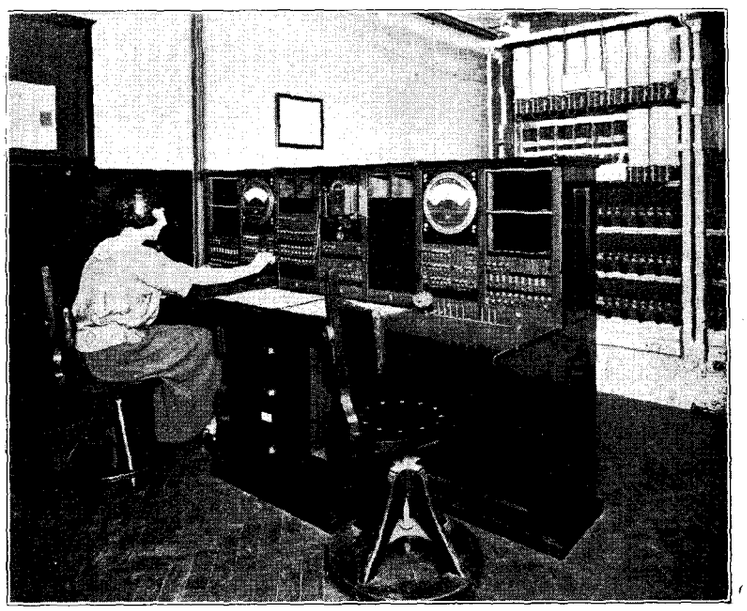


FIG. 3. TWO-POSITION TEST DESK.

The remaining equipment of the York switch room comprises a two-bay repeater rack, mounting the necessary repeaters, repeating coils and condensers. A main distributing frame, consisting of sixteen verticals, one end position unequipped at present ; a link distributing frame ; and a three-bay meter rack equipped with standard telephone meters for registering effective calls only. This is a special feature of Strowger automatic working; it eliminates error in recording calls and reduces subscribers' complaints of overcharging. There is also a fully equipped 2-position test desk.

The power plant and batteries for operating the York Automatic Exchange are located in the basement immediately below the switch room. The power board consists of three enamelled slate panels, mounted on a substantial iron framework, and carries the necessary apparatus for controlling the charging, discharging, ringing and signalling circuits. On the left hand panel are mounted the starters and switches for controlling the ringing machines. The central panel carries the ammeter and voltmeter with their respective multi-point switches, enabling readings to be taken at various points on the circuit ; the generator field rheostat ; booster battery variable charging resistance ; S.P. circuit breaker and the switches controlling the charge and discharge of the main and booster batteries. The third and right hand panel carries the supervisory equipment.

In addition to the main power board, there is also a separate starting panel for the charging motor-generator. This comprises a welded iron framework supporting a D. P. main fuse switch, and a motor starting switch.

The main batteries are in duplicate and comprise two sets of 25 Chloride S.B.W. 9 element cells, in lead lined boxes. Each battery has a present

capacity of 486 ampere-hours when discharged at the nine-hour rate, but the boxes will accommodate sufficient extra plates for a discharge of 702 ampere-hours to provide for future extensions, and the extra space is at present occupied by lead displacement tanks.

The charging motor-generator comprises an enclosed ventilated shunt-wound motor, designed for operating on 460 volts, D.C. supply. This is direct coupled to and mounted on the same bed-plate as a shunt-wound dynamo, having an output of 100 amperes at 57 volts. The normal speed is 1,000 r.p.m. and the voltage regulation ranges from 50 to 68 volts. The ringing dynamotors are in duplicate, one being designed to run off the supply mains, and the other off the exchange battery in series with an impedance coil.

For all local calls between subscribers, directly connected to the York Automatic Exchange, subscribers will dial numbers consisting of four digits. York subscribers also have access to three local sub-exchanges which are respectively called by dialling a single digit in each case, " 6 " for Dringhouse, " 7 " for Fulford, and " 8 " for Haxby. This immediately secures connexion with the manual operator, who is then given instructions for completing the call in the usual way. Conversely, the operators at these three sub-exchanges have " dialling-in " positions for completing calls incoming to York Automatic subscribers. To call any subscriber in an area outside York, the York subscribers will dial " 0 " thereby securing the services of the trunk or junction operator at the York Manual Switchboard, who will complete the call.

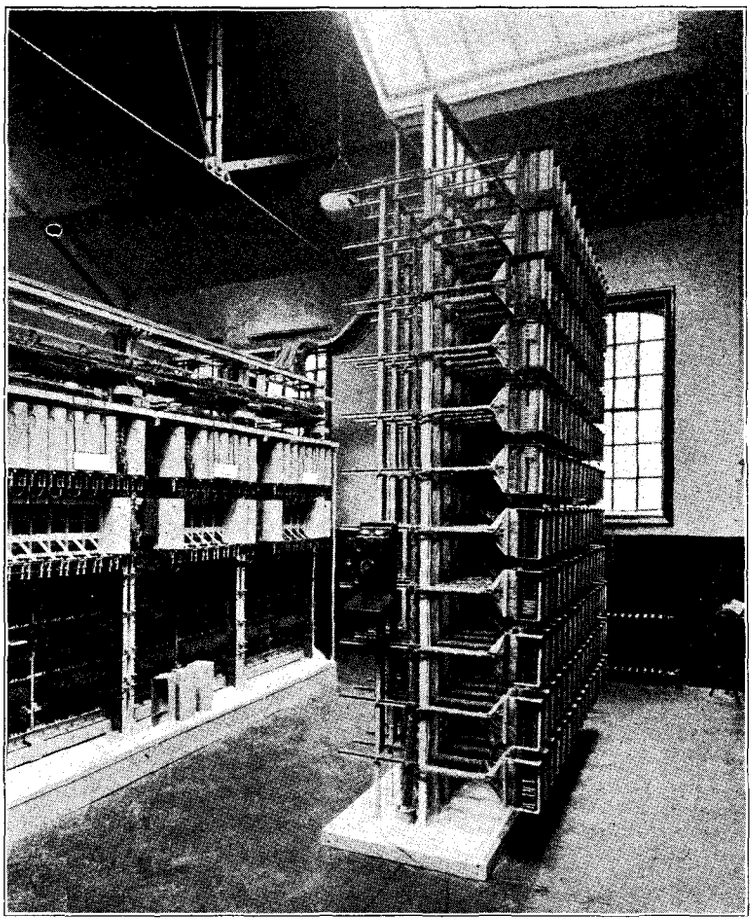


FIG. 4. MAIN DISTRIBUTING FRAME, &C.

Other special service numbers in addition to " 0 " for trunk and junction calls are :—

	Dial.
Phonograms and Telephone Telegrams ...	90
Inquiries	91
Official P. B. X.	92
Test Desk	99

With a view to improving the inward service from outside exchanges to York, arrangements have been made at most of the exchanges which have direct lines to York, whereby the operators at these exchanges can set up connexions direct to York subscribers, as well as to other subscribers in the York local area by direct dialling and without the intervention of a York operator. Among the exchanges to be thus fitted with " dialling-in " positions are Leeds, Hull, Scarborough, Selby, and Northallerton.

The new manual trunk and junction Switchboard at York was also manufactured and installed for the Post Office by Automatic Telephone Manufacturing Company. It comprises five 2-panel sections equipped with the necessary apparatus, a 4-panel multiple, and a cable turning section. There are four " A " operators' positions, and an Inquiry position, each equipped with fourteen cord circuits, and " dialling-in " facilities. On this board terminate the various junctions from York to other outlying exchanges, whilst the multiple also allows access to all York auto-subscribers for incoming calls which require the services of an operator to complete them.

The coin box circuits also terminate on this switchboard, and in this connexion it is of interest to record that multi-coin prepayment boxes are to be installed at all existing call offices and at the new telephone kiosks which are about to be erected in various parts of the city. Callers will be able to obtain local calls by dialling, without attracting the attention of an operator, but the connexion for speaking will not be " through " until the coins have been deposited. The coin boxes are provided with three slots for the reception of pennies, sixpences, and shillings respectively. For junction and trunk calls the caller will dial " 0 " and secure the attention of an operator. On passing particulars of the call, the caller will be advised of the fee. On the call maturing the caller will be asked by the operator to deposit the necessary coins in the usual way.

The new manual equipment for York Exchange also includes the usual I.D.F., special apparatus rack, and a one-position supervisor's desk.

The opening ceremony was performed by the Lady Mayoress, Lady Newbold Kay, at 2.0 p.m. on Nov. 15, and the first call on the new system was made by the Lord Mayor, Sir R. Newbold Kay, who rang up the Lord Mayor of Leeds as the representative head of a city which has enjoyed the advantages of Strowger Automatic service for the past six years.

CORRESPONDENCE.

THE FUTURE OF THE TELEGRAPHS.

TO THE EDITOR OF " THE TELEGRAPH AND TELEPHONE JOURNAL."

DEAR SIR,—In the interesting paper read at the Institute of Electrical Engineers, Mr. Murray condemns the present Telegraph Service. On the principle that drastic diseases require drastic remedies, he suggests the sweeping away of the Telegraph system, as known to us, and its substitution by an arrangement of Telegraph Exchanges on the Telephone Model. He insists on the need for the maintenance of separate Telegraph connections throughout.

As a set off against the loss involved in scrapping the existing expensive telegraph plant, the cost of providing teletype exchanges in lieu of instrument rooms, and the additional outlay for direct telegraph connection from business premises to the new exchanges (terminal facilities), the Post Office is invited to contemplate the probable saving which may accrue from the disappearance of the telegraph operators, and the officers engaged in supervision.

On the other hand, the business man is asked to install a Teletype telegraph on his desk and to get himself connected as a subscriber to a fresh exchange. He is promised that if, and when, his correspondents do likewise, his telegrams may be delivered at a speed hitherto unknown.

The speed attainable by duplex telegraphy is referred to in support of this view.

Is there any indication that, in the near future, the average business house will have even enough telegraph work to occupy entirely a simplex telegraph channel for any reasonable period ? If not, what compensation is offered for the extra expense ? The device of direct telegraph communication between merchants is not new. The Telewriter has been in use for a long time. This telegraph apparatus occupies little space, and can be attached to a telephone circuit. Firms so connected can telegraph duly signed orders to each other, by the simple operation of writing them down, at the same time copies are made available for filing in the sender's office. Notwithstanding the commercial utility of a signed order, and the advantage of attachment to a telephone circuit, there has not been any abnormal rush to install the Telewriter.

It is also likely that, in turn, the Teletype may shortly be superseded by an adaption of the " Phonetic Typewriter," which will enable words spoken into the telephone transmitter to be recorded in type at the distant end, thus rendering both the New Telegraph Exchange and Teletype installations worthless.

Finally, what provision is made under this scheme for the many others, who, although not telephone subscribers, are yet users of the telegraph ?

J. J. BOYLE.

6 *Jan.* 1924.

The
Telegraph and Telephone Journal.

PUBLISHED MONTHLY IN THE INTERESTS OF THE TELEGRAPH AND TELEPHONE SERVICE, UNDER THE PATRONAGE OF THE POSTMASTER-GENERAL.

Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

VOL. XI. FEBRUARY, 1925. No. 119.

THE LATE SIR ANDREW OGILVIE.

THE death of Sir Andrew Ogilvie removes from the Telephone world a figure which will always be associated with the transfer of the National Company to the State. In connexion with that transfer he was always imbued with the determination in laying the foundations of a great British telephone system to act as considerately as possible towards the officers of the old Company. For them, it was a very real change. They were to enter upon new conditions; they were to become part of the vastest unit industrial organisation in the world. Those of us who followed Sir Andrew in striving as far as possible to effect a fusion of spirit, as well as a fusion of organisation, know how tenderly and far-sightedly he led us. The circumstances of the transfer were such that they could only be known in part to the public. Fierce objections broke out, the purport of which seemed to be that enthusiastic and enlightened men, in changing from private employment to public employment, changed also their characters and lost some of their enthusiasm and some of their enlightenment. That criticism is no longer heard, and the fusion of spirit has been accomplished, and Sir Andrew lived to see it accomplished. But although he left us, in the official sense, before the full fruition of his aims was visible, yet those who had been associated with him were gratified to know that in his retirement he saw the development for which he had hoped. He continued afterwards to be associated with telephones rather from the manufacturing than from the operating point of view, but his direct interest was undiminished, and his unique knowledge always was at the disposal of any of us who needed it.

He had a singular attractiveness to those who had not had the same long official training as he had. His long study of organisation and economics led him to see both advantages and disadvantages from the point of the individual in State employment. He realised with singular acuteness the disadvantages which must follow from a vast organisation which was compelled to balance various types of industrial work in one generic organisation. He had studied with minute care the operations of the large American Companies, and he saw much to admire in them and much to imitate and, highly respected as he was by those of us in the English service who knew something of his philosophy and his outlook, it is a fact worth recording that the heads of the American Companies also held him in peculiar respect, and it is not too much to say, of affection. When the student of industrial organisation of the future comes to write of movements from private ownership to public ownership he will find that many subtle considerations entered, that this movement was not the simple nationalising which it is too frequently represented to be, and that involved in the process are many questions affecting the structure of the organisation to which were entrusted the operation of these enterprises. He will find in many of Sir Andrew Ogilvie's writings fresh light on these difficult subjects, but above all he will find that there are complexities and counter-weights which are easily overlooked.

Of him personally it is almost a presumption to speak, but we who are trying in this Journal to do something for the spirit of the vast industry of which we are a part cannot forget that he was the original inspiration of the Journal. He was a frequent contributor to the earlier issues. He wished it to occupy a place in the enlightenment and the encouragement of all who found their livelihoods in Telegraphs and in Telephones which would be a common bond apart from issues which are bound from time to time to separate us. It was said recently at an Industrial Conference that the War Office had the longest experience in the management of men. It is worth recording at this point that Sir Andrew Ogilvie brought the most enlightened side of military experience in respect of leadership to bear on the problems which arise from day to day. At his graveside was a very varied gathering, from the head of the Post Office and the heads of manufacturing companies and of other Telegraph and Telephone organisations, down to men who had served under him and were proud to have served under him in the old Middlesex. There were others who owed to him the particular leadership which he gave as Director of Army Signals in the war, but throughout the country and in many other places in the world there are men and there are women who still mourn the loss of a figure of which the Telegraphs and Telephones will long be proud.

THE LOSS ON THE TELEGRAPH SERVICE.

WHEN the House of Commons decided in 1885, against the advice of the then Postmaster General and the then Chancellor of the Exchequer, on the introduction of a minimum sixpenny tariff for inland telegrams, it definitely, and probably knowingly committed the telegraph service to subsidy from the taxpayer. It is true that the telegraph service, for a few years prior to 1885, had shown a financial loss, but it was of small dimensions

and might have been wiped out in time, if the alteration in the tariff had not been of so drastic a character. The desire of the House of Commons that the service should be widely developed by means of the cheap tariff was rapidly achieved, but the possibility of conducting the service on a financially remunerative basis was placed beyond hope and the loss inevitably grew with the development.

Whether the subsidisation of the telegraph service out of taxes was, on the whole, for good or for evil is a debatable question, but at all events the principle was never seriously challenged till the financial stress of the war and growing costs led in 1915 to the break of the sixpenny tradition, and the present tariff is now double that which the House of Commons thought right to fix in 1885. Even so, the cost of the service has increased so much under post-war conditions that the loss is heavier than it was immediately prior to the war.

The present financial burdens of the country have led to a change of public opinion in regard to the subsidy of public utilities at the expense of the taxpayer, and the most important problem of the telegraph service is how to place it on a remunerative basis. We accordingly commend to our readers the very instructive paper on "The Cost of an Inland Telegram" which was submitted last month by Sir Henry Bunbury and Mr. A. J. Waldegrave to the Telephone and Telegraph Society of London, and which appears elsewhere in this issue. It furnishes an analysis of the cost of dealing with the average telegram, and it shows that there is an average loss of 4¾*d.* on each inland telegram.

A further increase in the tariff would be very harmful to the service and may be regarded as an impossible expedient. The rescue of the service from its financial troubles can only come from a careful and constant economy. No heroic remedy is possible, but there is opportunity enough to reduce costs, and even increase revenue, in obvious directions. No one would propose the general closing of the thousands of small offices up and down the country, which cost much more than they contribute in revenue. These offices form a financial burden which the telegraph service must necessarily carry as a consequence of its statutory monopoly, but there are other leaks which might legitimately be stopped. The case of the Press tariff is historical, and, despite what has been written about it in the past, the question might again be raised why the Press should still be excluded from the scope of the public decision against any form of subsidy. Is it right to charge 5% interest on capital value in these days of a 4% rate on Treasury Bonds? Is it essential that the small and unremunerative offices should remain open for telegraph business throughout the day, and would a restricted and less expensive service not meet the reasonable needs of scattered communities? These are merely some aspects of the service which come readily to mind in considering the possibilities of reducing costs; but there are other possibilities of economy, and there is also the question whether new sources of revenue not involving disproportionate expense might not be found.

To reduce the cost of dealing with the average inland telegram from 1*s.* 8*d.* to 1*s.* 3¼*d.* will be no easy task, but it is not a hopeless one. The financial well-being of the telegraph service is of vital concern to the men and women employed in it. Many of these men and women have decided views as to the directions in which economies or new sources of revenue should be sought, and it would be well if these views were brought to a common pool, as the present state of affairs can only be overcome by united effort.

HIC ET UBIQUE.

ACCORDING to *Telephony*, striking proof of the great development of New York is brought to mind by the fact that this year it became necessary to issue the Subscribers' directory in two volumes. One book was not big enough to accommodate the list of telephone subscribers, which approximated 900,000. So large and awkward to handle, and difficult to bind, had the directory grown that it was necessary to issue one book for Manhattan and the Bronx, and another for Brooklyn and Queens. It will be remembered that in our May issue we drew attention to the possibility of having to divide the London directory, which chronicles the names of less than half the above-mentioned number, in the not too remote years to come.

"Advocates of government ownership of telephone systems," says the *Telephone Engineer* of Chicago, "will find small comfort in the recent announcements that the under developed and dilapidated systems of Spain and Greece are to be taken over and rehabilitated by private companies. Southern Europe has been very backward in telephone development, but with Spain and Greece following the lead of Italy and with the possibility that France also will fall into line in placing private enterprise in control, it is not beyond reason to expect these southern nations to outstrip their northern neighbours who still cling to the fetish of government ownership."

We shall believe in the transfer of the French system to private hands when we see it, and shall await with equanimity the day when the countries mentioned outstrip in telephone development the fetishists of Great Britain, Sweden, Switzerland, or Germany, for instance.

THE Telephone Development Association, says the *Glasgow Bulletin*, has asked the Postmaster General to encourage the greater use of telephones. They make excellent paper weights.

This Journal forgets a still more important use of telephones. They afford an excellent and ready theme for not-too-fresh jokes—as witness also *Punch*:—

East Ham's telephone exchange is to be enlarged. It is expected that there will be a special room where wrong numbers can be kept in cold storage for any length of time.

You never heard a joke like that before, surely!

THE *Manchester Guardian* quotes the following paragraph from the report of the Telegraph and Telephone Advisory Committee of the Chamber of Commerce:—

"*In a large district like Manchester,*" *the report goes on,* "*it is only* natural that individual complaints should be received both by the Chamber and the postal and telephone authorities, and it would be a remarkable organisation which could deal with the tremendous amount of traffic without receiving a single complaint. The close co-operation which exists between the officials and the Chamber enables the latter to appreciate the difficulties of the authorities, and therefore to assist them in providing the commercial community with the services which they require. There is little doubt that the Manchester organisations are extremely efficient, and are fulfilling their duties to the public in an admirable manner.

"From the discussions which the Chamber has held with the Postmaster it is evident that there is a keen desire to investigate any proposal which might be made for improvements to the various services, and it is sincerely trusted that the friendly relations which exist will be maintained to the general advantage of all parties concerned."

THE COST OF AN INLAND TELEGRAM.*

THE object of this paper is to lay before you the results of some recent investigations into the cost of an inland telegram.

These investigations were made because it was felt that the accounts of the telegraph service (as distinct from special investigations made from time to time) were not as fully used for the purpose of supplying information to the administration of the service as they might be. An interesting feature (perhaps the only interesting feature) of the figures which we shall lay before you is that they do take into account the total expenditure of the telegraph service. In this way they differ fundamentally from the built-up estimates of cost which are from time to time prepared. Such estimates are valuable and, when nothing better can be obtained, indispensable. But they are always subject to the fundamental doubt whether the simple transactions on which they are based are really representative of the whole, and whether they take into account all and no more than all the expenditure which is actually incurred on the service.

The figures which we lay before you are free from this element of doubt. We have taken the known aggregate expenditure on telegraph services as a whole as our starting point, we have eliminated classes of traffic other than the ordinary inland telegram and have thus isolated the cost of the inland telegraph service. This total cost, reduced to a cost per message, we have then analysed into its various component parts, making use of the latest available information for this purpose. We cannot and do not claim absolute accuracy or certainty for these results; but we find that they are consistent with such other information upon the subject as is available, and we think that they may reasonably be accepted as a pretty accurate presentation of the present-day cost of the inland telegraph service.

According to the Post Office Commercial Accounts the deficit on the Telegraph Service for the year ended Mar. 31, 1924, including interest on Capital, was £1,265,500. Eliminating what may be regarded as the two extraneous items of Broadcasting licences and payments under the Sutton judgment, the deficit was £1,260,000. It may be well to explain what is meant when we speak of the Post Office *Commercial* Accounts. These accounts were introduced in order to show as nearly as possible the financial results of the Post Office services on a commercial basis, that is to say as they would appear in the books and accounts of a commercial company. The ordinary accounts of a Government Department—which in their final published form are called the Appropriation Accounts—are purely cash accounts, and are intended simply to show that the sum voted by Parliament in any year for the expenses of the Department—in the present case the Post Office—is duly spent in that year on the services for which it was provided, or, so far as not so spent, is surrendered to the Exchequer. Similarly the ordinary account of Post Office Revenue, as embodied in the Finance Accounts of the United Kingdom, is purely a cash account and takes no account of revenue earned but not yet received, or of services rendered without actual cash payment. In order to bring these accounts into line with the accounts of a commercial undertaking, and to show the true financial result of the Department's operations, several adjustments have to be made, and the true revenue and true expenditure have then to be brought together. The chief adjustments are as follows:—

1. The expenditure which is incurred in respect of staff, buildings, stores, &c. employed on Post Office services generally, is divided under the three heads of Postal, Telegraph, and Telephone. The salary of a Postmaster, for example, has to be divided in this way. The name usually given to this process is "Common Service Apportionment." It is sometimes suggested that the Commercial Accounts are vitiated at the source by the necessity for this apportionment with its introduction of an element of estimate, but this criticism is not well founded. In the first place much of the expenditure is definitely earmarked even in the Appropriation Accounts for the particular service, postal, telegraph or telephone, on which it is incurred and in the case of Telegraphs practically 60% of the expenditure is thus definitely assigned, leaving only 40% to be apportioned. And, in the second place, the element of estimate, where it does occur, is spread over so wide a field that it is safe to assume that errors cancel out, over-estimates at one point being balanced by under-estimates at another. There is no reason to suppose that the officers furnishing returns of the division of common-service expenditure apportion time and costs other than according to the best of their judgment, and if an error of judgment is made in one direction it is a thousand to one that a corresponding error will be made elsewhere in the opposite direction. We may take it, then, that the figure shown in the Commercial Accounts as the expenditure on Telegraphs is neither over-stated nor under-stated to any appreciable extent by confusion with Postal or Telephone expenditure.

2. The second adjustment to which reference should be made is the bringing in of services rendered by one Government Department to another. The Stationery Office, for example, supplies the Post Office with large quantities of goods for which no cash payment is made by the Post Office. In the Commercial Accounts the value of these goods is entered just as if payment had actually been made. Formerly the value of all the Telegraph services rendered by the Post Office to other Government Departments was brought into the Commercial Accounts by an adjustment of this kind, but for the last two years Government Departments have paid for their telegrams like ordinary members of the public, and an adjustment is no longer necessary except as regards a few special services such as Direction Finding for the Mercantile Marine.

*Paper read by Sir Henry N. Bunbury, K.C.B., and A. J. Waldegrave before the Post Office Telephone and Telegraph Society of London.

3. A further adjustment is in respect of Interest on Capital. The interest actually paid by the Government is on the stock created following the purchase of the Telegraph system from the companies in 1870, but in the Commercial Accounts the interest charged is on the capital value of the system as it exists to-day, reckoning only plant value and including nothing for goodwill.

4. The next adjustment to be mentioned is that in respect of Depreciation. In the Commercial Accounts depreciation is charged, as it would be by a prudent company, according to the estimated life of the plant. What amounts to a Depreciation Fund is set up, and renewals are charged against the Depreciation Fund thus provided.

5. Then there is Pension Liability. This is charged as if the Post Office were paying into a pension fund; and the calculation of the amounts which would thus be paid is based on an actuarial valuation of the pension liability made by the Government Actuary, who is supplied with all necessary particulars of the service, official life, remuneration, and duration of life of the various classes of pensionable Post Office servants.

6. The last adjustment which it is necessary to mention is that where the buildings occupied are owned by the Government a rental value is charged in the account as if the service actually paid rent for the premises.

These, then, are the chief features by which the Commercial Accounts are distinguished from the Appropriation Accounts and, as already stated, the Commercial Accounts show that the loss on the Telegraph Services in 1923-24 was adjusted to £1,260,000 by eliminating Broadcasting licences and "Sutton" payments.

But this is the loss on the Telegraph Service as a whole; and our subject this evening is "The Cost of an Ordinary Inland Telegram." We must proceed therefore to isolate, if we can, the figures relating to ordinary inland telegrams by excluding those which relate to other branches of the telegraph service.

There are two sections of the Telegraph service, viz. the Imperial Cable and the Wireless Services, in respect of which separate Commercial Accounts are prepared and published, and we can proceed at once to modify the figure of £1,260,000 representing the total loss on Telegraphs, so far as it is affected by these two services. In 1923-24 the loss (after charging interest on capital) on the Imperial Cables was £38,000 and on the Wireless Services £66,000. Deducting these two amounts, the loss on the main Telegraph service would be reduced to £1,156,000. We have not, however, yet arrived at the figure of loss on ordinary inland telegrams taken by themselves. We have to consider the financial effect of the general foreign telegraph services, of the press service, of private wire rentals, of railway pass telegrams, of abbreviated address fees, and of one or two odds and ends.

Although no account of the Foreign Telegraph services, other than Imperial Cable and Wireless, is published, an account is prepared by the A.G.D. along the same lines. The division of cost between foreign and inland telegrams where staff or plant is employed in transmitting both classes of message presents some difficulty, but the result arrived at may be taken as giving at any rate a fair approximation to the facts, and it indicates that in 1923-24, after allowing for the loss on the Anglo-Irish service, there was a profit of £170,000 on foreign telegrams (other than Imperial Cable and Wireless).

Let us now look at the question of Press telegrams. We are all familiar with the statement that the loss on the telegraph service is due to the cheap rates conceded to the Press at the time of the State purchase of the system, and we know how indignant telegraph men are at the absence of any reference by the newspapers to their own favoured position when they are conducting their periodical campaigns against the Post Office. What is the truth of the matter in terms of pounds, shillings, and pence?

There is no doubt that the Press traffic is unremunerative. And this is true even in the strictest and most limited sense of the word "unremunerative." We should, so far as the accounts can tell us, be better off without the Press traffic. To-night, however, we use the word in its looser sense, and mean that it does not contribute its proportionate share to the expenses of the Telegraph services as a whole. The total receipts from the traffic in 1923-24 amounted to £91,000, whereas if it be assumed that the expenditure on the whole telegraph service should be shared among the different kinds of traffic proportionately to the volume of each kind, the expenditure on Press traffic, including a share of the interest charges, would be put at £348,000 and the loss would thus be £257,000. A year or two ago a much higher figure would have been shown, but the policy of the Press Association in renting private wires and dealing with the traffic itself has led to a large reduction in the number of Press telegrams handled by the Post Office and consequently to a reduction in the loss.

It might of course be argued, and has been argued by the Press, that their traffic is additional to the ordinary public traffic and ought not to be charged with a share of the standing charges, but for our purpose this evening we will ignore such a contention and relieve the ordinary inland service of the full burden of the £257,000 just mentioned. It will be seen that, even so, we shall by no means get rid of the loss on the ordinary service: the £1,260,000 with which we started and which had been reduced to £1,156,000 by having regard to the loss on the Imperial Cable and Wireless services will be increased to £1,326,000 by allowing for the profit of £170,000 on ordinary foreign telegrams; and then, by deducting the loss of £257,000 on Press traffic, we reduce the figure to £1,069,000.

There is still one substantial reduction to be made. Under the terms of the purchase of the telegraph system, the railway companies were given the right to send telegrams free over the Post Office wires, and practically all the Post Office gets in exchange is wayleave rights over the railways.

Limits have been placed to the use of the privilege, but even so it is estimated that the cost of the service rendered to the companies by the Post Office in 1923-24 was £84,000. Deducting this amount, we reduce the loss on ordinary inland telegrams to a figure below the round million, viz. to £985,000.

Unfortunately we cannot leave it at that. There is a profit on private-wire rentals and there is also a slight profit on abbreviated-address fees, though by no means enough to allow of a return to the former guinea fee; and when we have allowed for these known profits and for one or two other items of no great individual interest, and have thus completed our isolation of the loss on the ordinary inland telegraph service, we find that the amount of the deficiency is £1,022,000.

1. LOSS ON INLAND TELEGRAMS.

	£	£	£
Loss on general Telegraph Service 1923-24			1,260,000
Deduct: Loss on Imperial Cables ...	38,000		
„ Wireless Services ...	66,000		
„ Press Service	257,000		
Cost of Free Railway Telegrams	84,000		
		445,000	
Less: Profit on Foreign Services ...	170,000		
„ Private Wires, Abbreviated-Address Fees, &c.	37,000		
		207,000	
Net deduction			238,000
Net Loss on Ordinary Inland Telegrams			£1,022,000

The number of ordinary inland telegrams forwarded during the year 1923-24 was 51,225,000 and, dividing the deficiency of £1,022,000 by this number, we find that the average loss on an inland telegram is 4.788*d.*, say 4¾*d.*

We are now in a position to state the average cost of an inland telegram, for we know that the average revenue on such a telegram is 1*s.* 3.223*d.*, say 1*s.* 3¼*d.* This figure is ascertained by actually examining the charges on a proportion of the messages. Unless there is a change in the public rates the average revenue per telegram does not vary much from month to month or from year to year, though strangely enough it transpires that the figure is slightly higher for Scotland than it is for England and Wales. True, the difference is fractional, but still it remains a mystery that the Scotsman should be less successful in paring down the number of words in his telegrams than the Englishman.

As the revenue per telegram is 1*s.* 3¼*d.* and the loss is 4¾*d.* it follows that the average cost per telegram is 1*s.* 8*d.*

Before we proceed to analyse this cost, we had better perhaps make sure that this is not one of the cases where to deal with averages is to deal with illusions and unrealities. For there are such cases. We could, for example, ascertain by a simple arithmetical calculation the average number of subscribers to a telephone exchange; but suppose we did, and found that it was 537, should we have a basis on which to proceed with plans for designing and equipping actual telephone exchanges on standardized and uniform lines? Certainly not, for the telephone service has to cover a range varying from small rural exchanges to the biggest possible city exchanges. Here and there, no doubt, is an exchange which conforms to the arithmetical average, but, broadly speaking, the "average exchange" is a myth. On the other hand, we know the average revenue which will be produced by the addition of a given number of residential rate subscribers (although their individual use may vary within wide limits) and we can safely act on that knowledge: we are in the region where consideration of averages is legitimate and helpful.

To take another illustration, which perhaps comes nearer to the circumstances with which we are concerned this evening. If the Controller of the Stores Department were to ascertain the average-sized uniform required by a postman, as he could easily do, and decide to stock that size only, he would soon find himself in trouble with the U.P.W. Even the British public might be horrified. But this does not alter the fact that we are able to talk with reason and confidence of the average amount of material required for a postman's uniform, and for certain purposes to use this figure with advantage.

Averages, in fact, may be useful in dealing with the subject matter in bulk, but may be misleading and dangerous when applied to the individual case; and the smaller the section of the whole to which they are applied, the greater the risk of error.

Let us consider whether the variations in the character of inland telegrams—for such variations undoubtedly exist—are so wide and so fundamental in character as to render the figure of average cost illusory and worthless for any purpose without further classification and analysis. There are several classes of telegrams which, from the point of view of costs, clearly have a distinctive character, but which, on our existing information, we cannot isolate in arriving at our figure of average cost. The question is whether these telegrams are sufficiently numerous to make it illusory to talk of an *ordinary* inland telegram, or sufficiently divergent in cost from other telegrams to invalidate the use of the arithmetical average of 1*s.* 8*d.*

Take first the case of phonograms. Telegrams initiated over the telephone, which amount to about 15% of the total number of inland telegrams, give rise to special expenses at the point where they are taken down from the sender's dictation, and they also involve additional expense for accounting. But against these expenses must be set the saving of the ordinary counter work, and, in some cases, of transmission by wire from an outlying office to the phonogram centre. There is no difference in the work of transmission or delivery, once the message gets on the telegraph circuits, and it is on these operations that the main expense of a telegram arises. Telegrams *delivered* by telephone constitute about 11% of the total number of delivered telegrams, and where the addressee lives at a distance from the office of delivery there is no doubt a distinct saving. But the number of cases of substantial saving is relatively small.

The effect on a general average-cost of telegrams delivered to remote addresses, whether by telephone or by messenger, should perhaps be considered. Obviously the cost of delivering a telegram to an address several miles from the office is very high, and the revenue on such telegrams, even allowing for the fact that porterage is charged for distances beyond three miles, falls far short of the expense incurred. But the number of such cases of remote delivery is small in comparison with the total volume of the telegraph traffic. There are not more than a hundred telegrams a day in the whole country delivered at distances of over four miles, and probably the number delivered at distances of over two miles is not more than 1% of the total traffic. The bulk of the traffic is for addresses within a mile of the office of delivery; and in the cities and large towns 70% of the telegrams are for addresses within half a mile of the office of delivery.

Then there are Sunday telegrams. The cost of dealing with Sunday telegrams exceeds considerably the extra fee of 6d. which is charged on these telegrams, particularly at country sub-offices, where although the offices are open for an hour and a half there is an inappreciable amount of traffic. Of the total annual loss of a million or so on inland telegrams, about £30,000 may be attributed to the additional cost of Sunday work which is not covered by the special fee.

There are over a thousand telegraph offices at which the business done is so small that they must be regarded as unremunerative in a special degree. In some cases the loss is wholly or partially covered by contributions, under guarantee, from inhabitants of the neighbourhood. The loss falling on the telegraph enterprise from transacting telegraph business at these offices notwithstanding their exceptionally uneconomic character is perhaps £20,000 per annum, and the cost per telegram of the few telegrams dealt with is very high. But, after all, these figures do not bulk very large in the total telegraph business, and the inclusion of the telegrams concerned, with their aggregate cost, does not seriously affect the calculation of the average cost of a telegram.

It has sometimes been suggested that we ought to close these remote and unremunerative offices, but the majority of them are open for telephone business, and moreover, even if we closed them we should not recover the full value of the plant which has been erected to serve them. Nor should we escape delivery of all the telegrams which are delivered from these offices; a proportion of the telegrams would still be sent and we should have to deliver them from offices still more remote from the scattered addressees for whose benefit the offices exist.

Another class of telegrams which have a distinctive character consists of telegrams to and from Stock Exchanges and similar institutions. In the case of the telegraph offices attached to these institutions a very large proportion of the traffic is disposed of by direct wires and tubes and the number of intermediate transmissions is substantially reduced. The inland traffic at these offices is about 2½ million telegrams a year—nearly 5% of the total traffic. Here the costs will be below the average, whereas in several of the special cases mentioned they will be above the general average.

Possibly there are other classes of telegrams to which the practical telegraph men could point as abnormal in respect of costs. It would be more satisfactory no doubt if we were able to state definitely the costs of each separate class of traffic, and perhaps as time goes on we shall obtain more precise information—this is a field in which co-operation between the telegraph department and the accounting department may yield valuable results—but on the whole there does not seem sufficient in the consideration of the existence of special classes of traffic to deter us from making such an analysis of the average cost of an inland telegram as that to which we now propose to address ourselves.

From the accounts themselves, with certain minor adjustments, we are able to divide the expenditure under the following heads and to apportion the figure of 1*s.* 8*d.* as shown:

2. ANALYSIS OF THE COST OF AN INLAND TELEGRAM.

		d.		
Headquarters Administration, including Accounting		.62		
Operating, &c., including Counter work, Delivery, Local Administration and Supervision		13.60	15.87*d.*	
Pension Liability		1.52		
Work performed for Telegraphs by the Telephone Service	.36*d.* say	Staff .13 / Plant .23		
Maintenance...		.66		
Depreciation		.78	3.57*d.*	
Interest		.54		
Rent, Light and Heat, &c.		1.36		
Incidental Expenses, including stationery and uniform clothing ...		.56		
		20.00	Staff Cost say...	1 4
			Plant & Accommodation Costs say	4

It will be seen that, as indicated by the brackets, the bulk of the expenditure can be classified into two main groups—Staff cost and Plant and Accommodation costs, the former accounting for 1*s.* 4*d.* and the latter for 4*d.* out of the total cost of 1*s.* 8d.

It would be interesting at this stage to compare these figures of cost with the corresponding costs in a pre-war year. Unfortunately there are no pre-war costs available for the Inland service taken by itself and we shall, therefore, have to compare the cost under the various heads of an inland telegram in 1923-24 with the average costs under the same heads of all telegrams in 1913-14. As the two are not quite comparable, the results of the comparison must be accepted with a certain reserve. The difference, however, is not as great as it might seem because in 1913-14 there was no Imperial Cable, and no wireless worth talking about, while the continental traffic was, relatively to the whole, less important than it is now. Press traffic on the other hand was relatively very much greater ; over three times.

With these reservations we will give the comparative figures. The average total cost was then 11.4*d.* as against 20*d.*, showing an increase of 8.6*d.* per telegram or 75%. Plant charges alone including maintenance were 2.8*d.* and are now 3.57*d.*, showing an increase of 27½%. Staff charges were 8.1*d.* and are now 15.87*d.*, showing an increase of 96%.

These figures are significant ; the more so when it is remembered that while there is a slight element of uncertainty in the comparison in itself, there is no reason to doubt the truth of the figures showing the comparative increases in staff and plant charges in relation to each other. They show that while large economies must have been secured (as everyone knows they have been secured) in the cost of the plant employed, after allowing for the fact that additions to telegraph plant have been relatively small, the economies in the use of labour are not apparent.

We will now proceed to examine the various elements which make up the present total cost of 1*s.* 8*d.* per inland telegram. We will take the plant charges first.

Telephone plant used for telegraphs represents .23*d.*, say ¼*d.* per message. It is sometimes maintained that the rates charged against the telegraphs for telephone services are excessive and ought to be reduced, especially in connexion with the use of trunk lines for delivery to subscribers. This is as it may be, and we do not propose to express any opinion upon it. But it is relevant to point out that at any rate the item is not a large one and that even if the traffic were carried at half the present rates the saving to the telegraphs would be little more than $\frac{1}{10}d.$ per message. It is worth while placing on record that the charges made for the telephone service do not include any profit to the telephones. The next item of plant cost is maintenance of plant, which represents .66*d.*, or say ⅔*d.* per message. This expense varies directly with the amount of plant employed, and, having regard to all that has been done in recent years in the direction of economising in plant, we should, speaking as non-experts, doubt whether any material reduction of cost under this head can be anticipated. Moreover, the figure is in itself small. It is of interest to mention that for the last few years the telegraphs have had sone relief by the transfer from maintenance to construction of the salaries of the Engineering staff employed on works of construction ; the old arrangement, though made under high accounting authority, was a little unfair to the telegraphs. The next item is depreciation of plant, which represents .78*d.*, or say ¾*d.* per message. There is no reason to suppose that the charge made for the depreciation of telegraph plant is either too high or too low. Depreciation is a matter on which you can never be absolutely certain ; but the Telegraph Service has so long a history behind it and consequently so great an amount of experience, that we should be very much surprised to find at some future date that any substantial alteration of the depreciation charges, either upwards or downwards, was found to be necessary. We should perhaps utter just one word of warning. If the claims which are being made for the Teletype machine are even in the main warranted, the service may have to face a considerable scrapping of internal plant. If this contingency should arise, we hope that it will be faced with courage ; industries which fear to scrap obsolete plant and replace it by more efficient plant because of the immediate effect on their balance sheets, deserve the fate which usually awaits them of finding themselves in Queer Street. Let us hasten to add that this is not an advertisement, solicited or unsolicited, of the Teletype machine. Its owners seem to be capable of doing their own advertising.

Interest on Capital comes to .54*d.*, or say ½*d.* per message. Another very small item. And here the inland telegraph service enjoys a marked advantage. Not only was most of its plant acquired at pre-war prices, but the capital with which it was acquired is charged for at pre-war rates of interest. So far, then, as interest on capital is concerned, the service is collecting a post-war revenue with assets for which it paid a pre-war price and borrowed the money with which to pay that price at a pre-war rate of interest ; if the plant were valued at current prices and interest charged at current rates, the cost of interest per message would, instead of being .54*d*, be more like 1½*d.*

There is a charge which used frequently to be brought against the accounts of the telegraph services, but which has now been pretty well exploded ; in case, however, there are any members present who are not aware of its inaccuracy, we may perhaps be allowed briefly to mention it. The charge is that the accounts of the telegraph service are burdened with the excessive price which was paid for the undertakings of the original telegraph companies between 1870 and 1872. The facts are that the service was relieved of this capital burden many years ago—to be precise in 1912-13, when the telegraph plant was revalued and all water in the capital was written off. Since that date the service has been charged only with the plant which it actually employs, valued at its value on Mar. 31, 1912, or if installed since that date, at cost.

So much for the plant and accommodation cost involved in the handling of the average inland telegram : it amounts, as we have seen, to about 4*d.* a message. We turn next to that part of the cost which is attributable to staff charges.

Our analysis is as follows :—

3. ANALYSIS OF THE STAFF COSTS IN CONNEXION WITH AN INLAND TELEGRAM.

Total Staff Costs, 1*s.* 4*d.*

Administration and Accounting	1*d.*
Counter Work	1
Operating and Writing Duties	9
Pension Liability	1½
Delivery	3
Balance unallocated	½
	1*s.* 4*d.*

To begin with, we increase the .62*d.* for Headquarters Administration to a full penny by bringing in the cost of local administration (i.e. Surveyors, Postmasters, Superintendents, provincial Traffic Staff and the Clerical Staff of the C.T.O., &c.), the cost of which is about half that of Headquarters Administration.

Then we allot 1*d.* per telegram for counter work and attention to tubes.

Next, jumping to Delivery (if we may use such an expression as "jumping" in connexion with so sedate a proceeding as telegraph delivery is commonly supposed to be) it is calculated that the average staff cost of delivering an inland telegram is about 3*d.*

Pension Liability remains at the figure of 1.52*d.* already given, say 1½*d.* The figure covers the provision for the Maintenance Staff, but this only increases it very slightly.

The only important process in connexion with the transmission of a telegram remaining to be considered is that of operating and of carrying out the non-manipulative duties which arise from operating. We are able to make a pretty close estimate of the cost of the actual operating at the larger offices, which handle about 80% of the traffic, and on the present rate of output, about 23 transmissions an hour, the cost of performing the operating duties, including leave and the supervision of the duties, works out, as nearly as possible, at 5*d.* per telegram exclusive of the cost of pensions. The total cost of operating (as shown in Statement No. 3) is 9*d.* per telegram, so that the cost of the non-manipulative duties in and about the instrument rooms, including of course the work of indoor messengers, works out at about 4*d.* per telegram, again excluding pensions. A large part of this 4*d.* is incurred on writing duties, and it should perhaps be explained that the "Accounting" included in the 1*d.* for Administration and Accounting refers to Headquarters only, so that some part of the 4*d.* is attributable to local accounting work. But it is to be hoped that this would not be a great part.

The cost of operating at the smaller offices, where the work is less concentrated, is probably somewhat higher per telegram than at the larger offices, but, as already stated, 80% of the traffic is handled at the larger offices, that is at Zone, Area, and Group Centres, leaving only 20% for the small head offices and the sub-offices, and the higher cost per telegram at these offices is reflected in the ½*d.* per telegram which appears in the Statement as "Balance unallocated."

This completes the analysis of the cost of an Inland Telegram, and you are doubtless impatient that we should leave figures and begin to draw conclusions in order that you may differ from them. We do not propose to oblige ; we are going to leave that to you. The first duty of an Accountant is to ascertain the facts ; his second and remaining duty to present those facts in such a way that those who wish to draw from them the true conclusions shall be able to do so. If he goes on to suggest what those conclusions are, he does so at his peril, and we are not taking any great risks over this matter this evening.

But in pursuance of our second duty we may point out the leading lights, as the navigator calls them, in these difficult waters. The first is the very high proportion which staff costs bear to the total cost of rendering inland telegraph service ; the proportions are as you will have observed, staff costs 80%, plant costs 20%. Incidentally it may be pointed out (with the reservation which we have already made) that the proportion of staff costs to the whole is higher than it was before the war. In 1914 the proportions were about 71% staff, 29% plant, &c. This at first sight is a little surprising, because one would have expected that the considerable development in the use of machine telegraphy would have tended to increase the proportion of plant costs. In the C.T.O., for instance, we understand that about 40% of the total inland traffic is operated by high-speed machine instruments. No doubt the increased cost of machine instruments has been counteracted by savings in line plant, and as we have already pointed out by the greater increase in the cost of labour than in the cost of plant. We would, however, suggest that the matter is worth some further investigation. It may be mentioned that the out-turn in messages per operator-hour is only very slightly higher than it was before the introduction of high-speed machine telegraphy on a large scale.

Another comparison is perhaps also significant. Telegraph service, as we have seen, is rendered mainly by labour; telephone service, which competes vigorously with the telegraphs, is rendered mainly by machinery. In the telephone service the respective proportions are about—staff 35%, plant, &c., 65%; and the development of automatic telephony or machine switching will increase the disparity as time goes on. The comparison suggests some interesting reflections.

The next leading light is, we think, to be found in the figure of 9*d.* a message for operating, including the non-manipulative duties which arise from operating. This figure, which does not include pensions, as we have seen, can be divided into—operating 5*d.*, non-operating 4*d.* Is there here a field for investigation? The fact that the cost of non-operating duties, much of which are presumably performed by force paid at relatively low rates, comes so near to the cost of operating duties proper, suggests that there may be here problems worthy of investigation. We do not know enough of the inside of instrument rooms to form any opinion on what must be a problem, or group of problems, connected with organisation, but it certainly looks as though there were here matter for examination and study.

We would call attention to one other leading light. Our investigations have shown that, while it is possible to produce figures of average costs in considerable detail, it is difficult, if not impossible at present, to extend the analysis to individual offices. Perhaps this is putting it too high. The material may be there. If it is, we would suggest that it should be used. The state of the telegraph service, with its heavy deficit (equal to about 8½% on the capital which the public have invested in the undertaking), its diminishing traffic, its vigorous telephone competitor, and the progressive approximation of the average pay of its staff to the maximum, is serious. The charges to the general public for the service have been increased by 100%, and in spite of this the deficit is at least as great, and probably greater, than it was before the war. If there be a way out of this dangerous position, there can be no one who would not wish to find it; and if the examination of the subject which we have made and put before you contributes in any way to the discovery of remedies, our time will not have been wasted.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE number of telephones working on Nov. 30, 1924, was 1,233,411, an increase of 10,632 over the October total; the number added to the system during the month was 18,878 and 8,246 were recovered.

The following table gives an analysis of the progress made in extending the Telephone system in London and the Provinces during November:—

	London.	Provinces.
Number of Telephone Stations working:—		
Total	435,276	798,135
Increase for month	3,827	6,805
Residence rate subscribers:—		
Total	77,108	131,840
Increase	1,391	2,188
Exchanges:—		
Total	104	3,616
Increase	1	18
Call Office Stations:—		
Total	4,120	14,380
Increase	21	89
Telephone Street Kiosks:—		
Total	50	835
Increase	9	41
Rural Party Line Stations:—		
Total	—	9,159
Increase	—	56
Rural Exchanges opened under 1922 Development Scheme:—		
Total	—	600
Increase	—	11

More than 6½ million inland trunk calls were dealt with during the month of September (the latest month for which figures are available), or over a million calls in excess of September last year.

During the six months ended Sept. 30 the number of long-distance calls made was 38,426,978. The growth in trunk traffic is illustrated in the following table showing the traffic for each six-monthly period since September 1921:—

Half-year ended:	No. of Calls made. Total.	Increase over previous half-year. Number.	Per cent.
September, 1921 ...	26,031,655	—	—
March, 1922 ...	25,965,900	65,755 (decrease)	.2 (decrease)
September, 1922 ...	28,832,699	2,866,799 (increase)	11.0 (increase)
March, 1923 ...	30,009,407	1,176,708	4.1
September, 1923 ...	33,763,673	3,754,266	12.5
March, 1924 ...	35,844,207	2,080,534	6.2
September, 1924 ...	38,426,978	2,582,771	7.2

Further progress was made during the month of December with the development of the local exchange system. A new exchange was opened at Higher Broughton, and among the more important exchanges extended were:—

Motherwell.
Acocks Green (Birmingham).
Ipswich.
Godalming.
Cheetham Hill.

During the month the following additions to the main underground system were completed and brought into use:—

Chester—Wrexham,
Tunbridge Wells—Eastbourne—Hastings,
Plymouth—Polmarkyn,
Finedon — Kettering (Section of Wellingborough—Northampton—Kettering Cable),
Manchester—Eccles (Section of Manchester, Atherton, Leigh cable),
Nottingham—Mansfield,

while 82 new overhead trunk circuits were completed, and 74 additional circuits were provided by means of spare wires in underground cables.

TELEGRAPH EXTENSIONS.

Baudot working has now been established on the London—Cardiff—Newport (Mon.) route.

The following circuits have been equipped with Teletype:—

Hull H.P.O.—Hull Fishmarket B.O.
C.T.O.—Paddington Rail (2 circuits).

MIDDLESBROUGH TELEPHONE DISTRICT.

A PRESENTATION was made to Mr. P. J. SPENCE, Assistant Traffic Superintendent, Middlesbrough, on Dec. 29, to mark the occasion of his promotion to the position of Assistant Inspector of Telegraph and Telephone Traffic at Headquarters. The gifts consisted of a Barometer and a Tobacco Pouch, and the presentation was made by Mr. H. G. McFarlane, District Manager, who spoke with appreciation of Mr. Spence's services and sterling qualities. Mr. T. Hann, Chief Clerk, and Mr. W. Brodie, Contract Manager, and others also contributed remarks and extended to the recipient best wishes for success and happiness in his new sphere.

A MECCA FOR A HUMORIST.

The Telegraph and Telephone Age is responsible for the following paragraphs:—

"WHEN the King telephones, let all other instruments be dumb!" That's the rule in Mecca, where King Hussein of Hedjaz has had a telephone system installed.

The rule is effectively enforced by an automatic device which instantly disconnects all other telephones whenever the receiver is lifted from the King's instrument. As long as King Hussein's telephone is in use, no other telephone can be used in Mecca, save only the one with which the King is talking."

What a pæan of profanity would arise if, say, New York had a similar arrangement? and what a glorious place such a Mecca would be for the mischievous page boy?

IS TELEPHONY OUSTING TELEGRAPHY?

BY J. J. T.

(*Continued from page* 69.)

THE number of administrations which direct attention, in varying degrees, to the abnormal post-war economic situation as a definite cause of a decrease in telegraph traffic should read 18 instead of 19 and should therefore include the U.S.S. Republic.

Eight of the states concerned attribute the fall of telegraph traffic to increased charges, land and/or cable.

With regard to the question of decreases in telegraph receipts, here again the *Internal* traffic of the states concerned appears to have been that principally affected; whereas in some cases Internal traffic *only* is affected in the decrease and in others Internal *and* Foreign; in no case is there an instance of a distinct fall in Foreign traffic where Internal has at the same time held its own.

The replies to Question (4) though few throw further interesting light on the matter.

Has the co-relative increase of telephone traffic influenced the decrease of telegraphic traffic? If so, in what measure?

The Belgian administration states that the decrease in internal traffic is largely on account of the extensions of the telephone service. The large increase in the number of subscribers is no doubt due, to some extent, to the fact that pre-war rentals were only raised 100% while on the other hand internal telegraph rates were actually quadrupled!

This administration also adds that in a country so small in area as Belgium it was to be expected that telephone extension would have this detrimental effect upon internal telegraph traffic. This administration also maintains that it is not likely to be without its repercussion upon foreign telegraph traffic in the future. As soon—continues the Belgian report—as an international *entente* is reached regarding the unification and standardization of construction and methods of exploitation of long-distance telephone circuits, then certainly a large portion of telegraph traffic will pass over to the telephone.

In this connexion it is strange that the next country to reply should be France, whose administration reports that telephone development has only affected the telegraphs locally, and very little in long-distance inter-urban communications, probably to a maximum detrimental effect of about 1%. In international relationships the increased telephone traffic has had very little effect indeed up to the present.

In Sweden it is thought that telephone conversations must naturally replace telegrams, but in this particular country the greater part of short-distance telegrams was formerly composed of social and family greetings. The following parallel tables of Swedish internal and international telephone and telegraph traffic speak for themselves:—

Internal Service.	Inter-urban conversations.	Telegrams.
1920	90.7%	9.3%
1921	91%	9%
1922	92.5%	7.5%

Telegraph and telephone services with Denmark, Norway, Finland, and Germany:—

1920	24.5%	75.5%
1921	28.1%	71.9%
1922	30.2%	69.8%

Switzerland.—The following figures give a more exact idea of the development of telegraph and telephone traffic, spread over a lengthy period of just under forty years. However, we have here also to deal with a compact country of small area and population, nevertheless the figures are interesting.

Number of Inland telegrams and telephone conversations (in thousands):—

Year ...	1885	1890	1895	1900	1905	1910	1911
Telegrams	1,759	1,965	1,810	1,577	1,576	1,633	1,721
Conversations	150	576	2,206	4,482	6,339	9,949	11,061

Year ...	1912	1913	1919	1920	1921	1922	1923
Telegrams	1,706	1,646	3,296	2,525	1,665	1,351	1,243
Conversations	12,190	13,257	33,493	35,915	37,651	40,762	43,916

Number of International telegrams and telephone conversations (in thousands).

Year ...	1900	1905	1910	1911	1912	1913
Telegrams	1,694	2,160	2,763	2,995	3,155	3,186
Conversations	64	241	597	712	839	945

Year ...	1920	1921	1922	1923
Telegrams	4,608	3,757	3,275	3,400
Conversations	2,045	2,330	2,261	2,211

At this point in the inquiry more definite information appears to have been exhausted, for no other country is cited *pro* or *con* as having expressed definite opinions on this particular query.

There are, however, undoubtedly strong co-ordinating forces with large financial interests behind them making for the extension of international telephone communications in Europe which will eventually enable us to obtain more definite data concerning the relative popularity and utility of telephones and telegraphs to European business men. As was noted in last month's issue of the *T. and T. Journal*, the three sub-committees of the International Consultative Committee for long-distance telephone communication have concluded their labours in Paris. Millions of pounds will have to be spent before reliable trans-European telephony and inter-European telephony become so effectively interlaced as to link up all European capitals and chief cities. In the struggle to accomplish this end it is to be hoped that the maintenance of the European telegraph lines may not be neglected. If the suggestion of one of the above-mentioned sub-committees is as reported, the telegraphs will have to find some sufficiently clever foil to the thrust which proposes to give to newspapers, banks, and large businesses the free use of such long-distance telephone circuits as the proposed London-Berlin via Amsterdam, or Paris-Stockholm via Hamburg, in order to develop and popularise long distance telephony!

(*To be concluded.*)

LECTURES ON AUTOMATIC TELEPHONES (STROWGER SYSTEM).

MR. T. PLUMMER, M.I.E.E., the Superintending Engineer for the North Wales District, gave a series of lectures on this subject in November and December last, to the following Societies. The lectures, which were illustrated by lantern slides and demonstration apparatus, created considerable interest, and were well attended both by the general public and by the staff of the Post Office. At some meetings more than 200 were present:—

1. Engineering Society, Shrewsbury Schools: *Chairman*—C. Baker, Esq., M.A., D.Sc., Head Science Master.
2. Shropshire Philosophical Society: *Chairman*—T. Plummer, Esq., M.I.E.E.
3. North Wales Centre, Institution of Post Office Electrical Engineers: *Chairman*—T. Plummer, Esq., M.I.E.E.
4. South Midland Students Section, Birmingham Institution of Electrical Engineers: *Chairman*—P. Dean, Esq.
5. Engineering Society, University of Birmingham: *Chairman*—C. Donovan, Esq.
6. Postal Telegraph & Telephone Society, Birmingham: *Chairman*—J. Scott, Esq., Postmaster Surveyor.
7. P.O. Engineering Staff, Technical School, Birmingham: *Chairman*—W. J. Sumpner, Esq., D.Sc.
8. P.O. Engineering & Operating Staffs, Technical School, Hanley: *Chairman*—A. Giffen, Esq., A.M.I.E.E., Sectional Engineer.
9. P.O. Factory Staff, Fordrough Lane Factory, Birmingham: *Chairman*—C. Crisp, Esq., P.O. Stores Department.

SYNOPSIS.

Brief description of Common Battery Manual Switchboard working and use of Multiple—Advantages of Telephone Machine Switching—Various Automatic Systems—Strowger Step-by-step System.

Automatic Telephone Sets—Method of Dialling Calling Signals—Tone Tests and Auto-ringing—Increasing Capacity of Switches—Description of Selectors and Connectors—Numbering of Line Banks and use of Private Bank—Exchange Traffic Curves—Keith Plunger Switch and Rotary Line Switch.

Trunking Systems for 4-digit and 5-digit Exchanges—Working to Private Branch Exchanges—Arrangements for Metering Calls—Supervisory Signals—Numbering for Multi-Office Area—Satellite Exchanges—Multi-Office Area working with Direct Junctions—Use of Impulse Repeaters—Wiring Diagrams and Details of more important Apparatus.

Auto. Working in large Multi-Office Areas—Strowger 3-letter Code Dial—Director System—Working between Auto. and Manual Exchanges during Transition Period—Mechanical Tandem System—Key Set Call Sender—Coder Call Indicator—Automatic Telephoning of London.

Views of Automatic Apparatus in various Exchanges—Growth of Telephones in North Wales District, also Birmingham Area—Proposals for Automatic Telephoning of Birmingham.

MR. DONALD MURRAY ON "THE NEW TELEGRAPHY."

MR. DONALD MURRAY needs no introduction to the telegraph world. The influence of his inventiveness is apparent in the trend of machine telegraph development, and his facile pen is ever ready in the discussion and exposition of modern telegraph problems. But Mr. Murray's mental activities are not confined to the production of ingenious mechanisms; his is a mind which has never lost the long vision of youth, and the announcement that he was to read a paper on Dec. 18 to the Institute of Electrical Engineers on "Speeding Up the Telegraphs: A Forecast of the New Telegraphy" created unusual interest. Many readers may remember the profound impression made by the publication of Mr. Murray's Institute paper, in 1905, on "Type-setting by Telegraph," and others may recall the early trial of the "Murray Automatic" Telegraph with its "coffee-mill" type-printers. Looking back over intervening years we can now recognise that both these events were historic contributions to the science of communications, and that Mr. Murray set his mind to a task with foresight and clarity of vision that others lacked courage to share.

It was with memories akin to these that many of us took our places in an audience which was representative of various branches of electrical engineering and practice. We expected much and much was given. The "New Telegraphy" is revolutionary—evolutionary, if you will—and we confess to a stirring of the dry bones of our self-complacency.

The first material point Mr. Murray makes is that, in a comparison with the telephone, the telegraph is fundamentally the more economical as a means of communication over distances of from 50 miles upwards. The position is summarised as follows:—

"For working at 150 words a minute (the average rate of telephonic speech) by telephone, we need two costly telephone wires, that is to say, a telephone loop, or 75 words a minute on one good wire. The telegraph, on the other hand, requires one wire at about half the cost of the telephone wire, and will give 240 words a minute each way simultaneously, or 480 words a minute in all, on the one cheap wire. This is from 12 to 16 times more than the telephone can do, and the consequence is either a correspondingly greater carrying capacity for the wire or a correspondingly greater distance covered. It means that for any considerable distance, and particularly for long distances, the telegraph is far cheaper than the telephone."

Whatever the present telegraph system lacks, it does not suffer from a lack of circuit facilities, and as far as the economic use of wires is concerned, it may be admitted that modern telegraph apparatus presents us with possibilities that have not yet been fully exploited. What, then, are the weaknesses which relegate the telegram to a secondary position in the matter of speed and convenience?

"These wonderful facilities suffer from the grave defect that they do not link up closely with the business man. The telephone does, and the telegraph does not. The telegraph has to get the assistance of the telephone to complete the linkage. That is quite satisfactory for the occasional telegram and for the private and domestic message: but big users of the telegraph require something better. They need a telegraph linkage that will put them directly in touch with their correspondents, just as the telephone does."

Having stated the problem, Mr. Murray proceeds to prescribe as "twin-remedies" the start-stop telegraph printer or typewriter, and Teletype exchanges or switching centres. It may be explained that the word "teletype" is used in its generic sense throughout the paper; and is not intended to mean a particular make of start-stop machine. Renters would be supplied with teletypes or other similar machines which may popularly be described as telegraph typewriters, capable of being worked by the office typist, and connexions with the local Telephone Exchange and other teletype subscribers would be obtained either on the subscribers' telephone lines through the local Telephone Exchange or by means of direct teletype circuits. Mr. Murray is inclined to the view that the engineering and traffic difficulties in the way of employing existing telephone lines and equipment are not insuperable.

"It ought to be practical for a subscriber having one telephone line and a teletype, to ring up the telephone exchange and say "teletypes." He would then be plugged through to the Teletype Section, and it would appear to be a simple matter for the Teletype Section to cut off his telephone loop completely from the telephone exchange and connect it to the Teletype Section. The subscriber by means of a switch in his office would then cut out the telephone and cut in the teletype. He would teletype to the Teletype Exchange stating his requirements and he would be put through in the same way by the aid of the telephone in the case of a local call, or direct to the central Teletype Exchange for a trunk or long-distance call, and he would then have his message typed direct at its destination."

For our part—and we are expressing a personal view—we are apprehensive of the combined use of lines and equipment for telephone and teletype switching. Successful results are more likely to be attained by the use of direct teletype lines between subscribers and the Teletype Exchange, the calls being passed in the first instance by telephone and the teletype switched into circuit when the connexion is completed. For the passing trunk calls between towns, a form of telegraph call wire working would appear to be most suitable. Whatever the final arrangement may be, there are grounds for the belief that the system, "if successful, would in time effect a complete revolution in telegraph methods and organisation." Mr. Murray in characteristic vein, dips into the future and rather startles us with his description of "silent and deserted galleries at St. Martin's le Grand, when the screwdriver and the soldering iron will take the place of the morse key and sounder." But our fears are somewhat mollified when we consider that every citizen is a potential user of the telegraph and arrangements will require to be made for dealing with public traffic. Telegraph offices of a sort will still apparently be necessary.

"The general public will continue to write out their occasional telegrams and hand them in at the nearest telegraph office. There, calls will be put through to Glasgow or Manchester or elsewhere, and the telegrams will be teletyped direct to their destinations. Every hotel and public place will have a teletype for delivery and reception of telegrams. There will be teletype call offices or pay stations at hotels, big stores, underground stations, post offices and other convenient centres where it will be possible to use the teletype on similar terms to the telephone in similar circumstances, namely, payment of a sum according to time and distance."

Such is a necessarily brief outline of the "New Telegraphy." The basic principle—telegraphic intercommunication—is, as Mr. Murray states, quite familiar, and was exploited in the London Intercommunication Switch designed by Colonel Purves, which provides direct switching between telegraph offices in the Metropolitan area. An interesting and more closely analogous example of telegraphic intercommunication was, however, actually in operation fifty years ago when Wheatstone A.B.C. instruments were in general use. At Newcastle-on-Tyne many of these instruments were installed in collieries, shipping offices &c., and the late Mr. A. W. Heaviside devised an Exchange system by means of which these various A.B.C. renters were placed in communication with each other. Mr. Murray claims that the advent of the telegraph typewriter, with multiplex trunk facilities, has restored the question of telegraph switching and terminal transmission and reception to the realms of practical business, and his exposition of its economic possibilities to the manufacturer, the financier, the banker, the farmer, and the small newspaper proprietor merits serious consideration. It is, we think, from the financial aspect that the scheme will at first make its appeal to the business world. Teletype intercommunication locally has no advantage to offer over the telephone unless in exceptional cases, but for long-distance communications the cost of the new telegraphy may prove to be an attractive feature. "London to Birmingham for a penny" is a slogan with an arresting appeal, and this is how Mr. Murray thinks it can be done.

"Taking, first, London to Birmingham, roughly about 100 miles, the Post Office will lease a complete telegraph wire during the day for a rental of £685 a year. There is no difficulty in getting six channels each way on one telegraph wire from London to Birmingham. Hence, dividing £685 by six we get a rental of £114 a year per channel. Dividing this by 300 days in the working year we get 7*s.* 7*d.* per day. Taking the business day at 8 hours we get a rental per hour of a trifle under a 1*s.* or only 0.2*d.* per minute. Assuming that the active time of communication is 3 minutes and that the time spent in connecting and disconnecting is 3 minutes, or, in all, 6 minutes per call, the rental would only be a trifle over 1*d.* for 6 minutes. Even if the Post Office tripled this rate and charged 3*d.* for a three-minute teletype talk between London and Birmingham with a "no-delay" service, it would be regarded by the business community as a godsend."

One cannot resist the exhilarating effect of Mr. Murray's paper, and while we may be a little critical of his claims, and doubt some of the grounds for his optimism, we must all subscribe to the opinion that this contribution to the science of communications will affect, sooner or later, the trend of telegraphic development. The British Post Office is arranging to test the system experimentally at an early date.

The paper was given a warm reception by a large audience, and was favourably commented upon by Colonel T. F. Purves (Engineer in Chief), Mr. J. Newlands (late Controller C.T.O.), Mr. T. B. Johnson, (Superintending Engineer), Mr. E. H. Shaughnessy, (Staff Engineer, Wireless) Mr. J. Stuart Jones, (Deputy Chief Inspector, Traffic Section), and Mr. A. E. Thomson (Western Electric Co)..

Examples of the Creed, Kleinschmidt, and Morkrum start stop printers were on exhibition in the Lecture Hall. A. P. O.

REFORM OF GERMAN POSTAL ADMINISTRATION.

THE following abstract from *Archiv für Post und Telegraphie*, an official German publication, gives an interesting account of the machinery which has been set up for working the Post Office (Reichspost) on the lines of a private business, and of avoiding the necessity for submitting its Budget to Parliament. The German Post Office is now stated to be in a very flourishing financial condition. A surplus of 50 million marks was obtained during the first five months of the current financial year, and the Administration is said to be considering further large reductions in tariffs, including telephone charges.

The former laws governing the administration of the Post Office, being found unsuitable for efficient management of the Deutsche Reichspost, new laws were proposed and passed. They came into force on April 1, 1924.

The reason for amending the laws was that much time was lost in submitting, as required by the old laws, the many items included in the Post Office budget estimates to Parliament and to the State Council, and this procedure had proved to be not only unnecessary, but directly detrimental to the development and efficient working of the Post Office. Further, previous experience had shown that if such questions came before Parliament, it was not so much the budget itself which occupied attention, but that the different actions of the Administration were subjected to criticism. Although such discussion in Parliament may be useful, and may influence the Administration to the benefit of the postal services, there can be no doubt that the association of the discussions with the granting of the necessary credits is useless and harmful. It often unduly delays the granting of supplies without which the Administration cannot work, and the necessary measures cannot be taken at the time they are needed. At periods when business conditions are unsuitable, or the value of money fluctuates rapidly, the conditions necessitating a certain action are so changed before the proposal has passed through Parliament that any parliamentary decision is already nullified and may have caused much loss due to the delay in arriving at a decision.

During recent years the Post Office suffered considerably owing to these conditions. The whole of its equipment, especially the telegraph and telephone plants, was in bad condition. Operating expenses increased whilst revenues decreased, therefore continually increasing financial aid was required from the State. Although this condition can partly be attributed to the bad trade generally prevailing, it was caused to a great extent by the existing laws, which made the Administration of the Reichspost dependent on the Parliament. Consequently, it was impossible for the Reichspost to act promptly and keep pace with the rapid fluctuations in the currency.

The new law is intended to give the Administration of the Post Office more freedom and thereby eliminate the delay in taking action. It will become an independent concern conducted on the lines of a private business and with organising methods which will enable quick decisions to be made and quick action taken, so that the Reichspost may be responsible for the entire business. According to the new law the Reichspost has to pay all its expenses from its own revenues, and will not receive financial grants for the postal services from the government. In this way the necessity was obviated for obtaining Parliamentary sanction for the expenditure, which owing to the time consumed delayed business and was inimical to progress. It is true that prior to the War, under the former laws, the Post Office handed over a profit to the State, but it is probable that without these laws which hindered efficient management of the Post Office, the profits would have been still larger, and it is doubtless equally true that under the present varying conditions an economical working under the old laws would be impossible.

In order to obviate the necessity for Parliament to grant credits for the development and maintenance of the postal services, and at the same time not to exclude the Government from control of the business affairs, new laws were formulated and passed for the Administration of the Post Office. Under these laws a Board of Directors (Verwaltungsrat) will be appointed which will *act in place of Parliament and State Council* in matters pertaining to the Budget and general administration of the Post Office which up to the present has been handled by Parliament. It is hoped that in this way decisions will be made quickly and action taken in good time, so that the efficiency of the services will be increased.

The Post Office remains a State undertaking, but it will be managed like a private business and must have the same freedom of action as a private concern. The Post Office Minister *remains responsible to Parliament*, and is director of the whole undertaking. Should it arise that a matter comes before Parliament for discussion, it is hoped that settlement can be arrived at in a very short time, because those members of the Verwaltungsrat who are also members of Parliament will have had the opportunity to study the business affairs of the Post Office at first hand and be in a position to give full information to Parliament. These members of Parliament may also bring up for discussion in Parliament all such points on which they are not in agreement with the remainder of the members of the Board of Directors and the Post Office Minister.

For the purpose of ensuring free action in the Administration the Board of Directors must not be like a small Parliament, and therefore the number of its members should not be too large. They should be chosen from men who have had experience in business affairs and in traffic problems, who are willing to give their services to the postal administration and assist in the efficient management of the business to the benefit of the postal services.

Guided by these considerations new laws were proposed and passed. The following is an abstract of new laws for the management of the Post Offices :—

PARA. 1.

The Post Office, including the postal, telegraph and telephone services, is to be administered by the Post Office Minister in co-operation with a Board of Directors (Verwaltungsrat) as an independent undertaking, under the name of "Deutsche Reichspost" according to the following laws.

The property of the Government which is devoted to the postal services, and all public and private rights and obligations of the postal administration, are to be regarded as the separate property of the "Deutsche Reichspost," which is entirely separate from the other property rights and obligations of the government.

For the liabilities of the "Deutsche Reichspost" only its special fund is responsible; on the other hand the Post Office is not responsible for any other obligations of the State. International agreements remain unchanged.

PARA. 2.

The Reichspost Minister issues the orders for the use of the communication services and fixes tariffs concerned, taking into consideration the decisions of the Board of Directors. The Minister is responsible to the Parliament, so that the Post Office is managed in conformity with the laws, and in accordance with the requirements of the traffic and of German industry and commerce.

Each year a business report, profit and loss account, and balance sheet have to be submitted to Parliament and to State Councillors showing the financial position of the Post Office.

The Verwaltungsrat is composed of not more than 25 members who are nominated by the President of the State. The Parliament as well as the State Council each propose 5 members and the Minister of Finance 1. Up to 14 members are proposed from the employees of the Reichspost by the Post Office Minister in agreement with the Minister of Finance and State Council, and 9 of these members shall be selected from men who have special knowledge and experience in industry, commerce, and traffic; these will be proposed by the Post Office Minister in agreement with the Minister of Finance and the State Council. The Board of Directors appoints a working committee according to general business procedure.

PARA. 4.

The members of the Board of Directors have to fulfil their duties like careful business men, and must indemnify the Post Office if they default.

PARA. 5.

The Post Office Minister or his representative is the Chairman of the Board of Directors.

The Governments of different countries have the right to send delegates to the meetings of the Board of Directors. They have no right to vote, but can offer their opinions and make proposals relating to matters under discussion.

The Chairman of the Board of Directors is responsible for sending a copy of the agenda to be considered at the meeting to each country beforehand, giving the necessary notice.

PARA. 6.

The Board of Directors decides questions relating to the estimates for the budget, the carrying out of Administration duties, taking up loans, the acceptance of guarantees and conditions pertaining thereto, the rates for liquidation of debts, regulations for wages and salaries of the employees, tariff rates for postal, telephone, and telegraph services, regulations for the use of equipment, general principles for the investment and application of amounts to the credit of postal cheque accounts and the investment of sums allocated for depreciation, taking over new and giving up existing business premises.

The Board of Directors has no right to increase the expenditure above the amount of the proposal of the Post Office Minister, if his consent to this increase is not forthcoming. The State Parliament decides, at the request of the Post Office Minister, should the latter not be in a position to take responsibility for any decision of the Board.

The Government will communicate its decision to the Board of Directors.

The Board of Directors has to assist the Post Office Minister in the Administration of the business and to watch that the enactments of the Statutes are observed. For this purpose its opinion must be obtained in every important question of the Administration. Upon request the Board of Directors must be informed as to the financial situation at any time, and reports as to receipts and expenditure must be submitted every month to the Post Office Minister.

PARA. 7.

The expenses of the Reichspost as well as the liquidation of interest and liabilities must be paid out of revenue. The Government will grant no extra funds for this purpose from the State Treasury. Credits shall only be accepted for the extension of plants and liquidation of interest, and loans must be permanently secured from the income of the services.

PARA. 8.

Each year a reserve fund of 0.8% of the yearly income from operation, the net profit and suitable interest has to be set aside until the reserve fund has reached the sum of 20% of the yearly operating expenses. After it reaches the amount of 10% of the yearly operating expenses, half of the net profit has to be handed over to the Government, and after the amount *of 20% has been reached the Government must receive the whole net profit.* As the reserve fund is for the security of any losses which may occur, it has to be put aside in cash or in secure investments.

PARA. 9.

Proposals for loans, the type of securities offered and the guarantees for them must previously be submitted to the Post Office Minister and Minister of Finance. Where not otherwise provided, the debts of the Post Office will be handled by the Administration for the public debts. The Ministers of Posts and Finance will exercise the authority necessary, and documents relating to the debts have to be prepared by the Post Office Minister and the Administration for public debts.

PARA. 10.

The assets to be taken over by the Post Office will be fixed on April 1, 1924, jointly by the Ministers of the Post Office and Finance. The debt will be *increased by all loans which are raised after this time for the purpose of the* post and telegraph operation of the Reichpost.

PARA. 11.

The Post Office must submit to the auditing department of the Government an annual balance sheet together with profit and loss account, and the auditing department will examine the same in accordance with Para. 15, and forward it for the approval of the Board of Directors.

PARA. 12.

As regards their rights and duties, the employees of the Reichspost are Government employees.

PARA. 13.

The agreements with the States of Bavaria and Würtemberg dated April 27, 1920 remain unchanged.

PARA. 14.

The appropriation of land sites for Post Office buildings, and the acquirement of buildings already occupied for postal services, is allowed if full compensation is paid for them. In individual cases the Reich President's consent is necessary, otherwise the arrangement made must be quite in accordance with the existing laws.

PARA. 15.

The Board of Directors shall be formed without delay and commence its functions. It has to prepare a budget for 1924.

At the same time the present laws concerning the acceptance of loans and the responsibility for the securities are cancelled, so that the Board of Directors takes the place of and exercises the authority instead of Parliament and the State Council.

The Post Office is conducted by the Post Office Minister, who is assisted in the management by a Board of Directors, consisting of 25 members.

The Post Office Minister has 7 departments:

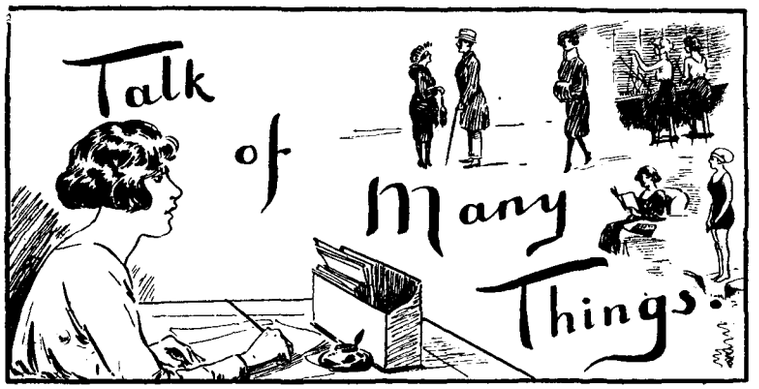
1. Department for the postal services.
2. Department for telephone and telegraph construction work.
3. Department for telegraph and radio.
4. Employees' department.
5. Treasury matters relating to the accounts.
6. *Department for internal matters relating to Bavaria.*
7. Department for internal matters relating to Würtemberg.

All technical matters relating to the art of telegraphy, telephony, and radio, including the testing and buying of the construction material, apparatus, power supply and equipment of the telegraph and telephone exchanges are handled by the "Telegraphentechnisches Reichsamt" (Telegraph Technical Department) which consists of 7 departments:

1. Administration and general department.
2. Experimental department.
3. Line construction department.
4. Radio matters.
5. Design of Apparatus.
6. Supply of construction material.
7. Buying of apparatus.

There are 46 "Oberpostdirektionen" (Chief Postal Authorities or managers) to carry on the postal, telegraph, and telephone services in Germany operating in the respective areas.

WE TELEPHONISTS



Multiple Pegs.

LOOKING back on the past year there was one day which was bright in my memory. Its lustre lasted for some time, but as other days came and went its brightness faded. It was fascinating to watch that little light as I floated down the stream of life, but I knew, unwillingly, that soon it would die out entirely and that only a many-hued impression would cloud my eye. I knew that I should be glad when it finally went out because at times it twinkled mockingly and at other times it shone reproachfully. Sometimes it blazed defiantly as though it were aware of my desire to quench it with the waters of Lethe. I know that I ought to be sorry that it has now gone and I know that I should have made some effort to preserve it because it was a reminder of the momentary revival of my better self. It was the last bright hour of Dec. 31 1924 when I made my New Year resolutions.

In those last fleeting moments I took down my virtues from the shelf and dusted them. On the whole they were not a bad collection: true, some were rusty and the moth had attacked others, but I judged that with care and a little attention they would see me through another year. I put my vices away in a cupboard—just handy in case of emergency. Then I took myself to task, had a spiritual stock-taking, and decided to pull up my mental socks. And so to bed, feeling mighty pleased, as quaint old Pepys would say. On the morrow I felt that I had been rather severe with myself, and it seemed, on reflection, that I was in for rather a thin time, but I resolved not to surrender. In any case to feel like a martyr gives one no small amount of satisfaction.

To-day, I am faced with a multiple in which many of the "resolution-jacks" are pegged. There are a number of red pegs but I hope that in those cases it may be possible to restore service eventually. Some of the resolutions require careful examination before service is given and I have marked those with a white FL peg. Some have altered so much in character that they are now marked with a green peg, and others have proved so irksome and impossible that I have put pink pegs in them all.

But what distresses me most is the number of black pegs I have used.

"Indeed, indeed, Repentance oft before
I swore—but was I sober when I swore?
And then, and then came Spring, and Rose-in-hand
My threadbare Penitence apieces tore."

PERCY FLAGE.

We have pleasure in printing another letter from Mr. Shinmyo, addressed to the Controller, which we feel sure will interest our readers:—

"DEAR MR. VALENTINE,

Tokyo, which was reduced to debris in a night or so, has now turned to be a beautiful city just as good as it was before, at least in its appearance, by the strenuous efforts of the citizens who have been encouraged by the warm *sympathy expressed towards them by the various nations of the world.* People escaped from the town at those times have gradually re-inhabited, and all the stores and shops present live aspects of vigour.

The Tokyo Central Telephone Office, which lost 16 out of its 20 exchanges, has since added 6 exchanges to its remained four. At present 10 offices are in active service, accommodating 80% of the pre-quake subscribers. These all belong to manual system, but the 10 exchanges to be installed in near future will be all those of automatic. The management has completed *the necessary arrangement and is waiting only the arrival of the indents* from abroad, which is expected next March.

As the director of the institution, I flatter myself that every possible exertion has been done by myself towards the reconstruction of Tokyo's telephone system, and am quite satisfied to find the citizen's appreciation of same through articles in daily papers here.

The telephone reconstruction has thus been brought almost to completion, and I hoped to spend a year or so at a quiet seaside for my health's sake. Thus, with last month I have retired from the service in the Department

of Communications where I was more than 30 years. I have hitherto never been in other lines of calling and always been with the Department throughout.

While I was busy in preparation to go to seaside, Viscount Goto, ex-Home Minister and ex-Major of Tokyo and one of a few greatest statesmen Japan has ever given birth to, overhearing that there was the intention of my resignation, has been very kind to offer me through Mr. Inukai, Minister of Communications, and Mr. Kuwayama, Vice-Minister of the Department, the position of Managing Director in the nascent Tokyo Radio Broadcasting Company, over which His Excellency is to be President.

'Man is ready to die for the one who fully trust in him' is an old proverb of ours. I could not but accept the kind proposal made by such a big personage as His Excellency with all my heart. I am therefore busy working for the new institution just under way.

It is the first experience for Japan to have radio broadcasting in such a large scale, and especially under an official character like this. Japan is also going to have another such a concern in Osaka. Tokyo will have radio station opened sometime next April and we are busy engaged for the preparation. Ours will be a 1½ Watt station operating in 375 metres. This will be known as J.O.A.K. in the Radio world.

It was only the other days' occurrence that we were able to distinctly and clearly hear a message cast away by the K.G.O. (San Francisco) all the way over the Pacific Ocean. With the further improvement and development of the science as well as the apparatus, nations of the whole world would, I believe, be the neighbours of one another in the real sense of it.

Taking this opportunity, let me thank you for kindness shown to me while I was with the Department and hereby solicit your further guidance and information in future which I may stand in need.

With compliments of season and best wishes,

Yours very faithfully, N. SHINMYO."

The Song of the Operator.

(*With profound apologies to the shade of Tom Hood.*)

" 'Fore lamps that are glowing white
And lamps that are glowing red
An operator sits at the Board
With ear-piece on her head—
Switch ! Switch ! Switch !
Her fingers ever alert,
As still with a voice of melodious pitch
She soothes subscribers curt.

" Call ! Call ! Call !
From all parts of the Board,
And Call ! Call ! Call !
Till I drop on a faulty cord.
Then I rapidly turn it up
For the Engineers' attention.
(The unkind remarks of the irate sub.
It's not my place to mention.)

" Call ! Call ! Call !
From early morn till night ;
Call ! Call ! Call !
As the lamps keep glowing bright—
Now green and red and white,
Now white and red and green,
Small wonder at a sudden rush,
If some should pass unseen.

" Oh, men with transmitters loud !
Oh, men with receivers faint !
It's not the wires you're wearing out,
But the temper of a saint !
Switch ! Switch ! Switch !
Goes the little busy bee,
Who is careful not to clear a line
Till she's pressed the meter key.

" An operator smart
To a supervisor's grown ;
But I hardly fear her terrible shape,
It seems so like my own.
She quiets me in my lively moods
Yet keeps me up to the mark,
And I sometimes wonder if, when at home,
She ever has a lark.

" Call ! Call ! Call !
From subscribers at Message Rate,
Who've a very happy knack
Their calls to understate.
But we see no reason to doubt
The correctness of our fees—
With which most pleasant phrase
Their minds the office ease.

" Call ! Call ! Call !
From that subscriber and this,
Till I come to try the line
Of one who is 'temp'rarily dis. !
Plugs, black and yellow and grey,
Plugs, grey and yellow and black,
And I quite expect e'er long to find
A plug in every jack.

" Call ! Call ! Call !
From subscribers greatly enraged—
Simply because the number they want,
When tested, shows engaged.
How dare I tell them that !
And they shower me with abuse—
I might as well suggest
Their own line was in use.

" How pleasant is that short hour
Of respite, passing brief,
The 'blessed leisure of Love and Hope'
We call our 'Lunch relief.'
Then returning to the Board,
We renew the charging of fees,
Answering subs. as the glows come up
With eternal 'Number, please ?'

" 'Fore lamps that are glowing white
And lamps that are glowing red,
An operator sits at the Board
With ear-piece on her head.
Switch ! Switch ! Switch !
Her fingers ever alert,
As still with voice of melodious pitch
(Would that such tones came from the rich !)
She soothes subscribers curt."

FRANCISCO.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

LONDON TELEPHONE SERVICE NOTES.

Telephonists' Society.

THE Annual Dance of the London Telephonists' Society was held at the usual rendezvous—Bishopsgate Institute—on Saturday, Jan. 3, and was one of the most successful of the long series which has continued, except for a break during the War period, since 1907.

Mr. Skinner, who has always provided the music, once again led his orchestra, and his cheery personality added considerably to the evening's enjoyment. And there are many folk who think no one can play valses like Mr. Skinner.

An innovation this year was the provision on the supper tables of carnival caps of many attractive colours and designs which speedily made the supper room a scene of much gaiety. It is surprising what a difference a hat makes, and the way dignified Superintendents and Traffic Officers were converted to an appearance of frivolity and even dissipation by the addition of some carefully-selected headgear was a joy to behold.

There were 240 members and friends present, and though many familiar faces were missed the company were happy to have with them this Session's President, Mr. Maycock (a very special honour, as this is believed to be the very first Service Dance to which it has been possible to coax him (he must come again), and four former Presidents in the persons of Miss Cox, Mr. Corner, Mr. Beck, and Mr. Buckeridge who was M.C. for the umpteenth time. Another former President, Mr. Edmonds, had hoped till the last moment to be with us, but was unfortunately prevented by illness, to everyone's regret.

Of course it was a wet night, as usual, but the weather never affects either attendance or enjoyment at this event, and everything went with a swing from the first note played by Mr. Skinner's Orchestra till Auld Lang Syne and the National Anthem warned us that all good things come to an end.

However, we hope to do it all over again next Season, and have booked the Hall and Mr. Skinner for Jan. 2 1926. Members please note !

Retirement of Miss K. H. Butcher.

On Dec. 31 Miss K. H. Butcher, Supervisor, City Exchange, retired.

The Committee of the G.P.O. South Refreshment Club kindly arranged for the Annual New Year's Tea and Social to be held on that date, and many friends of Miss Butcher availed themselves of the invitation to attend the Social in order to see her on her last day of service.

To meet Miss Butcher's wish there was no special ceremony, but an informal presentation was made to her over the tea-table by Miss Cox, Superintendent, Female Exchange Staff, of a cheque for a substantial

amount, the gift of her staff and many friends. A personal gift of a silver-backed mirror had also been given to Miss Butcher by the staff of the City Exchange.

Miss Butcher has been in the Service, with the United Telephone Co., the National Telephone Co., and the Post Office for nearly 42 years, and has taken a large share in the development of the Telephone Service from its inception.

She has, during her career, been at the following exchanges and offices: Heddon St. (old Edison board), Queen Victoria St., Chancery Lane, Westminster, Hop, Central (Oxford Court), Bank, London Wall 1903-1913, and from 1913 at the City Exchange, G.P.O. South.

Miss Butcher will be greatly missed by the very large number of her colleagues who at some time or another have worked with her and have appreciated her many sterling qualities, not the least of which was her unfailing readiness to assist in any difficulties (official or unofficial) referred to her—and that such cases are frequent is the experience of most Supervisors of large exchanges.

Miss Butcher takes with her the good wishes of all who knew her for good health in which to enjoy her retirement.

Langham Choral Society.

For their Queen's Hall concert this year the Choral Society are performing Coleridge Taylor's "Hiawatha." Of the many works performed by the Society this is the most attractive. On the last occasion the concert hall was packed, and it is hoped that the audience will be of the same order on Tuesday, Feb. 10. In order to encourage this the majority of seats have been priced at 1*s.* 3*d.* and 2*s.* 4*d.* The Society would be glad of the assistance of any past members, and if this should meet the eye of any willing persons perhaps they will get into touch at once with the Hon. Sec., Mr. W. R. Child, Contract Branch, Dean St., W.

Visitors to Exchanges.

When the September quarter's accounts were sent out they were accompanied by a pamphlet explaining the stile-strip method of repeating numbers, and an invitation was extended to visit the exchanges. During October and November 353 subscribers responded, the greatest amount of interest appearing in the City. It is to be hoped that those who have made the visit will pass their impressions on to others who may in turn be prompted to follow their example.

Looking Ahead.

The following letter was received recently from a subscriber:—

DEAR SIR,

I shall be extremely obliged if you will kindly inform me which will be the worst Telephone Exchange in the London District, should the ————Exchange be burned down.

Thanking you in anticipation,

Yours very truly,

A fitting sequel would be for the next occasion of delay in calling the exchange to be due to a fire drill.

Culled from the Exchanges.

Avenue Bazaar.—A Bazaar in aid of the Westminster and Shadwell Children's Hospitals, organised by the Avenue Staff, was held at the above Exchange on Saturday, Dec. 13. The proceedings were opened at 3 p.m. by the Controller, who, on this occasion, was accompanied by Mrs. Valentine, and they were both accorded an enthusiastic reception. In a brief but comprehensive speech Mr. Valentine outlined the splendid service rendered to suffering humanity by the two hospitals which were to benefit by the Bazaar, and congratulated the staff on their efforts to raise funds for so worthy a cause. He welcomed the friends who had rallied to their support, and in declaring the Bazaar open expressed the hope that the contents of the various stalls would be speedily sold out.

A vote of thanks to Mr. and Mrs. Valentine was then proposed by Miss Ashmead, seconded by Mr. Gray, and was carried with acclamation by all present.

The real business of the day began forthwith, and the stalls were gradually denuded of their dainty burdens by clamorous customers—mostly accompanied by accommodating males, who cheerfully disbursed cash on request, and fulfilled the duties of light porters, as though to the manner born!

Thanks to the untiring efforts of the Organising Committee and their band of enthusiastic helpers, no less than to the generous support given by their friends, the gratifying sum of £133 has been raised. This is being divided between the two hospitals above mentioned.

The organisers desire to take this opportunity of thanking most heartily all those who in any way contributed to this splendid result. We regret to announce that, owing to a prolonged spell of muffin-toasting in the refreshment department, our tame poet has had another seizure, with the following painful symptoms:—

The hour of three approached at last,
As upward to the rest-room passed
A crowd who joined the hue and cry
For Christmas gifts they meant to buy
At our Bazaar!

We wonder how they all got in—
This throng of all our kith and kin!—
But there they were, to our delight—
Prepared to spend cash left and right
At our Bazaar!

Our good Controller made a speech,
Congratulating all and each,
On efforts made for Charity—
And hoped we'd raise much £ s. d.
At our Bazaar!

The opening ceremony o'er
Fair helpers then came to the fore,
And plied a brisk and beaming trade
In dainty goods and sweets (home made—
For our Bazaar!)

By instinct each stall-holder knew
The ideal gift for me and you—
And smilingly they helped us choose
Things to adorn and to amuse
Dear Ma and Pa!

"Try not to pass" one damsel cried
Until the Hoop-la you have tried!
Before you all our treasure lies—
Aim true, and you will win a prize
From our Bazaar!

"Oh, stay!" the waitress said, "And rest—
Our teas will soon renew your zest!
We've scones and crumpets, cakes and fruit—
Designed all appetites to suit—
Howe'er bizarre!"

With joy we answered to the call,
And made a meal that was not small—
Then tried another toasted scone
And fell back with an awful groan—
We'd gone too far!

And when the evening shadows fell
Lo! there was not much left to sell;
The teeming stalls were nearly bare,
Yet everyone seemed happy there,
At our Bazaar!

The side-shows, scattered all around
Possessed of stores of wealth, were found
Still trying stragglers to entice,
For one last flutter at half-price—
Good luck! Houp-la!

Then finally, when all was o'er,
And added up the total score,
We found we had exceeded far
The proceeds of our last Bazaar—
Hip! Hip!! Hurrah!!!

C. A. S.

AUTOMATIC TELEPHONE MANUFACTURING CO.'S DANCE.

AUTOMATIC Telephone Manufacturing Company's Sports and Social Club held its Annual Carnival Dance on Tuesday evening the 13th inst., at the Embassy Rooms, Mount Pleasant, Liverpool. The function was well attended, some 350 being present, and dancing continued well into the small hours. There was an excellent display of fancy dress costumes many of the wearers having gone to considerable trouble to secure novel and striking effects.

The prizes were presented by Mrs. G. W. Moore, prize-winning costumes being:—

Ladies: "Old English," "Carmen," "Tons of Money," and "Claritone"
Gents: "Oriental," "Private Wiper," "The Parson," and "Cat Burglar."

Great credit is due to the two energetic M.C.'s Messrs. Duckworth and Boyd, assisted by four stewards, to whose untiring efforts the success of this, the first Fancy Dress Carnival Dance held under the auspices of A.T.M.S. & S.C., was largely due.

(A photograph illustrating this function is unavoidably held over till next month.)

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TELEGRAPH AND TELEPHONE MEN.

XIV.—

MR. W. T. LEECH.

[Reproduced by courtesy of "St. Martin's le Grand."

MR. WILLIAM THOMAS LEECH, who has assumed charge of the Telephone Branch of the Secretary's Office, needs no introduction to our readers. Few members of the Head-quarters staff are better known in the Post Office service and, on the other hand, it can be said that his knowledge of the Post Office staff of all grades is probably unrivalled. For some years past he has been in charge of the Staff Branch, and in that capacity, he has impressed all who came into contact with him with his shrewdness, impartiality, strong common sense and tenacious memory. These qualities are of primary importance in the management of any business, and the telephone service, with its rapid growth and increasing complexity, will afford ample scope for their exercise. Mr. Leech's qualifications for his new post are, however, not limited to those arising from his character. He brings to his new duties a sound technical equipment and, altogether, the management of the telephone service could not be in more competent hands.

IS TELEPHONY OUSTING TELEGRAPHY?

BY J. J. T.

(*Continued from p. 94.*)

IT appears to be generally agreed among the administrations that the effect of the aerial post upon telegraphic traffic has been practically negligible.

Question No. 6, What remedial measures does your administration intend to apply?

The Australian Federation states that plans are on foot to improve the transmission and delivery of telegrams, and in order to attain this end the latest and most modern equipment is to be installed. Other measures are being taken to accelerate a telegram from the moment it is handed in to its delivery to the addressee.

Belgium has taken similar measures in the same direction. They have inaugurated what is known as an "accelerated transmission" between the commercial centres of Belgium, the financial and commercial markets of Antwerp and Belgium for example. Telegraph circuits are installed in the very centre of business exchanges, and the motto is: "Instantaneous transmission, immediate delivery." Apparently for the first time in Belgium, a system akin to the Deposit Account System of the British administration has been inaugurated, and also the collection and delivery of telegrams by telephone. Although small at first, the administration reports that the ordinary inland traffic has gradually increased and still shows a tendency to do so. The report goes on to say, however, that the delays on telegraph correspondence at the present time are still considerably heavier than before the War, and adds that this feature cannot but have its retrogressive influence.

Egypt, Hungary, Italy, New Zealand, Luxemburg and Sweden, have all reduced their telegraph charges.

The Dutch administration proposes to go to the length of reducing telegraph charges to the level of the telephone, but does not give any details of the basis upon which this is to be done.

The following are the French propositions:—Introduction of letter-telegrams, Urgent telegrams, and Reduced Rate telegrams for local delivery. The reorganisation of the regulations regarding registered addresses, and the development of the telephone-telegram.

As regards the international telegraph service, more specially a reduction of the rates between France and limitrophic countries is suggested, as also the creation of a new type of cheap international telegram for contiguous territories, and also the inauguration of a week-end telegram service.

The French administration has in fact recently made considerable advances, in Paris at any rate, by the adoption of certain American and British methods, and for some year or two has adopted the Urgent (Triple) Rate telegram for certain of their international services.

New Caledonia has taken the abnormal step of raising the *telephone* charges, especially the rentals of subscribers.

Switzerland has placed a proposition on the agenda of the forthcoming International Telegraph Conference to increase the charges applicable in the international regime, those for the interior regime having already suffered an increase of 100%.

From all these various experiences it seems fairly clear that it is the local and interior telegraph services which generally speaking have suffered most the competition of telephone development, and also that it is the smaller areas which have shown the largest decreases, Switzerland, Belgium and Holland, for example.

This is not surprising and would appear to be in the natural order of things. A short telephone circuit is able to give a cheaper and quicker service than a short telegraph circuit, taking into account the more direct touch between the two individuals in the former case and the heavy charges of collection, bringing to account, and delivery in the latter.

When we come to long-distance telephone and telegraph circuits, the handicap of the latter is less heavy, and between two large commercial towns lengthy single-line telegraph circuits of 150 miles and over, fitted with modern high-speed apparatus, should prove a more remunerative proposition than double-line telephone circuit, hour against hour, both fully loaded.

There is doubtless an economic point where the telephone will cease to prove as profitable as the telegraph, given the same quality of line maintenance; that point will differ in different countries and localities, but sooner or later it must be reached. There is, for example, no room for a local telegraph service, say within a radius of two miles of St. Paul's, London.

Much has been heard of the proposed extensions and interlacings of European telephone communications, but the capital required to complete the necessary network will be enormous, and provided even the present mostly inferior telegraph lines could be well maintained, international telegraphy, so far as Europe is concerned, would have nothing to fear. It is safe to say that many of the long-distance telegraph circuits of Europe have lost 75% of their earning power owing to poor upkeep and the neglect of rudimentary precautions against undue deterioration.

Wireless telegraphy for the moment holds its own over long-distance wireless telephony but may not always do so, but it is not likely to be very long before Great Britain's foreign telegraphs may feel the effect of her own telephone extensions to the Continent.

It is, of course, not possible to answer the question with any certainty which the writer himself has placed at the head of these articles. The aftermath of the War is still with us, and when pre-war and post-war results are compared they are frequently as between like and unlike, so that all that one can do is to wait and watch the tendencies, the new ideas, and the new inventive genius which one morning may give the *coup de grâce* or a fillip to one or other or both of our crafts. Meanwhile, the practical organiser of telegraphs must concentrate upon the problems of rapid delivery, the chief solution of which would still appear to be the aid of the telephone. Thus may it not happen that, instead of ousting the telegraphs, the telephones may render most valuable aid in the one direction wherein lies the chief weakness of the present-day telegram—its delivery?

MR. OLIVER HEAVISIDE.

IN Mr. Oliver Heaviside, who died on Feb. 4 last, there passed away a notable scientist to whose researches much of the progress made of recent years in long-distance communication is due.

Mr. Heaviside was born in London in 1850 and, after a few years' service with the Great Northern Telegraph Company at Newcastle-on-Tyne, he retired in 1874 to Devonshire, where he devoted himself to the study of the theory of electro-magnetic radiation and its application to the solution of the problems of telegraphy and telephony, with and without wires. In particular, long-distance telephony owes much to him. In the early days of telephonic communication distortion of sound waves on long lines presented much difficulty. Mr. Heaviside suggested the directions in which remedies should be sought, and his suggestions led to the discovery by Professor Pupin in America of the advantages to be obtained by the introduction of loading coils at intervals along the line. This remedy is now adopted extensively in many countries. Mr. Heaviside's contributions to the science of Wireless Telegraphy were no less notable, and in particular, he was probably the first to point out that in the higher regions of the air there exists a permanently ionized layer which would act as an upper guide to the electric waves.

A FEW NOTES.

BY E. J. J. JOHNSON, *Traffic Superintendent, Glasgow.*

A GENERAL accusation of lack of progress and reluctance to adopt improvements is frequently made against the Post Office. Such statements arise more often than not because of a lack of knowledge on the part of the speaker of what has been or is being done to keep the services rendered by the Department up-to-date. The reluctance of the Post Office to advertise its doings in the Press does not give the general public an opportunity of knowing what is being done quietly and effectively behind the scenes.

The changes which have taken place in the Glasgow Trunk Exchange and Phonogram Room during the last four years have not, in all probability, come under public notice, and may not have been fully appreciated by the average telephone user. In this article an attempt is being made to summarise the changes which have taken place, and to indicate the effect of these changes on the Telephone Service.

The policy of the transfer of short distance trunk lines to the Local, or as they should now be called, Combined Exchanges, has been continued, and during the period under review 127 circuits have been removed from the Trunk Exchange.

In order to make a "no delay" service possible on these routes the number of circuits was increased by 71, which with 56 already in the Central Exchange makes a grand total of 254 circuits to date.

The provision of the "no delay" service on the shorter trunk routes has speeded up the service to these places so that telephonically speaking they are brought into the city, as the time taken to get into touch with the distant correspondent is no greater than if he were connected to one of the suburban exchanges.

The carrying out of this policy has meant that the Trunk Exchange has suffered a considerable loss in the number of trunk lines terminated and worked, but it is assuming its proper function of being a place where long distance calls are handled and controlled.

The long distance lines have been increased in number; a notable instance is the increase in the speaking circuits between Glasgow and London from 6 to 10. A further considerable increase in these long distance circuits is anticipated in the near future.

Comparisons of traffic handled in the Trunk Exchange under the changing conditions just enumerated would be somewhat valueless, but the monthly value of originated and controlled trunk traffic in 1920 was £6,717, and in a corresponding month in 1924 £8,528, thus showing that the value of the work performed in this Exchange is increasing, in spite of a reduction in the number of lines.

As an indication of the increased amount of trunk working now undertaken by the combined exchanges, a comparison of the value of the Originated Short Distance Trunk Traffic for the Central Exchange in Glasgow in 1920, and a corresponding month in 1924 may perhaps be given; the figures are £1,172 and £2,657 respectively.

The general increase in trunk working in the Glasgow District is shown by the statement that in October 1922, 187,188 trunk calls were originated, while in 1924 the number had increased to 225,005, or an increase of 37,817 per month in two years.

The time is rapidly approaching when there will be so few short distance trunk lines in the Trunk Exchange that subscribers will easily be able to distinguish between places which are reached via that exchange and those on a "no delay" basis and will therefore be in a position to ask for "Trunks" when desiring a long distance call. This will save the writing down of particulars of such calls in the Combined exchange and passing of these details by the "A" operator to a trunk board operator, as is the present practice. The subscriber stating his requirements to the trunk record operator, cuts out a transaction in the Combined exchange with a reduction of the possibility of error and saving of time. The time of the Combined exchange operator is saved, and no increase of work is put on either subscriber or trunk record operator.

The trunk record table is being changed from order wire, and ordinary signalling to ancillary working. It is anticipated that a considerable improvement in the Record Service will result. This change is also in anticipation of the time when the subscriber will state his requirements to the record operator direct, as already outlined.

A considerable number of long distance trunk calls pass through the Glasgow Trunk Exchange between English and Scottish, and also Northern Ireland towns. The length of the circuits involved and other conditions which arise from time to time frequently causes the unaided or unamplified speech currents to be so weakened, that conversation is difficult. In order to overcome this as far as possible, a cord repeater section has been installed in the exchange. This is staffed during the busy periods of the day, and calls on which speech is known to be difficult are passed through this position, which is fitted with keys and lamp signals to render the appropriate degree of amplification and control of the circuit possible to the telephonist. In many instances calls which would have had to be abandoned have been quite successful when passed through this position, also difficult calls have been made easy.

In common with all other exchanges in the kingdom the fixed time trunk call system has been introduced, and proved to be very successful, the number of such calls originated per day being about 200.

The Phonogram and Telephoned Telegram Service is carried on at one end of the Trunk exchange and this has been completely reorganised by the fitting of new equipment of the ancillary type. On this equipment the lamp calling signal appears on each of twelve different positions, thus bringing it within easy reach of a disengaged telephonist who, on plugging in to take the telegram, automatically extinguishes all the signals, thus enabling a quick service to be given as compared with the older system in which a distribution switch was employed. The service given to subscribers has been greatly improved not only in reducing the time taken to answer, which under the old system averaged 21 seconds, but also in the provision of additional circuits which removed any holding up of incoming calls because of "no lines" being available.

The removal of this restriction altered the incidence of the incoming traffic to such an extent that an adjustment in the staffing of the positions was necessary.

The traffic handled is considerable, being in the neighbourhood of 3,000 transactions per day. The time taken to answer has been reduced to an average of 7 seconds.

The acceptance of telegrams for onward transmission from unattended call offices is being given an experimental trial, and while the number of such telegrams is not great, there are sufficient to show that the service is meeting a public requirement particularly after Post Offices are closed. The messages received average about 1.5 per day.

With the view of speeding up the service, and also introducing economies in working an experimental trial of "dialling in" subscribers on the Dundee Automatic Exchange is being made; the experiment is not yet completed, but it promises to be successful.

Other minor items such as the introduction of a "delay" board, the combination of three service private branch exchanges into one, and its fitting in the trunk exchange for convenience and economy in staffing, an improved system of recording faults, etc., have also been brought into use.

Equipment for the proper observation of the Trunk service has been installed, and will be brought into use at an early date.

By means of this apparatus a close watch will be kept on the service, any deficiencies being brought to light and the remedy applied. It is hoped that an improvement in the Trunk service will result which will more than justify the time and expense which this observation work will entail.

An endeavour has been made to keep the Glasgow Trunk Exchange and Phonogram room up-to-date in so far as equipment is concerned, and it is hoped that the service given is satisfactory, and that in the near future it will be even more satisfactory than at present. Of this there is every prospect as with an increase in Trunk circuits and increasing mileage of underground, or cable, circuits, the liability of interruption by faults is decreased and the main cause of delay in service removed.

NOTES ON TELEGRAPH PRACTICE.

By G. T. ARCHIBALD.

III—*Concerning Telegraph Tariffs.*

PRIOR to the transfer of the telegraphs to the State, which took place on Jan. 28, 1870, the service was almost entirely controlled by three private companies, viz., the Electric and International, the British and Irish Magnetic, and the United Kingdom Electric Telegraph; and a fair amount of telegraph traffic was handled by the railway companies. The charges in those pre-transfer days varied, according to distance, from one shilling for twenty words to two shillings for twenty words in Great Britain, and to six shillings for twenty words between Great Britain and Ireland. An additional charge was demanded on telegrams which had to pass over the systems controlled by two or more of the companies. The names and addresses of the sender and of the addressee were telegraphed free of charge.

The companies confined their operations to places where there was sufficient traffic to make the business profitable. Generally speaking not more than one office was provided in each town by the Company concerned. In the majority of cases the telegraph office was situated at the railway station.

On the transfer the charge for an ordinary inland telegram was fixed at one shilling for twenty words, and threepence for each additional five words or part of five words, with a minimum charge of one shilling irrespective of the distance between the point of handing in and the point of delivery. The names and addresses of the sender, and of the addressee were telegraphed free of charge. The cost of a reply telegram could be prepaid; multiple address telegrams were accepted at a charge of threepence for each copy after the first, for delivery in the same free delivery, and provision was made for the repetition of telegrams throughout their transmission on the request of the sender, the charge for this service being one half the ordinary tariff. Telegrams were re-directed for a similar fee.

A fee of sixpence a double mile was charged as porterage on telegrams for delivery outside the above mentioned limits where a foot messenger was employed in delivery, but one shilling per double mile had to be paid when delivery was effected by cab, fly or horse express.

Press telegrams were charged at the rate of one shilling for seventy-five words during the day period—9 a.m. to 6 p.m.—and one shilling for one hundred words outside those hours with a charge of twopence per 75 or 100 words for each additional address wherever situated.

In 1883 a resolution was carried in the House of Commons, that the time had arrived when the minimum charge for an ordinary telegram should be reduced to sixpence. It was estimated that the proposed reduction would entail a serious loss of revenue and heavy new capital expenditure, and although opposed to the change the Government of the day bowed to the wishes of Parliament. The new Tariff was not, however, brought into operation until Oct. 1, 1885, when the charge for ordinary inland telegrams was reduced to sixpence for twelve words with a minimum of sixpence, irrespective of distance, with $\frac{1}{2}d.$ for each additional word, but the free transmission of the name and address of the sender and of the addressee was abolished. This reduction resulted in a remarkable increase in traffic, especially of what may be termed local traffic, the number of such telegrams in London alone increasing from 1,800,000 in 1884-5, to 3,800,000 in 1886-7. The Press message tariff was not reduced, this service already being unprofitable.

Before dealing with subsequent tariff changes it may be useful to discuss the method of charging. Thirty years ago the public were exasperated and amused by apparent inconsistencies in the charging of words, but in the process of time the administration has seen fit to allow the passage as one word of many combinations of words and signs, which were formerly held to count as two, three, or more words. The term word is now held to embrace plain language in any modern tongue or in Latin; all words not forming part of any modern language or of Latin, and all unintelligible combinations of letters are charged for at the rate of five letters to a word in the text of a telegram, and as one word in the address. With the exception of words which are ordinarily written as one or joined by hyphens, e.g. mother-in-law, no combination of words is counted as one word. Abbreviations such as "can't" "won't," etc., are counted as one word, but "alright" and other similar combinations are counted as two words each.

Exceptionally commercial symbols such as b/l, a/c, &c., are counted as one word each. Figures are counted at the rate of five figures to a word and fractions are counted according to the number of figures used, thus $\frac{3}{4}$ counts as one word, $10\frac{1}{2}$ is counted as one word, $197\frac{3}{8}$ is counted as two words. In combinations of letters and signs each unit is counted as one word; in ordinal numbers the affix st, nd, rd, is counted as two figures, thus "1st" counts as one word, "1,782nd" as two words. The symbol % is charged as three figures when used alone.

Certain place names are counted as one word each, irrespective of the number of words of which they are composed; when it is necessary to add the name of a county or town to an address in order to distinguish it from another place the addition is not charged for, e.g. Burton Westmorland is counted as one word.

Punctuation signs, inverted commas and parentheses are charged for if required to be transmitted: "a.m." and "p.m." are counted as one word each, and letters added to figures to denote the number of a house or of a telephone subscriber are counted as figures, exceptionally.

Other concessions respecting inland telegrams include the free transmission of expressions such as "reply paid" which indicate that a reply has been prepaid; and the acceptance of five figures or cipher letters as one word.

The next concession of importance was authorised in 1892, when free delivery was given at night of telegrams for outlying districts of large towns. In 1897, as a Queen Victoria "Jubilee" concession, the free delivery of telegrams was extended from one mile to three with a porterage charge of threepence a mile beyond that distance. This was followed in 1906 by a further concession which provided that the chargeable distance of telegrams for delivery beyond the three mile limit should be counted from the boundary of the free delivery area instead of from the delivery office.

No further tariff charges were introduced during the next few years—until after the outbreak of war—when increasing costs made it necessary to revise the inland tariff. The sixpenny telegram of which the Britisher was immensely proud, had been in jeopardy for some time, when in November, 1915, the charge was increased to ninepence for twelve words, with ninepence as the minimum,

and ½*d.* for each additional word. The charge for additional addresses of multiple address telegrams was increased from twopence to threepence each, the fee for repetition was increased proportionately, threepence instead of twopence was fixed as the charge for the cancellation of a telegram before transmission commenced, and the charge for night telegraph letters was increased from sixpence to ninepence for 36 words. The new inland rate was applied to re-directed telegrams, and the charge for Second Service was also increased from sixpence to ninepence.

The increased tariff did not affect the volume of traffic handed in, the war being responsible for a tremendous amount of work.

Then came an increase in the press tariff, an increase which most telegraph officials considered to be long overdue. On Jan. 1, 1920, a new tariff for press traffic was brought into operation and the charges became one shilling for 60 words instead of 75 words during the day period 9 a.m. to 6 p.m., one shilling for 80 words during the night period 6 p.m. to 9 a.m. with threepence instead of twopence for each additional address. No further change in the press tariff has taken place.

Owing to the heavy increased cost of labour and material further increases in the tariff for ordinary inland telegrams became inevitable, and new charges were introduced on Sept, 1920. The minimum charge was then fixed at one shilling for twelve words, with a shilling minimum and one penny for each additional word. The charge for each additional address of a multiple address telegram was raised from threepence to fourpence, the fee for a Second Service was raised from ninepence to one shilling, and the charge for the repetition of a telegram was increased to a halfpenny a word. Porterage fees were increased from threepence to sixpence a mile beyond the three mile limit or outside the Town Postal Area, and the charge for night telegraph letters was also raised from ninepence to one shilling for thirty-six words with a penny for each additional three words.

A novel feature was introduced into the new tariff, in that an additional charge of sixpence was levied on every telegram handed in between 12 midnight on Saturdays, and 12 midnight on Sundays, Good Friday, and Christmas Day. These rates are still in force.

A new service called the Night Telegraph Letter Service was put into operation on Jan. 1, 1912, with the object of providing a means of communication after the usual posting hour, and at a cheaper rate than by the ordinary telegraph service. The service was restricted at the outset to London and Aberdeen, and London and Belfast, and the charge was fixed at sixpence for thirty-six words or less, with ½*d.* for each additional three words. The night telegraph letter must be written on the ordinary telegram form, plain language must be used and registered abbreviated addresses are not accepted. Replies may be prepaid at the ordinary inland telegraph rate. This service is not available on Sundays owing to the abolition of the Sunday postal delivery. The service, which is not known and used as much as it ought to be, is now available at most of the larger towns in the country.

Perhaps the most valuable concession of all to the telegraph user proved to be the introduction of the Registered, Abbreviated, or Arbitrary address. This arrangement was instituted in 1875. A registered abbreviated address must consist of one word together with the name of the office at which it is registered, and the first word must not contain more than ten letters. The Post Office prefers that easy English words should be used, but suitable coined or foreign words are not refused. A proper name may not be registered if there are other persons of the same name in the place of registration unless the written consent of those persons is obtained. In no circumstances can a proper name be registered by a person with a different name. Thus, a person named "Ogilvie" is not allowed to register the name "Booker" even supposing there is no person of the latter name in the place.

A person is not allowed to register an address at a place unless he either resides or has business premises there. A registered abbreviation which has been cancelled cannot be taken up by another registrant within six months of the cancellation except with the consent of the former registrant. In London, abbreviated addresses are registered at the Central Telegraph Office; in the Provinces they are registered at Head and Sub-Offices, but not at Town Sub-Offices.

The original fee, which remained in operation until 1920, was fixed at £1 1*s.* 0*d.* per annum, and this fee covered the charge for registration of special instructions regarding delivery to alternative addresses and any alteration from time to time of those instructions.

The arrangement did not probably appear to be a concession on its introduction in 1875. At that time the name and address of the sender and the addressee was telegraphed free of charge, and the only incentive to large users to register an abbreviated address at their own cost was that their telegrams might be expedited by the consequent reduction in the number of words to be signalled. At all events very little use was made of such addresses prior to the introduction of the sixpenny telegram, and the consequential abolition of the free transmission of the names and addresses of the sender and addressee, which gave an impetus to the system. The number of registrants steadily increased from year to year and when, as happened, the possession of such an address came to be regarded in commercial circles as evidence of business standing many persons who sent and received very few telegrams became eager to have the right to print them on their stationery. At the present time there are 32,000 registrants in London, 4,000 in Birmingham, 5,500 in Glasgow, 4,300 in Liverpool, 6,000 in Manchester, 1,600 in Leeds, 2,000 in Newcastle-on-Tyne, and 1,600 in Cardiff.

In 1920 the registration fee was raised from £1 1*s.* to £2 per annum, but even at the higher price the service retains its popularity. In order that there may be no misunderstanding it should perhaps be made clear that the registration fee covers not only the cost of registration, but the value of the time of addressing clerks in searching for and translating the abbreviated address into the ordinary address for delivery purposes.

An interesting development of the registered abbreviated address is the addition of what is known as the "Indicator" word in telegrams for registered addresses in London. Considerable delay was occasioned owing to the size of the lists to be consulted at the Central Telegraph Office, in order to ascertain the office of delivery, and after considerable inquiry the Indicator Word System was invented. Under this system, three words are used for each registered address, the additional word being telegraphed free of charge. The intermediate or "Indicator" word is an abbreviation of the name of the delivery office; thus, a telegram addressed "Sanguinary Westcent London" would circulate to the West Central District Office, a telegram addressed "Pneumatic Led London," would circulate to Leadenhall Street for delivery, etc. A few registrants declined to use the Indicator word, and it therefore remains necessary to retain at the Central Telegraph Office lists containing delivery instructions, although of course the number of references has been considerably reduced. The use of the Indicator is not compulsory, but new registrants invariably accept it. Its use has unquestionably speeded up the delivery of telegrams in London, and it is a matter for regret that there are still a number of registrants who fail to appreciate its effectiveness.

Previous to the adoption in 1885 of the sixpenny tariff, it had been customary to repeat figures in telegrams free of charge. This free repetition had been instituted mainly because of the imperfections of the morse code. Any lengthening or clipping of the dots and dashes, of which the morse code is composed, and any unusual interval between the signals result in incorrect transmissions. Plain language serves as a check against errors arising from the inherent weakness of the Morse Code, but code and cypher provide no check, and errors due to imperfect sending, apparatus faults, or to disturbing electrical conditions may pass unnoticed. For some reason which does not seem very clear free repetition was suspended in 1885. At the same time the number of figures counted as one word was increased from one to five, with the result that the use of figures in telegrams greatly increased, and codes began often to be formed from figures. In 1889, in consequence of many complaints of errors in transmission the then secretary to the

Post Office proposed to re-introduce free repetition of figures, but as a set off against the extra work, and cost to reduce the number of figures telegraphed as one word from five to three. This scheme was not pursued, but early in 1892 Mr. (Later Sir) Henry Fischer, Controller of the Central Telegraph Office, called attention to the large number of figure errors and recommended the adoption of Sir A. Blackwood's proposal. No action was taken, however, until later in the same year when the Postmaster-General, Mr. Arnold Morley, decided that figures should be repeated, "as far as may be found necessary and practicable," in a shortened form on all circuits upon which the figure code is used. Free repetition was then re-introduced generally except on Stock Exchange circuits, the exception being due to the fear that the additional work and delay due to the repetition of figures—Stock Exchange telegrams being composed largely of figures—would be intolerable and that the stockbrokers would be the first to complain.

In 1904 it was again suggested that the free repetition of figures should cease, but no change was made. In 1906 it was agreed to experiment at an office where figure telegrams preponderated. Returns taken during the experiment showed a slight increase in the number of errors, but for reasons which need not be discussed here the arrangement was continued at the office concerned.

In 1907 the question of free repetition was again discussed, this time at a conference of telegraph supervising officers. The conference recommended that free repetition should cease on all circuits fitted with Wheatstone, Morse, Duplex, or Quadruplex apparatus, but the Administration felt that there would be a large increase in the number of errors if the proposal were adopted, and that the small gain in time would be purchased at the cost of discredit to the Post Office.

With the development of machine telegraph apparatus it was thought that the original necessity for repetition had largely disappeared and further experiments were made, but it was ultimately decided that figures should be repeated on all types of apparatus. On the whole it seems fair to urge that the Post Office should take all reasonable steps to ensure accuracy, and on those grounds the free repetition of figures is not only justifiable but necessary.

TELEGRAPHIC MEMORABILIA.

THE retirement of Mr. F. J. Brown, Assistant Secretary to the Post Office, will no doubt be more adequately dealt with elsewhere in these pages. We of the telegraphs however—and may we say, more especially of the cables and wireless department of the Central Telegraph Office ?—would wish to pay our humble tribute to the kindly spirit which has always dominated personal contact with this worthy representative to the Secretariat.

Indicative of this spirit was his farewell visit to the C.T.O., on the actual day of his withdrawal from active participation in Post Office activities.

This, by no means the first expression of personal appreciation of C.T.O. endeavours to co-operate with the Administrative side, will stand out and remain a fragrant remembrance in the midst of the more general atmosphere of unrequited official effort.

The retirements from the C.T.O. upon reaching the age-limit have become bewildering of late as, rapidly, familiar faces—in many cases looking surprisingly youthful for their three score years—turn away for good from official life. Of these Harry Hayman and "Jack" Mansell, to cite their names in due chronological order, are the most recent. Both leave behind them records of good fellowship, of a race well run, of a Department well served, and of staffs well content to give of their best to discipline so well and soundly based on comradeship and common sense.

The staff of the C.T.O. was not a little elated at the appointment of an old C.T.O. telegraphist in the person of Mr. F. W. Phillips to the post of Assistant Secretary to the Post Office, and aptly enough with special oversight of the newly formed branch of "Overseas cables and wireless." Those who had close opportunity of watching our colleague's career testify ungrudgingly to the capacity for hard work possessed by this still "young man" of the Service.

From China came, last month, a Xmas and New Year's greeting from our much respected friend and colleague Paul Sun, who, members of the C.T.O. will recall spent some very happy months in our midst studying many of the administrative, technical, and financial features of Post Office organisation. To those greetings and their sender we return our very kindliest thoughts and wishes in the fond hope that the return to his native land has brought to him restored health and the best of good fortune.

It is entirely due to the compiler of these columns that the following sad announcement of the sudden death of a much respected Cableite was unfortunately omitted from our last issue.

Mr. Victor E. D. Hughes was a telegraphist with a remarkable history; born a Britisher in Heligoland long before that island was ceded to Germany, he was trained as a telegraphist, and went abroad, where for a time he followed his calling in a private company's service. Quitting this occupation as too unremunerative he went into the grain trade in Odessa where for a certain period he also acted as British Consul. After many successful years misfortune, however, overtook him and he came to England much reduced in circumstances. Here he again followed his old vocation, being finally accepted for permanent service in the Post Office, his knowledge of languages, especially Russian and German, naturally drafting him into the Foreign Telegraphs, C.T.O. Here he made many friends, being of an equable and kindly disposition, a specially well-informed colleague, and a very good *raconteur*. He once related to the writer how in Odessa he was known by the Russians as "that mad Englishman" because, as an early morning recreation, he enjoyed half a mile swim out to a war-ship in the Black Sea and back again!

During the war he was in constant request in the Censor's Department, C.T.O., as may be well understood, and after his retirement, four or five years ago, he found useful employment at Dulwich College and elsewhere as a teacher and lecturer in the Russian language.

The London County Council is about to install, so we are given to understand, an electrical signalling device of a special type which should prove of particular interest to the inquiring traveller and the American tourist in the coming season. By pressing a button labelled with the name of the district to which the inquirer wishes to find his or her way, lamps light up the route on a suitable map which forms the central panel of a kiosk.

When studying radio developments and watching the many and varying vistas of its possibilities, it is wonderfully luring to find the unexpected ways in which the medium that at one time we, as telegraphists and telephonists, were perhaps inclined to think was solely to be associated with the wireless branch of our craft, insists upon pushing its utility in hitherto unthinkable directions.

Take, for example, the radio-micrometer by means of which Professor Boys of St. Mary Bourne, near Andover, measured the heat from a candle placed at a distance, the heat of the moon, and the weight of the earth, as explained by him to the Astronomical Society some few weeks ago.

The *Westminster Gazette* described how, by means of the radio-micrometer, the professor discovered that the heat from a candle flame 300 yards away produced a violent effect on the mechanism of his apparatus. At the same distance his niece stood in place of the candle, and the warmth from her face produced an effect on the instrument of about half the magnitude of that of the candle. [*She must have blushed* !—ED.] By means of this apparatus the heat of a candle flame miles away can be measured.

Following this, Professor Boys produced melted quartz rock crystal fibre a ten thousandth part of an inch thick, yet of the tenacity of steel, in order to give the right amount of tension to balance the electro-magnetic force set up. By that means he was able to measure the heat of the moon. This fibre is a perfect insulator for supporting parts of apparatus.

Later he set up an apparatus at Oxford, and after years of study he was able to calculate the weight of the earth.

Having successfully measured the calorific value of the moon and the avoirdupois of the earth, Man, in the person of Mr. C. J. Cutcliffe Hyne, next turns his scientific imagination to the navigation of the future which, as he said at the Annual Dinner of the Seven Seas Club, will be done by electrical accumulators. "These accumulators will give us one-horse power for twenty-four hours in the space of a pint pot. Then every little stream in Britain and the rest of the world would have a turbine in it, and there would be windmills on every vacant bit of ground, and tidal estuaries would be producing power, till eventually steamers, instead of bunkering with coal or oil, which took up a lot of cargo space, would bunker with accumulators from the Zambesi or Sutherlandshire, stowed in convenient space.

One thing I am sure will occur in the future. We shall have the oceans—the Western, for example—mapped out in squares, showing where the ship was, and all the men in charge would have to do would be to see where the ship was at the moment, and take it for granted it was so.

If they were doubtful about the depth beneath them, there would be a gauge to tell them as well as the nature of the land underneath. The new navigation would also give them the details of the distances of ships which were in the neighbourhood, and if one were coming too near they would ring him up on the loud-speaking telephone and tell him to sheer off!"

Attention is directed to the excellent report of the C.T.O. Library which appears elsewhere in this issue. The Secretary and Committee are to be congratulated upon the result of their united efforts. The policy of women serving on the committee has no doubt assisted in this happy result.

There is a very interesting description of L'Administration Centrale des Postes et Télégraphes en Angleterre by E. Quenot, of the French Administration, in the January number of *Les Annales des P.T. et T.*

The writer appears to be very much struck with the austere simplicity of the surroundings. The furniture even of the chiefs is very simple, the walls are unpapered, but are painted with washable paint. In the offices of the chiefs *une carpette trés ordinaire* !

Our French colleague notes with particular interest also the precautions taken against fire, remarking upon the existence of fire buckets and other similar appliances and the staff of firemen employed, an arrangement which it is believed is non-existent in French offices.

Naturally the Woman Establishment Officer calls for remarks, and the view that such an officer is a protector and espouser of the feminine special needs was evidently new to our visitor.

Of the Registry, our kindly critic professes surprise at its exactitude and its costliness, and fears that the service rendered by this particular department, though excellent and incontestably useful, and one which his own administration might well apply as a principle, is nevertheless meticulous and exact to a degree which would admit of reduction without sensible effectiveness.

One little item protrudes from these observations and gives the writer no little amusement. It is the naive description of the simplicity of the furniture of an English Civil Servant's office and—it's *carpette trés ordinaire* ! The writer knows of one, well fringed, which lovingly entangles one's feet as one rises with due dignity to greet a caller.

The following interesting electrical signalling item is on the authority of the *Electrical Review* :—

More than twelve years' work and nearly a quarter of a million pounds have been expended by the London, Midland and Scottish Railway in renovating its Birmingham hotel (the Queen's), which will be finished within the next few weeks. Among innovations is one to minimise noise, an ingenious system of light-signals in place of bells. The touch of a "bell-button" by the bedside switches on a series of signal lamps—outside the guest's door in the adjoining corridor, in the attendant's pantry, in the manager's office, and on an indicator board in the main hall. As the lamps can be extinguished only at the room door itself, the management is able to supervise and ensure prompt service. By means of a "maid finder," another electrical device embodied in the system, the silent signal also reaches a servant who may at that moment be working in another bedroom. This noiseless scheme of signalling has been extended to other parts of the hotel to apply to the waiting staff, porters, lift men, and reception clerks.

A most interesting series of experiments in radio telephoning was proceeding as we went to press, and a brief résumé of the nature of these experiments may not be amiss to some of our overseas readers who do not always see the home daily press. These experiments are along the lines of a radio-telephone service between ships and the shore which may be linked up with the General Post Office land telephone lines. Southampton is the head-quarters, and the trials have reached such a stage that a commercial service could be undertaken if suitable wavelengths could be allotted free from mutual interference between the proposed service and existing broadcasting and other commercial radio stations. The experiments are being conducted by the Marconi Co., in conjunction with the General Post Office and the Southern Railway Co., whose cross-Channel steamer *Princess Ena* is being used for the purpose. A "duplex" radio telephone set has been specially designed by the Marconi Co. for the experiments, and the technical problems connected with such a system are claimed to have been solved. Further experiment is still necessary, however, in order to fit in a service of this nature amongst existing radio services without mutual interference. By the courtesy of the G.P.O. the land station for the experiments has been established at the Sectional Engineers' Office at Millbrook, Southampton. Under good conditions, perfectly good simplex telephone communication has been obtained between the *Princess Ena* at sea and Southampton up to a distance of about 200 miles.

According to the *Morning Post*, the Eastern Associated Group of Cable Companies has appointed a Suggestions and Inventions Committee to examine proposals, suggestions, or inventions submitted by employees. To encourage the submission of ideas the companies are awarding three £5 prizes in the first 12 months, which will be paid whether ideas are adopted or not, a payment in addition to anything which may be made for an adopted proposal.

Writing on Imperial Radio Communication, the *Birmingham Post* and the *Electrical Review* recently stated that the Donald Committee reported in favour of a scheme of development by private enterprise with Government control. The report was accepted by the Labour Government and the Committee was asked to prepare details of the proposed control. This proved a difficult task, for in addition to the Post Office, the Naval and Military departments required representation on the controlling body. The Committee was understood to be on the point of reporting when the Labour Government fell. Sir William Mitchell-Thomson, the present P.M.G., did not re-appoint the Committee, and the omission has been taken to indicate that its report would not have been unanimous, and the first-named journal points out that a new assistant secretary has just been appointed who has had a long experience of Imperial wireless. However much of this may be in complete accordance with facts, one thing stands out very clearly concerning the repeated delays, and that is how little truth there is in the allegations against the Post Office itself as the chief source of delay in the progress of Imperial Wireless.

AUSTRALIA.—*Press Cable Rates.*—It is reported that the reduction of Press cable rates is under discussion by the Commonwealth Government and the Pacific Cable Board.

Australian papers give the following "up-to-date" information regarding the "Beam" Radio Stations, some at least of which, however, appears to have appeared in print on at least two previous occasions. A contract involving £120,000 has been entered into between Amalgamated Wireless (Australasia), Ltd., and the Marconi Company, Ltd., for the erection of two beam radio telegraph stations in Australia for communication with England and Canada. Certain minor clauses have yet to be completed before the agreement is signed. The Federal Government's representative on the board holds £501,000 of the company's paid-up capital of £1,000,000, and stated that arrangements would be made shortly for the erection of another station to serve traffic to and from the East. The station for English traffic would be set up first, but the site—as in the case of the Canadian traffic station—had not yet been selected. The Amalgamated Co. would provide the sites, and also arrange for the provision of the power to be used by the stations.

The contract provides for the operation of the first station within 12 months of the date of its signing. A guarantee was being given by the Marconi Co. that the station would be capable of handling 43,000 words duplex daily, which was double the total that had been provided for in the earlier proposal, and penalties for failure to complete the undertakings given by the Marconi Co. were contained in the agreement, which differed materially from that entered into with the same company by the British Government. No royalty for the use of patents would be paid, whereas the British Government would have to pay 6¼% royalty. The contract would have to be sent abroad for signing, but that would not delay the preliminary work. Of the £120,000 to be paid for the two stations, £75,000 would go to the first to be erected for traffic with Britain.

CANADA.—Within the next few months, says the Canadian correspondent of a London press agency Montreal will be directly connected with Australasia by wireless.

GERMANY.—It is reported in Germany says the *Electrical Review*, that as a result of the exceptional activity of the British cable making industry, competition in world markets has recently slackened and that this circumstance has allowed German cable factories to obtain large orders both from North and South America for cables destined for the extension of the North American cable network. A German newspaper says, with what reason we do not know, that there is a prospect "that the Eastern and Eastern Extension Companies will allot comprehensive orders to the German cable industry in the near future," in connexion with a large cable network extension which is to be undertaken in the next few months.

INDIA.—Reuter's agent at Delhi states that it is understood that the Government of India has offered to grant a licence to the Indian Radio Telegraph Co. to operate a "beam" radio station in India for communication with the United Kingdom, subject to an agreement the terms of which will shortly be signed.

ITALY.—From Stockholm comes the information via Reuter's Trade Service, that the Italian Government, which is handing over the administration of nearly the whole telephone system of the country to private enterprise, has awarded the concession for one of the five zones to a combine of the L.M. Ericsson Company, Stockholms Enskilda Bank, Hambro's Bank, and the Fatme telephone works at Rome. The holders of the concession will modernise and develop the telephone service of the zone, which comprises Southern Italy and Sicily, with 22,000 subscribers. The concessions for the other four zones have been awarded to Italian firms, some of which have concluded agreements with the Ericsson concern for technical assistance.

NORWAY.—The Government has reduced to almost one-quarter the budget estimates of the telegraph administration's proposed expenditure in the ensuing financial year, so that the total outlay will be only 6,556,000 kr., as compared with nearly 25,000,000 kr. which had been asked for. The former figure includes 2,000,000 kr. for the continuation of the work of reconstructing the telephone system in Oslo, 1,300,000 kr. for the completion of the Stavanger radio station, and 40,000 kr. for that of the Spitsbergen radio station. The Stavanger station is expected to be ready this year.

PARIS.—It is contemplated that the International Telegraph Conference will be held in Paris, probably in September, according to the latest information, although the exact date is not yet fixed. Should the conference meet it will have a very heavy task, as the last Convention was signed in 1908 at Lisbon, and much water has flowed under the bridges since that date, while telegraphy itself has been revolutionised entirely.

The Radio Amateurs are also arranging to hold a conference—the first international conference of amateurs—at Easter in the city, when delegates from Canada, North and South America and most European countries, object of which will be to get uniformity of treatment for amateurs of the different countries in certain ways. Among the subjects to be considered are international communication between amateurs—it is sought to make as easy as possible two-way communication between any two countries—and the question of an international radio language.

PHILIPPINES.—Reuter's correspondent at Manila states that representatives of the Radio Corporation of America announce that plans have virtually been completed for the erection of a large radio station at Manila. The transmitter, with eight steel towers, will be located on Mariveles Peninsula, near the entrance to Manila Bay, within the United States Navy Reserve. The receiver will be about three miles from Manila. A submarine cable will connect the two, and both will be remote controlled from a building in the business centre of Manila. Testing has been carried out in the last few weeks under the direction of Admiral Bullard. It is said the project will involve an outlay of $4,000,000.

SWEDEN.—The Swedish Radio Service Co. has started operations, and three or four stations have been heard testing. According to the *Daily Mail* the new Gothenburg station (SASB) is to give regular concerts about 8 p.m. on 290 metres, and the long-wave station at Boden (2,500 metres) will probably be transmitting regular programmes next month.

Rash Vows.—Take, then, no vow at random; taken with faith
Preserve it; yet not bent as Jephthah once
Blindly to execute a rash resolve,
Whom better it had suited to exclaim
"I have done ill," than to redeem the pledge
By doing worse.
—"*Paradise*"—*Dante.*

J. J. T.

TELEPHONE NOTES.

"On Dec. 18 and 19 the eastern central portion of Missouri and the western central portion of Illinois were struck by one of the worst sleet storms experienced in the past forty years," writes P. Kerr Higgins in *Telephone Engineer.* "Pictures of the damage were almost out of the question, as miles and miles of line were laid completely flat on the ground in a tangled mass." Nevertheless Mr. Higgins tries his hand at a pen picture. "In several leads," he says, "I noticed a mixture of white cedar and native oak poles, averaging 22 inches. The cedar broke with the weight, while the native oak (new) only bent over, in many cases from three to four feet of earth." There is something grand in that picture of the stout oak standing with its accoutrements on the striken rout, with head bowed but still unconquered and unconquerable.

About the same time England, too, was struck by "a rain-storm from the south-west" although the "severe cold wave" from the north-west was late and the sleet did not materialise. But what sleet is to overhead lines, rain can be to underground cables. The baling out of flooded manholes and the dessicating of cables, however, is not calculated to thrill and inspire as was that fight of the "repair crews from Colorado, Kansas, Missouri and Minnesota" in the "snow drifts in Nebraska and on the slippery roads of Iowa." So our own epic is not likely to be written.

The results were the same in both countries. Many subscribers found their telephones down or "all in." Also the newspapers on both sides had something to say in the matter.

The tone of the comments is said to have been one of the mitigating features of the American catastrophe. For once in a way the same may almost be said of the British experience. In effect the comment on this side amounted to nothing more than a reminder that cables do not solve all the problems of continuity of telephone service. If the trouble was, as had been stated, due to water percolating into the cables, water is precisely what one expects to find underground. An unpalatable fact.

So in truly British style we open a new acquaintanceship with a talk about the weather. Having done so it is due to our patient readers to outline the object of this column which will, the writer understands, be a permanent feature so long as somebody can be found to make it worth reading. It is intended to be interesting rather than instructive, written more in sorrow than in anger, when criticism is being controverted and for the delectation of everybody in the telephone field. No restrictions have been placed upon its activities. Letters from readers conveying local news of general interest to be included therein will be warmly welcomed and the items fully commented upon. "The most interesting item in a newspaper is your own name. The next most interesting is the one which relates the incident you saw," as Mr. Marc A. Rose says in the *Telegraph and Telephone Age.*

Kiosks.

"Some time ago the Aylesbury Corporation agreed to the erection by the Postmaster General of a telephone kiosk in the Market Square, and all arrangements were made," says the *Evening News.* "But the permission of the Council has been withdrawn as the Postmaster General has intimated that on principle he cannot agree to pay the 5*s.* a year demanded by the Council for the privilege of erecting the kiosk. An annual payment of one shilling is, he says, as far as he can go." On the other hand a certain northern watering place is said to be prepared to pay the Postmaster General for the privilege of having kiosks erected. The Chief Constable of the town has induced the Town Council to guarantee a number of kiosks over and above those considered necessary by the Postmaster General on condition that the facility which these call offices provide of calling the Fire Brigade free of charge be prominently advertised on the kiosk. The Corporation would be well advised to adopt the Council's business methods apparently. Or is it vice versa?

Promotions and Transfers.

The retirement of Mr. Ruddock, late District Manager of Aberdeen, coupled with the amalgamation of the Swansea and Cardiff Districts has apparently smoothed the way for the return of Mr. P. Edmond to his "land o' cakes and brither Scots." Speaking of Aberdeen District and Mr. Edmond, calls to mind recent interesting reports of instances in which important personages have travelled huge distances back to Scotland specially, in order to attend the opening of a small rural exchange, sometimes even merely a remote rural call office.

"From the lone shielin' of the misty islands
Mountains divide us, and a waste of seas.
Still the blood is strong, the heart is hielan,
And we in dreams behold the Hebrides."

Another interesting promotion and transfer is that of Mr. A. E. Coombes, Traffic Superintendent, Liverpool, who has just taken up duty in the room of Mr. E. Williamson, late District Manager, Glasgow. Mr. Coombes is well known in traffic association circles for his optimism. His faith in a successful future for the telephone in England, and everybody connected with it, cannot be shaken. We congratulate him on his transfer to a sphere of even greater opportunity.

On Making Friends.

If the technical journals truly reflect actual conditions, the U.S.A. Public Utility Companies are intensifying their efforts to obtain and retain public interest and goodwill in their own particular company. This tendency is not less clearly manifest in the telephone field, and *Telephony* describes an interesting experiment made with this end in view at Ottawa, Kansas. Each of the 30 telephonists were in May last asked to be responsible for 10 visitors, as "everybody agrees that our best friends are those of our patrons who come to us as visitors." The experiment yielded "300 better friends for us," and on being repeated in October resulted in 1,211 names being registered as visitors, about 900 of these being school children. Recollecting that probably half England owes its wireless sets to school children, one is tempted to reflection as to the possible results of such an experiment in England. And the inherent possibilities in the situation which will be created when our telephonists take upon themselves the duties of hostess are fascinating. Why should they not? A recent leaflet distributed generally invites subscribers to visit their exchange. "Such visits are welcomed and may be arranged by telephoning the Supervisor in charge." One cannot imagine that visits will become less welcome, or of less value through the invitation being extended in a "voice with a smile in it."

E. S.

CAN THE COST OF AN INLAND TELEGRAM BE REDUCED?

BY H. G. SELLARS (*Central Telegraph Office*).

THE extremely interesting paper by Sir Henry Bunbury and Mr. A. J. Waldegrave, entitled "The Cost of an Inland Telegram," which was read by the former at the meeting of the Post Office Telegraph and Telephone Society on Jan. 19, left nothing to be desired in the manner of its preparation and delivery, and the decimalised conclusions were, of course, as exact as the complicated details which make up a telegraph service would permit. An illuminative discussion followed, and it is to be regretted that many would-be speakers from all branches of the service were prevented from submitting their ideas by the old gentleman with whom we are in perpetual conflict—Father Time.

The question which presented itself to the speakers and audience was naturally that which appears at the head of this article, or, as an ambitious variation, "How can the deficit be turned into a surplus?" The exposition of defects in any organisation is usually an easy matter, but to suggest a remedy sometimes presents difficulties which experience and practice find almost insurmountable.

Sir Henry's audience, after examining the admirably marshalled and displayed statistics, looked at the problem from the theoretical and practical points of view, but could only discover seven courses of action which, taken singly, or collectively, might have the desired effect. The suggestions enunciated by the various contributors to the debate were (*a*) reduction in the cost of plant and maintenance, (*b*) reduction in the amount of non-manipulative work connected with telegraphy, (*c*) reduction in the number of telegraphists, (*d*) increase of output per operator, (*e*) improvement of apparatus, (*f*) reduction of rates, and (*g*) advertising facilities to the public.

Mr. John Lee, in his unique and fascinating manner, stressed the value of the telegraphs to the community, nationally and internationally. He described the facilities offered to the public, and contrasted the efficiency of the British service with that of other administrations, but, with the experience of a lifetime spent in various capacities, was apparently unable to offer a panacea. It was surprising to hear from one of the Engineer-in-Chief's Staff that no great reduction had taken place in the mileage of wire in use. The writer, and many others on the commercial side, contemplated a great saving in lines and maintenance when multiple apparatus, permitting the utilisation of one line for several channels, replaced simplex and duplex morse working. The extended use of metallic instead of "earth return" circuits, and the provision of underground routes, must be taken

into consideration as a counteracting factor, but nevertheless, it is to be hoped that in the near future some saving will be shown in the cost of lines, and in maintenance—both indoor and outdoor. An appreciable reduction in apparatus cannot at present be foreseen, and indeed could apparently only be brought about by an elaborate system of switching at central offices. This idea, however, is not practicable, as, firstly, the Baudot, which is rapidly becoming the leading instrument in this country, does not lend itself to switching, and, secondly, the consideration of delay immediately arises. A talented inventor recently visualised the time when "senders" would telegraph directly to "addressees," but many years would no doubt elapse before such a system became extensive enough to have a drastic effect on the amount of apparatus in telegraph offices.

The question of non-manipulative work entailed in telegraphy is a serious one, and is not always fully appreciated by those who have no experience of the internal arrangements of a large office. Sorting and circulating the huge amount of traffic; transferring it to the various floors, sections, and circuits; collecting, classifying, and disposing of "finished" telegrams; dealing with service correspondence; preparing the necessary duty charts and lists for a huge staff; keeping records and books of reference up to date for the information of the staff; compiling indispensable statistics for future guidance, etc., are phases of the work which are constantly borne in mind by all those interested in telegraphic matters with a view to discovering quicker, simpler, and less laborious methods. Administrators consider carefully every scheme—simple, involved, or far-fetched—which is suggested, but the irreducible minimum of non-manipulative duties appears to have been reached.

The expenses of operating staff accounted for more than thirteen of the twenty pence making up the cost of an inland telegram, and the field of scope for suggestions looked promising. "Reduce the number of telegraphists" said one gentleman, but time did not permit the elaboration of his proposal. Such a result could apparently only be attained by the introduction of four methods, viz. (*a*) by "switching" which has previously been designated as impracticable, (*b*) by the adoption of apparatus which would allow telegraphists to "send" or "punch" a greater number of words per hour with the same output of energy, (*c*) by opening up, as one speaker suggested, avenues of promotion in other branches of the Civil Service for suitable telegraphists over a certain age, and (*d*) by offering voluntary superannuation to operators advanced in years. The last two proposals would obviously produce a telegraph service manned by a young cheap staff.

Increase of output also had its protagonists, and one heard remarks about high speed apparatus. A short time ago a highly placed official asked how it came about that, in spite of the introduction of high speed apparatus, the output per operator showed no appreciable rise. Let us say at the outset that, except in a few instances, "high speed" apparatus is not used in this country. The Baudot, which is becoming the chief means of communication, is a "multiplex" instrument by which a large number of words can be transmitted over one wire in one minute, but the speed of each "arm," or channel, of which the multiplex installation is made up, is limited to about thirty words per minute. The speed of each operator employed on them can therefore never be higher than that at which it is possible to "send" on an ordinary telegraph key, and, as each "arm" requires the services of a telegraphist, the total installation output is divisible by the number of officers engaged. The "operator average" on such a system could only be increased by the invention of apparatus which would enable a telegraphist to keep more than one channel "fed," or by curtailing the number of transmitting arms so that the bulk of traffic on hand would always ensure continuous transmission, a method of procedure which would give rise to complaints of delay. If high speed transmitters, such as Siemens, Creed, or Wheatstone, are worked at upwards of 80 words per minute the number of operators required increases in proportion to the speed attained, and, as a result, we have simply reduced the number of channels, and transferred the traffic from one town to another in a shorter period. We are forced to the conclusion, therefore, that whether transmission takes place by morse key, Baudot Keyboard, Automatic Baudot, Western Electric, Siemens, Creed, or Wheatstone transmitters, the output per operator is governed by the speed at which the telegraphist can write, "send," or "punch" (with sticks or typewriter keyboard), and this output is detrimentally affected by temporary faults in apparatus or lines, corrections of errors incidental to transmission, or the uneven flow of traffic. An improvement in apparatus might be expected from the many inventive minds continually at work on the subject, but it is difficult to suggest the direction of research which will lead to an increase in the operators' capacity for production. The number of telegraphists employed could perhaps be *considerably* restricted by the introduction of a transmitter into which the telegram forms themselves could be fed, thus obviating the preparation of "slip." Nothing short of a revolution in the means of transmission will produce the desired result, and the foregoing flight of imagination is presented gratis to our inventors for the very necessary development.

Whether a reduction in rates would be efficacious could only be decided after careful consideration of all the circumstances by a body of experts conversant with the fields from which telegraphic traffic is obtained, and it would no doubt be found necessary to examine a zone system of charges. The introduction of special rates for certain classes of traffic might be discussed, although the loss attributed to the "Press rate" does not offer much encouragement. In one direction, however, it might be possible to open new ground. Some years ago a publishing firm advertised one of its publications by telegraph. Firms advertising extensively would welcome a means of bringing their wares to the notice of prospective buyers without running the risk of communication in the form of a circular being thrown aside unread, and a cheap system of multiple address telegrams might attract them.

Advertisement of the facilities available would no doubt produce a slight increase in the number of our customers, but, apart from the question of cost, a long time would elapse before the psychology of the British public would be so altered that the idea of sending a telegram would present itself as readily as writing a letter, or telephoning. The acceptance of telegrams over Phonogram circuits is going a long way towards making the sending of telegrams easier and therefore more popular. The fact that Inland telegraphs are a monopoly limits to some extent our scope for advertising, but in the case of overseas telegrams every effort should be directed to making the British service superior to its rivals in efficiency and speed, and the public should not be allowed to overlook that superiority.

Long association with the foreign telegraph service causes the writer to note with a certain amount of congratulation that the handling of overseas traffic (cable and wireless) showed a nett profit of £66,000 during the year ended March 1924, but until the sister organisation is a paying proposition the satisfaction will be incomplete.

RETIREMENT OF MR. F. J. BROWN.

Mr. F. J. BROWN, M.A., B.Sc. Lond., C.B., C.B.E., Assistant Secretary in charge of inland, foreign, and wireless telegraphs, retired from the Post Office service on Feb. 6 last, under the age limit after thirty-eight years' service. He entered the Secretary's office on Aug. 4, 1886; and, although some of his time was spent in other branches of that office, his main work undoubtedly was that performed in the Telegraph Branch, where his unique and complete knowledge of the cable systems of the world, and his never-failing memory, enabled him to play a great part in latter-day developments in cable and wireless services. Quick-witted, a good fighter, imperturbable and not without an obstinate belief in his own views, Mr. Brown will be long remembered by his colleagues for his unshakeable evidence and prompt and cogent exchanges with opposing counsel in the Marconi case, and for the able and effective manner in which he maintained the Post Office supremacy in matters of wireless communications after the great war.

Mr. Brown's knowledge of cable work was gathered over a period of at least twenty years. He was Secretary of the Cables Landing Rights Committee from 1905 to 1910, and was the Post Office representative on this Committee until 1919. This Committee was the forerunner of the present Imperial Communications Committee, on which he was the first Post Office representative, a position which he retained until his retirement. He also represented certain British interests at many international conferences during the peace negotiations and served on many subsequent Government Committees on Imperial wireless and kindred services, including the Norman Committee of 1920, the Broadcasting Committee 1923, and the Donald Committee 1924.

It is perhaps only necessary to consider the vast developments in cable and wireless work during those twenty years to realise the interesting work which fell to Mr. Brown's lot. The Imperial cables to America, the cable to Russia provided during the war, the largely increased number of cables to other parts of the Continent, the first link in the Imperial Chain of Wireless Communications (Leafield to Abu Zabal), the nationalisation of the wireless ship and shore stations, the development of Wireless Direction Finding Services, and of the continental wireless service from Northolt and Caistor, and last, but not least in popular estimation, the establishment of wireless broadcasting service; these are some of the important problems which he was called upon to consider. He was deeply interested in the progress of the great 1,000 Kw. wireless station at Rugby and the Imperial "Beam" stations now in course of construction; and we have no doubt that his retirement before those schemes had come to fruition was to him a source of considerable regret.

Mr. Brown will, we understand, attend the International Telegraph Conference in the rôle of representative of the Cable Companies, and in this and in his new functions we wish him every success.

The
Telegraph and Telephone Journal.

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Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.1. The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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THE TRIUMPH OF THE MESSAGE RATE.

THE new French telephone rates which came into force last month represent another triumph for the message rate principle, that equitable system by which the subscriber pays in accordance with the amount of service he receives. Under the new tariff subscribers in the larger cities of France pay 360 francs a year, and have in addition to contract for 2,000 calls a year, involving a total payment of 660 francs a year for Service. By the telephone decree of June 21 last a new form of subscription was introduced in Germany under which a minimum number of 600 calls costing 90 marks has to be paid for annually, no yearly installation charge being made. Thus, in the three largest telephone Administrations in Europe, viz. Great Britain, France, and Germany the flat or "unlimited" rate is at last abolished, not without the liveliest opposition. In March 1899 a Bill was brought before the Reichstag proposing to replace the existing tariff by one which decreed an annual charge of £5 plus a minimum charge of £1 for 500 calls. This aroused so much hostile criticism from "big business" that it was shelved, and remained shelved until the War. After the Armistice the only alterations made to the telephone charges were in the nature of heavy surcharges, and hundred and thousand fold increases to meet the rapid and bewildering fluctuations, chiefly in a downward direction, which occurred in the value of German currency. In France, too, the principal post-war changes were in the form of increases to existing tariffs. Both countries, we are glad to see, have now succeeded in carrying out the reform of their rates on the only sound economic basis for the payment of telephone service. This basis was adopted about a score of years ago in connexion with business rate telephones in New York, and the message rate system is now practically universal in Chicago, Detroit, Cleveland, and New York, and is the rate charged for over 70% of the telephones in Boston, Philadelphia, San Francisco, Baltimore, Washington, and other important American cities. Sweden, Norway, and Denmark still cling to a measured rate, which, while it does not allow the subscriber an unlimited number of calls, allows him such a large number of free outgoing calls that it is in effect almost a flat rate. Switzerland and several other European countries have abolished the unlimited rate whose final disappearance can, we think, only be a matter of time. The flat rate which served its purpose admirably while the telephone was in its infancy, when there was some rough average equality in the use of the service made by the various subscribers, and when the cost of providing and maintaining the circuit was of prime importance, had already begun to show its defective character during the vigorous youth of the service. It is now altogether an anomaly; and every Administration as it finds the large user is obtaining for a moderate comprehensive charge an inordinate number of calls (and incidentally overloading his line and giving occasion for thousands of costly "line engaged" signals) at the expense of the smaller user, is bound to reconsider the question. No Administration, after it has successfully overcome the somewhat natural opposition of the powerful interests represented by the large users of the telephone, has ever regretted the step it has taken in abolishing flat rates.

HIC ET UBIQUE.

We offer our sincerest congratulations to our three new Assistant Secretaries, Mr. L. Simon who is now in charge of the Inland Telegraph Branch, Mr. H. D. Wakely who went to the Staff Branch, and Mr. F. W. Phillips who became head of the new Overseas Telegraph Branch. Also to Mr. E. H. Shaughnessy, O.B.E., who has been made an Assistant Engineer-in-Chief, and Major A. G. Lee, M.C., who succeeds him as Staff Engineer in charge of the Wireless Section.

Mr. W. T. Leech, (Assistant Secretary) has been transferred from the Staff Branch to the Telephone Branch; and Mr. A. R. Kidner, Assistant Secretary, from the Telephone Branch to the Mails Branch, *vice* Mr. E. W. Francis retired. Mr. R. A. Dalzell, C.B., C.B.E., director of Telegraphs and Telephones is now in control of the Inland Telegraph Branch, Overseas Telegraph Branch, and Telephone Branch.

BY the new French telephone decrees, which came into force in February, the flat rate is abolished. Existing subscribers in the larger French cities will pay 360 francs per annum, plus 15 centimes a call, but they must pay for at least 2,000 calls a year, which brings the total charge up to 660 francs. The minimum number of calls will be reduced subsequently to 1,500, 1,000, and 500. New subscribers pay what are called "contributive parts" of 700 francs at Paris and 450 francs at Lyons. In addition there are small charges for instrument maintenance.

Similarly in Germany a law of June 21, 1924, did away with flat rates. No annual subscription is now payable, but in towns with over 10,000 subscribers the subscriber must pay for at least 50 calls monthly at 15 pfennige each, amounting to a minimum payment of 90 marks (say £4 10*s.*) a year. New subscribers pay an installation charge of 90 marks.

On February 27 an additional Anglo-Dutch telephone circuit was brought into use, connecting London with the Hague.

The *Daily Herald* recently contained an amusing account of how the Marquess of Graham, addressing a meeting in the Isle of Arran, whilst intending to curse national ownership and to bless private enterprise, somewhat naively went on to describe the shortcomings of the latter. After saying that "he personally felt that private enterprise and personal liberty were more in accordance with the Scottish character than to be purely and simply the paid pawn of a Government machine," he recounted the efforts he had made to get the Railway Co. to improve the steamer service between Arran and the mainland.

The Marquess went to Glasgow and saw the general manager of the railway company concerned. The latter referred him to London, confessing himself powerless to move in the matter. His lordship took the manager's advice and asked a friend of his, a director on the board. A deputation was formed, and stood by to go all the way to London to put their case; but there was nae luck aboot the hoose, it seems. The chairman of the privately-enterprising railway company notified them to the effect that "he never had received a deputation, and he never would."

Another speaker revealed the interesting fact that the Postmaster-General, despite the fact that he anticipated a loss thereon, had installed a telephone service between the island and the mainland. (As it turned out, his fears were not justified.) But what the "paid pawns" of Government are prepared to do, the directing brains of private enterprise are not, it seems.

He condemned the "shockingly bad" steamer service. "They were told that the service was not a philanthropic institution, and that the amount of traffic between the mainland and Arran was not sufficient to justify a better service. The matter had been put before the directors in Scotland, the directors in England, and the general manager, and the reply they got from all was that they could not improve the service because it was not economically possible to do so."

A correspondent of the *Western Daily Express* has some extraordinary impressions of the social customs of America:—

Your leading article on telephones, he says, leads one to consider whether U.S.A. and Canada do not over use the 'phone. Do they not use it unnecessarily because it is there? Just as we smoke, drink, and ride in trams, when we might be better without. I cannot quote the authority, but I believe the young American girl uses the 'phone excessively. It is at her bedside. The first thing she does when awaking is to 'phone a friend. "Hullo, Sadie, old dear, how about a cocktail at ten?" "Right oh!" Second call: "Hullo, Maisie, old bean, what about a cocktail at 10.30?" Third, fourth, fifth, etc., ditto. There are millions of girls in America (so I'm told).

Would not housewives grow lazy and larger if all shopping was done by 'phone? Little do we realise how those trips to White Ladies Road retain our wives' and daughters' figures in that delightful proportion we adore.

As regards business men, English business quarters are more centralised. What man will use the 'phone (with all its annoyances) if he can pop out and have five minutes' chat with the man he wants?

Behind the times possibly, but not ahead of them anyway.

We don't think *all* the millions of girls in the States take five cocktails a day; on the other hand the kind of business man (English and otherwise) who abjures the telephone and is so eager to "pop out" and see a friend not infrequently has the cocktail idea at the back of his mind.

The following comment from *Truth* on a "Growl" is well worthy of reproduction:—

A London telephone subscriber complains that for between two and three years he has been overcharged with rent at the business rate of £2 a quarter, whereas he has recently discovered that he is only liable for the residential rate of £1 12*s.* 6*d.* The matter has been put right, but he seems to think that many other subscribers are being "treated" in the same way and that the Service is to blame. I am always ready to criticise a public service if it is at fault. In this case I think it would be unfair to do so. The difference between the business and the residential telephone rental is not concealed but advertised as plainly as possible in the forms of application, etc., and also in the telephone directory. Not only is this so, but the rates are set out clearly and unmistakably in the agreement which every subscriber has to sign. If in spite of all this people pay 7*s.* 6*d.* a quarter more than they need do, they should blame themselves, not the London Telephone Service.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE total number of telephone stations working at the end of the year was 1,243,621. During the December quarter the net growth was 30,179 stations, an improvement of 6,000 over the increase for the Summer quarter. The number of new stations added to the system during the last three months of the year was 54,850 and the ceased 24,671.

So far as Trunk Traffic is concerned the latest records (October) beat all previous results. During the month 6,915,201 calls were dealt with, an increase of 875,600 over the October 1923 totals.

The development for the month has been as follows:—

	London.	Provinces.
Number of Telephone Stations working at Dec. 31, 1924:—		
Total	439,223	804,398
Net Increase for month	3,947	6,263
Residence Rate Installations:—		
Total	78,564	133,750
Net Increase	1,456	1,910
Exchanges:—		
Total	104	3,641
Net Increase	—	25
Call Office Stations:—		
Total	4,135	14,470
Net Increase	15	90
Street Kiosks:—		
Total	52	879
Net Increase	2	44
Rural Party Line Stations:—		
Total	—	9,236
Net Increase	—	77
Rural Exchanges opened under the 1922 Development Scheme:—		
Total	—	621
Net Increase	—	21

Further progress was made during the month of January with the development of the local exchange system. Among the more important exchanges extended were:—

LONDON—Chingford, Redhill.

PROVINCES—Birkdale, Burnley, Durham, Hanley, Dudley, Maidstone, Nelson, St. Annes-on-Sea, Peterborough, Bognor.

During the month the following additions to the main underground systems were completed and brought into use:—

Liverpool—Manchester Cable.
Welwyn—Stevenage—Hitchin ,,
Bath—Bathford ,,
Bristol—Gloucester ,,
Gloucester—Cheltenham ,,
Leeds—Huddersfield ,,
Godstone—East Grinstead ,,
Manchester—Irlam (Section of Manchester—Atherton—Leigh Cable.
Northampton—Wellingborough—Kettering Cable.
London—Purley Cable
Coventry—Rugby ,,

while 73 new overhead trunk circuits were completed, and 71 additional circuits were provided by means of spare wires in underground cables.

MAIN UNDERGROUND TELEGRAPH AND TELEPHONE CONSTRUCTION IN GREAT BRITAIN.*

BY W. E. TWELLS, M.I.E.E.

IN the early days of Telegraphy the Companies were well aware of the advantages to be obtained by the use of underground wires instead of the overhead system, and many schemes were planned and long lengths of cable laid during the period 1840-1860. Notable schemes were the British and Irish Magnetic Company's route through the Midlands, and the cable between London and Cromer laid in connexion with the direct submarine cables between England and Denmark and Hanover. The schemes were not a success owing mainly to the difficulty in maintaining a satisfactory insulating material. Gutta-percha proved to be the best substance available, but its life was short in dry situations, and when the telegraph system was transferred to the State in 1870 the underground sections were of short length only.

For about twenty-three years after the transfer, underground extensions were limited to short sections in towns and other places where wayleave difficulties made it impossible to maintain overhead lines. A considerable network of cables was laid in Newcastle-on-Tyne in connexion with the Post Office local telephone system. In practically all cases the cables were formed by stranding a number of "Quads" each formed by twisting four insulated wires about a common axis; the insulator used was gutta-percha.

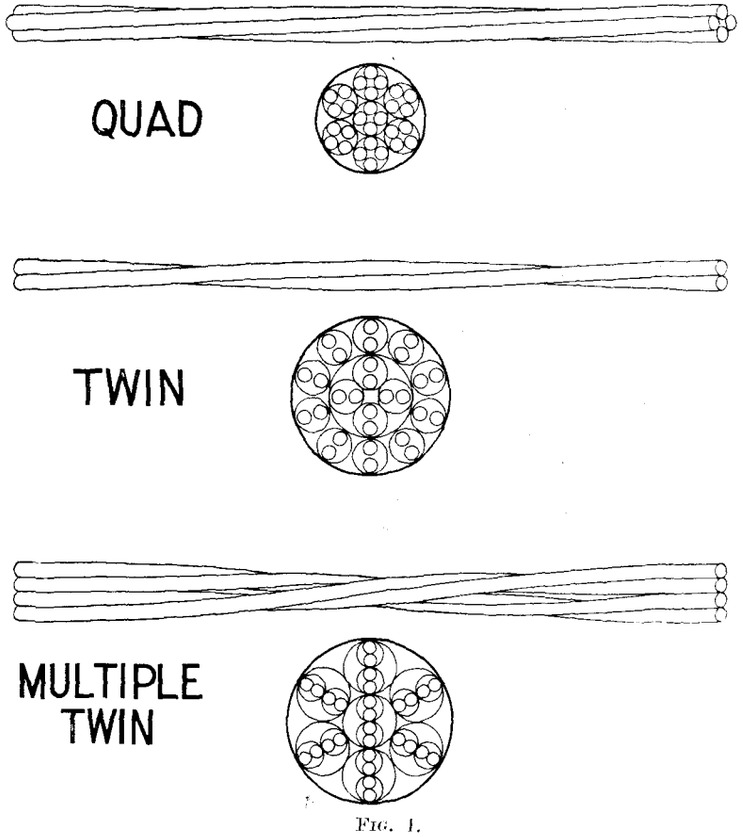


FIG. 1.

Although many other types of cable were tried from time to time, no considerable improvement was effected until the air space paper core cable was introduced.

Before proceeding to describe the developments which have taken place since the introduction of this type of cable, it will it is thought be useful to illustrate some of the various methods of insulating and stranding the conductors.

Fig. 1. The copper conductor in each type shown is enveloped with a paper in the form of a thin tape applied loosely to the bare conductor either longitudinally or spirally. A strand of cotton is usually wound spirally over the paper. The cotton keeps the conductor centrally in the paper tube, and by compression at the point of contact opens out or "balloons" the paper

*Paper read before the Post Office Telephone and Telegraph Society of London.

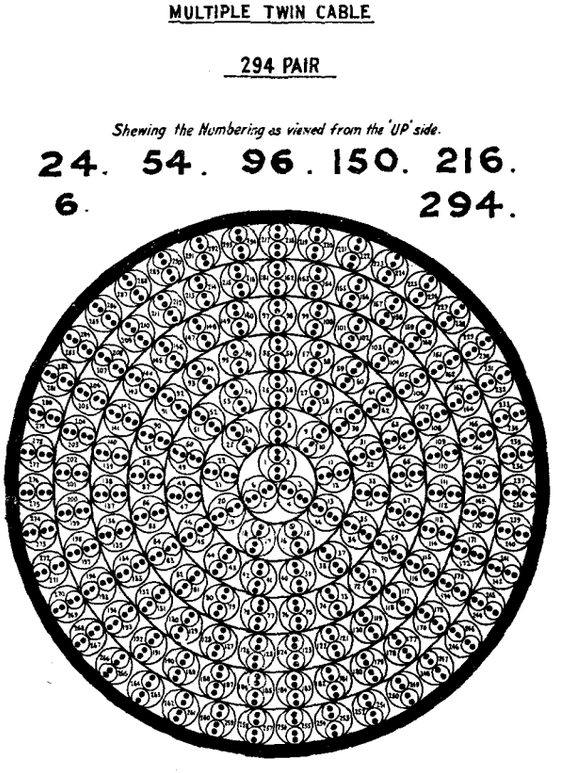


FIG. 2.

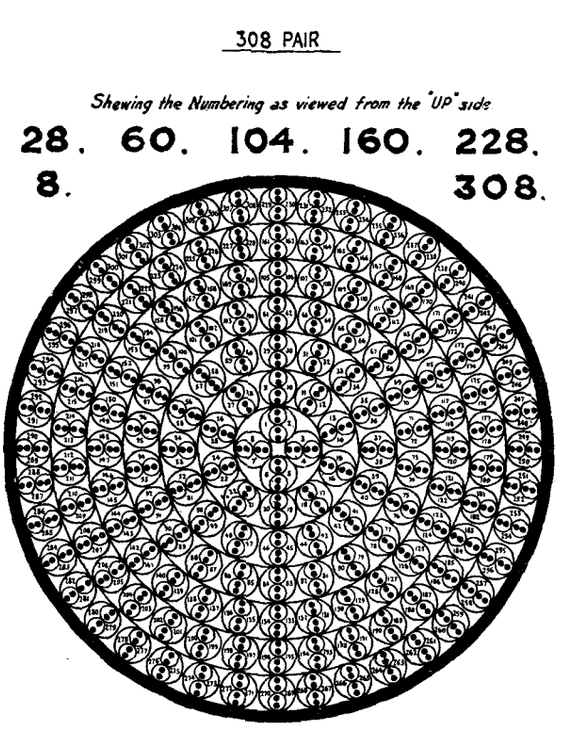


FIG. 3.

between the convolutions, thus tending to make the space uniform about the wire and reducing the malformation of the core, during the subsequent manufacturing processes.

The Quad type is laid up in a similar manner to the old gutta-percha cables. The length of the complete twist or lay is altered in adjacent quads to reduce parallellism and cut down the cross talk.

Fig. 2 shows the make-up of the cables adopted as standard types in 1913. The large figures at the top indicate the number of pairs obtained when one or more of the outer layers is omitted. A three colour scheme is at present standard practice, an orange marking quad forming the commencement of each layer. The centre core consists of three quads.

Fig. 3 shows the number of pairs obtained when the centre core is formed of four quads. It is of interest because the maximum size of 40 lb. M.T. twin cable is laid up in this manner. This cable containing 160 pairs has been a great favourite of recent years, and we have laid over 487 miles of it under 30 separate contracts. The London–Bristol cable containing 308 pairs of 20 lb. conductors is of this type.

Fig. 4 shows the lay up for the new Quad cable, 254 pairs 40 lb. Different colours in adjacent layers have been adopted in order to avoid the possibility of introducing a left hand Quad in a layer which is stranded in a right hand direction or a right hand quad in a left hand layer.

The Twin type consists of two insulated wires twisted together to form a pair.

The Multiple Twin type was invented with the object of obtaining a superposed or so-called phantom circuit on two physical pairs. Two twisted pairs are twisted together to form a quad core.

Another type not illustrated is the Quadruple Pair, which also provides for a phantom circuit. In this type four twin pairs are twisted together to form a quad. Most of the main telegraph cables are formed up in this manner, but this type is not now used by the Department.

A cable is constructed by stranding in layers either quads or pairs, alternate layers being stranded in a left and righthand direction. The completed cable core is wrapped with paper and passed through a lead press, which applies a uniform sheath of lead of prearranged thickness.

The section diagrams show that for an equal number of pairs the twin and multiple cables occupy equal space, and that the Quad type occupies much less (33%) space than the other types. Paper core cables were used by the National Telephone Company for the local system in 1896, and short lengths were used by the Department about the same time. In 1897 a telephone cable containing 37 pairs of 100 lb. conductors was laid between Manchester and Bolton.

The rapid growth of the Trunk service and the consequent large increase in the number of circuits resulted in congestion on the open lines, and it became necessary to release the open telegraph wires for Trunks, and replace them by long-distance cables.

The London—Birmingham route was probably the most congested in the Kingdom, and as the overhead lines were practically at right angles to the direction of the worst storms (which experience shows usually follow a course from the Bristol Channel to Lincolnshire and Norfolk), this route was selected for the first cable. The cable contains 38 pairs of 150 lb. copper conductors, paper insulated and lead sheathed. Quad formation was adopted for a considerable distance, but this method of stranding proved to be unsatisfactory owing to the unevenness between the pairs and the consequent large amount of electrical interference between the circuits. Twin formation was adopted for the greaater part of the distance. The cable was satisfactory in every respect ; it has rendered excellent service and has proved remarkably free from trouble of any kind. The cost of maintenance is practically negligible. When it is realised that in 1898 there was no proper method of testing the plumbers' work, or the continuity of the lead sheath after laying, and that dessicating plant was not available, it must be admitted that the work done is an object lesson to all responsible for the construction and maintenance of cables.

The policy of placing the main telegraph routes underground was continued from year to year, the various extensions being as follows :—

1903	Birmington to Warrington, Manchester and Liverpool.
1904	Warrington—Carlisle.
1905	London—Slough (first section of London—Bristol).
1906	Carlisle to Glasgow, completing through route to London.
	Manchester—Bradford—Leeds.
	Slough—Chippenham.
	London—Chatham.
1907	London—Bristol—Taunton—Exeter.
	Newcastle—Durham.
1908	Glasgow—Edinburgh.
	Durham—Middlesbro'
	Exeter—Plymouth—Penzance.
	Birmingham—Worcester—Bristol—Sharpness.
1909	Second cable, London to Birmingham.
1910	Bristol—Birmingham through route completed.
	Leeds—Middlesbro'
	Penzance—Porthcurno.
1911	Chatham—Canterbury.
1912	Sharpness—Cardiff.
1913	Leeds—Hull, Canterbury to Dover, St. Margarets Bay and Abbotscliff.
	London—Chelmsford.

In 1912 the policy was reviewed, and it was decided that the justification for replacing overhead wires by underground was considerably less than when first adopted.

This decision was undoubtedly arrived at as a result of the introduction of "loading" and the great improvements which had been effected in the manufacture of telephone cables. For many years prior to 1912, all local telephone cables had been of the lead covered air space type, and the invention of the multiple twin formation made it practicable to proceed with the construction of long-distance trunk cables.

Fig. 5 shows a typical telegraph cable. 16 quad pair cores each with 4 pairs 20 lb., wormed in the spare space ; 5 pairs of 100 lb. conductors, one in the centre and four wormed between the quads and eight single conductors, each covered with a metal tape outside the paper insulation.

In 1912 it was decided to provide a joint telegraph and telephone cable, 48 pairs of 70 lb. conductors and 6 pairs 100 lb., between Leeds and Hull instead of the purely telegraph cable originally designed. This was rendered possible by the introduction of "balancing" during the cable laying operations. Balancing is effected by testing the electrical constants of each of the wires in each of the cable lengths included in a section of cable between two pairs of loading coils and the selection of the wires to be joined together at each

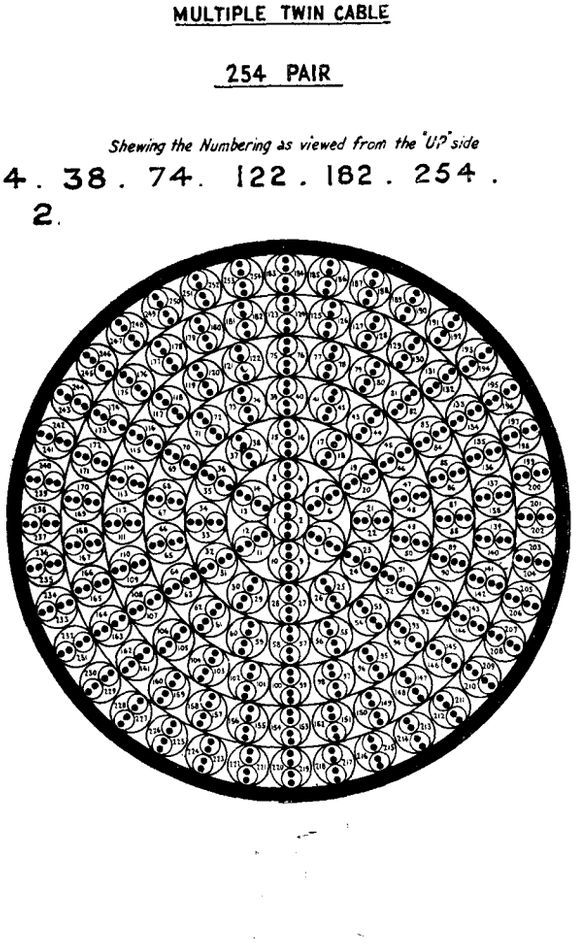


FIG. 4.

joint in order to secure as far as possible electrical uniformity throughout, with the consequent elimination of cross talk or "overhearing" between the various pairs of wires and between the phantom circuits. The work was carried out by the Research Section staff under Mr. Pollock, and the completed cable was and is quite free from interference between the telegraph and telephone pairs and also between the telephone pairs themselves. All the pairs have long been in use, and a new cable containing 122 pairs is now nearing completion. The success achieved enabled the Department to proceed (without apprehension as to the results) with the rapid extension of inter-town cables, and in 1913 a main cable between London, Birmingham and Liverpool was authorised. The cable was composite in type and consisted of 2 pairs, 300 lb. ; 14 pairs, 200 lb. ; 12 pairs 150, and 24 pairs 100, and the loading provided for phantom circuits. This cable, 210 miles in length, was the first long distance trunk cable laid in England, and was laid and balanced by contractors. The cable was not completed and brought into use until 1916, when it was of extraordinary value in securing telephone communication

between the important centres immediately after the great storm in March, which did extraordinary damage to all the overhead lines passing through the Midlands. It may be of interest to know that the cost of storm repairs to overhead lines in 1916 exceeded £300,000, and that £1,660,000 has been similarly spent during the past ten years.

TANDEM SCHEMES.

In 1910 it was considered that the growth in the trunk traffic justified a large increase in the number of lines, and the introduction of a "no delay" service between the more important towns, and Tandem schemes were drawn up for Glasgow, Liverpool, Manchester, Birmingham, Leeds and Newcastle-on-Tyne. A careful study of the traffic in each area was undertaken and a forecast showing the development to be anticipated as a result of the improved service was prepared. The figures arrived at were used by the Engineers in preparing the schemes, and it was at once apparent that the overhead trunk routes would be quite inadequate for the number of circuits required, and that an extensive underground cables system would be necessary at each centre.

Fig. 6 shows the Manchester Tandem scheme ultimately decided upon, and it may be of some interest to state the various problems which had to be dealt with before the decision was arrived at. Simple as the scheme appears it involved an investigation of the most economical and efficient means of providing 78 groups of direct circuits, each involving a number of incoming and outgoing channels requiring a different grade of transmission.

After making deductions for the transmission allowances required for :—

(*a*) The local service at each end of the chain of circuits used for a long distance trunk call ;
(*b*) The local junction circuits ;
(*c*) The inter-zone lines, and
(*d*) The Exchange losses throughout the chain,

it was ascertained that not more than three standard miles could be allowed for each of the outgoing circuits in the Tandem cables and six miles for each of the incoming circuits.

QUADRUPLE PAIR
PAPER CORE CABLE
16/100 Q.P. + 5/100 TWIN + 16/20 TWIN + 8/20 S.S.

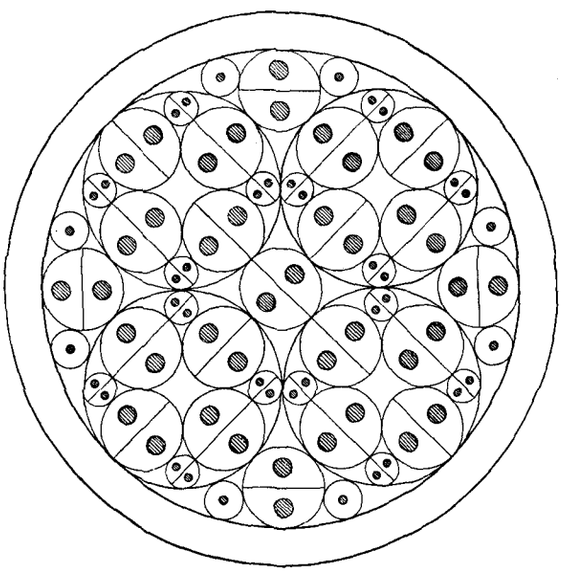


FIG. 5.

Two schemes for providing the circuits were considered, and alternative estimates (*a*) for the expenditure at the outset ; (*b*) at the end of eight years, and (*c*) at the end of fifteen years, were drawn up for each scheme. The schemes were (*a*) direct cables between each of the towns, and (*b*) cables radiating from Manchester. The second scheme proved the more economical, it involved very much less duct work and enabled larger cables (which are cheaper per pair) to be drawn in, thus economising duct space. Circuits between the outlying places, e.g. Oldham to Rochdale, Bolton, etc., were routed via Manchester. The type of cable to be used in each case, composite or uniform gauge, required a considerable amount of investigation, and it proved economical to lay a uniform cable at the outset, and to provide lighter gauge cables at a later date when the provision of direct links would relieve the radial cables of the short cross country circuits and to set free pairs for the additional circuits which would then be required. Reviewing the scheme after the lapse of ten years, it is clear that the decision arrived at was correct, as every pair in the cables shown on the diagram has been brought into use for circuits requiring a high grade of transmission which could be obtained only by the use of the heavier conductors.

The cables laid at the outset provided for circuits required for eight years, and ducts were laid on the basis of fifteen years' development. Six-way ducts were laid between Manchester and Liverpool, six ways to Bolton, four to Stockport and three to Oldham.

All the Tandem schemes were completed during the war, and the large growth in the trunk traffic which immediately followed resulted in seriously overloading the circuits on certain of the routes. An extensive programme of additional cables was commenced after the Armistice.

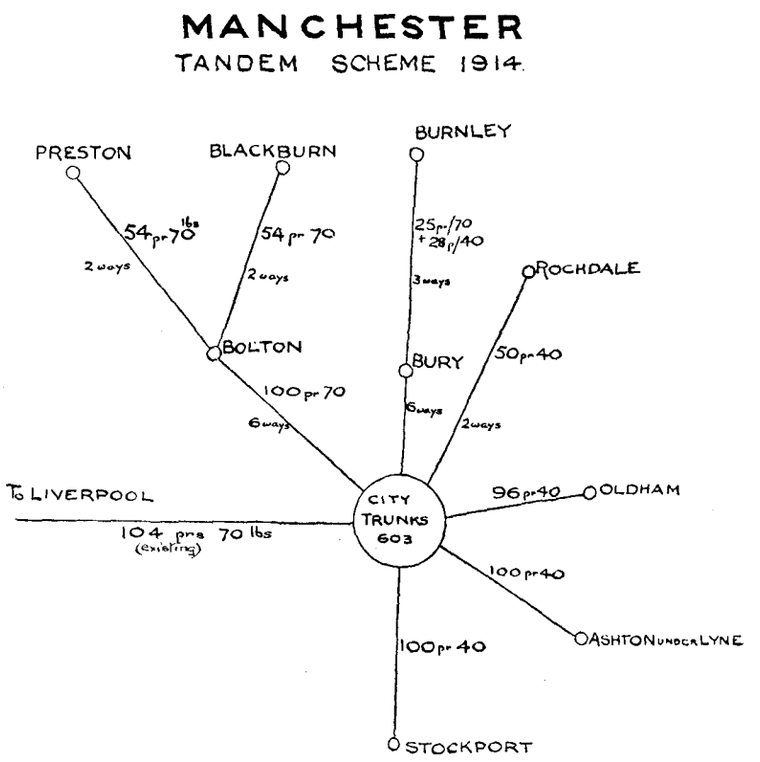


FIG. 6.

The present position as regards underground communication in the Manchester area is shown in Fig. 7.

You will notice from this that many direct routes have now been opened up, e.g. Preston, Blackburn, Burnley, Todmorden, Rochdale and, nearer to Manchester, Wigan, Bolton, Bury, Heywood, Rochdale, and in addition a large number of cables have been provided along the original routes.

In spite of the provision of cables containing many more pairs than were contemplated then the Tandem scheme was planned, the duct routes are now congested, a new line to Stockport containing six ducts has been laid down, and during the present year it will be necessary to lay additional ducts to Oldham and Rochdale.

One of the most striking features of the development of the main underground system is the necessity for providing additional cables along the existing routes. In many cases the largest practicable size of cable has proved inadequate for the growth of the traffic after three or four years, and it is certain that for years to come a considerable expenditure will be necessary for cables supplementing the existing network quite apart from the expenditure on cables for extending the system to towns at present served by open lines.

I have selected the Lancashire area as an illustration in the belief that you would be interested in the growth of the system in the principal industrial district of the country, and further, because it presents problems widely different from those in the London area.

Concurrently with the consideration of the Provincial Tandem schemes, proposals were made for a similar development to the Exchanges within a radius of twenty-five miles from London. In one respect the problem was simpler to deal with as there is comparatively little community of interest between the towns comprised in the scheme, the great bulk of the traffic being to and from London.

The proposals were included in the Main Underground Programme, but had to be deferred owing to the war, with the result that the post-war short trunk service left much to be desired. The scheme was revived in 1919, the anticipated development reviewed and the underground cable scheme considerably extended. Ducts and cables involving an expenditure of over

£750,000 were put in hand, and the London Toll scheme was brought into operation in September, 1921.

It is impossible in the short time at my disposal to deal at length with the development of the short Toll and Trunk service in the London area which now extends to the south coast, includes Bedford and Cambridge on the north, and reaches to the neighbourhood of Oxford in the west.

The large increase in the number of circuits required and the congestion of the duct routes in London has made it necessary to obtain cables containing a larger number of pairs, and it is intended this year to revert, on some of the routes, to the older type of cable. This type which is invariably described as Quad, Spiral Four, and Star occupies less space per pair than any other type, and permits of an increase of 50% in the number of pairs for a cable of given diameter. The type was abandoned years ago because it was impossible at

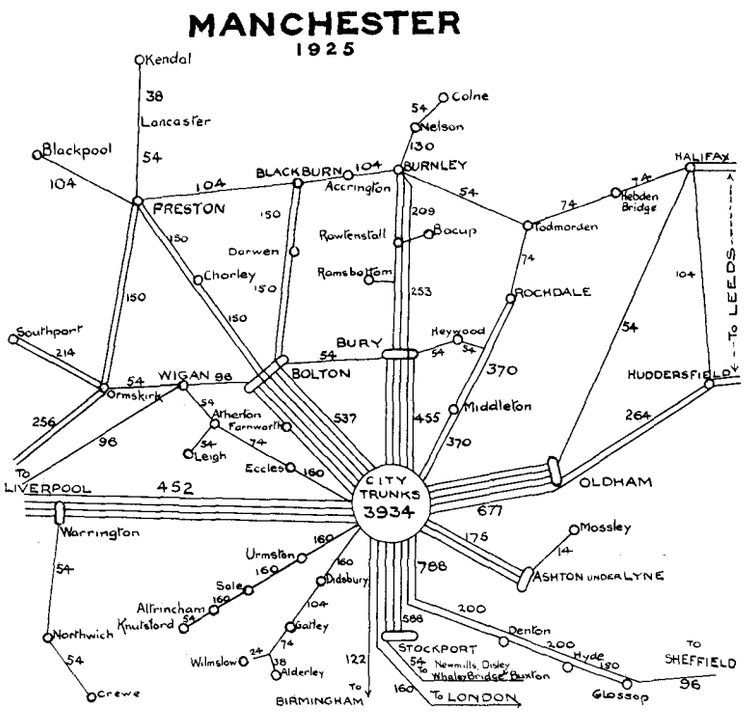


FIG. 7.

that time to manufacture in such a way that uniform results and freedom from cross talk could be secured. During recent years great improvements have been effected in the manufacture of multiple twin cables, large sums have been spent by the cable manufacturers, both on research work and on experimental lengths and it is now considered practicable to introduce modifications in the design of the quad type cable which will result in the production of a cable suitable for side loaded circuits up to fifty miles in length.

Although cable makers will not be tied down to the precise method o obtaining the results required under the terms of the contract, it is probable that the first cables will consist of a number of quad cores laid up somewhat in the manner described in connexion with Fig. 1, but each conductor will be served spirally with a paper string underneath the paper covering, and the cotton thread will be omitted. This method of construction results in greater uniformity and increases the resistance to compression or squashing during the subsequent quadding and stranding operations.

The introduction of this larger cable involves the provision of more loading coils at each point on the route, and it would be almost impossible to construct manholes of the necessary size in London. Up to the present date the largest loading coil case used by the Department contains sixty coils, it weighs half a ton, and without the leading out or "stub" cable is 3 ft. 4 in. high. Five of these cases would be required in each manhole for each of the cables, and these would necessitate the construction of a manhole 13 ft. 6 in. in length. Five main cables have been laid along Oxford Street and Holborn since the war, and special manholes have been built for each cable at the appropriate loading points. We have almost reached the limit on this and other routes radiating from the Trunk Exchange in the City. A new pattern loading coil, smaller than the existing coils and suitable for cables containing side loaded circuits only, has recently been introduced, and it will be practicable to place the whole of the loading coils for a single cable in one case. The manholes on the congested routes will be of the maximum size, but it will be possible to load five toll cables at one point instead of providing a separate manhole for each cable. The new design will greatly simplify the cabling arrangements in the manholes and enable a more robust method of construction to be adopted.

The London—Bristol cable is designed for no less than eight separate coil cases, the main cable is divided at each loading point into eight smaller cables, and each of these had to be taken the whole length of the manhole and bent round for connexion to the appropriate loading case. On completion there will be eighteen cable joints in each manhole. Similar methods have been followed for other main cables, but the number of subsidiary cables required is smaller. The loading coils are placed at intervals of $7\frac{1}{8}$ miles throughout the length and the complete manhole, with its complement of loading coils, will cost £3,000.

An alternative method has been adopted for the London—Derby cable now being laid. A single stub cable is provided from each pot and is joined directly to the main cable by means of a balloon joint. No subsidiary cable will be used.

LONG-DISTANCE CABLES.

The first long-distance trunk cable laid was the London—Birmingham—Liverpool cable completed in 1916. Although of maximum diameter, this cable contains 52 pairs only, owing to the heavy gauge conductors required.

The introduction of the Valve Telephone Repeater has enabled the weight of conductor to be reduced from 200 lb. per mile to 40 lb. and to 20 lb. for the long four wire circuits.

A London—Manchester cable containing heavy conductors was authorised as part of the reconstruction programme to be put in hand immediately after the war, and in addition a heavy gauge telegraph cable between London and Nottingham, following the same route for 110 miles. The experience during the war, and research work in America and England, showed that great economies could be effected by the use of repeaters, and the schemes were therefore remodelled to provide 160 pairs (instead of 48) of 40 lb. conductors, and the outer layer containing 56 pairs was appropriated for telegraphs. The inclusion of telegraphs in a sensitive repeater cable was not decided upon without a great deal of consideration. Tenders were sought for a cable in which a lead screening tape to enclose the trunk pairs was provided, the screen being directly connected to earth throughout its length by similarly sheathing two of the cores in the outer layer in contact with the outer lead sheath of the

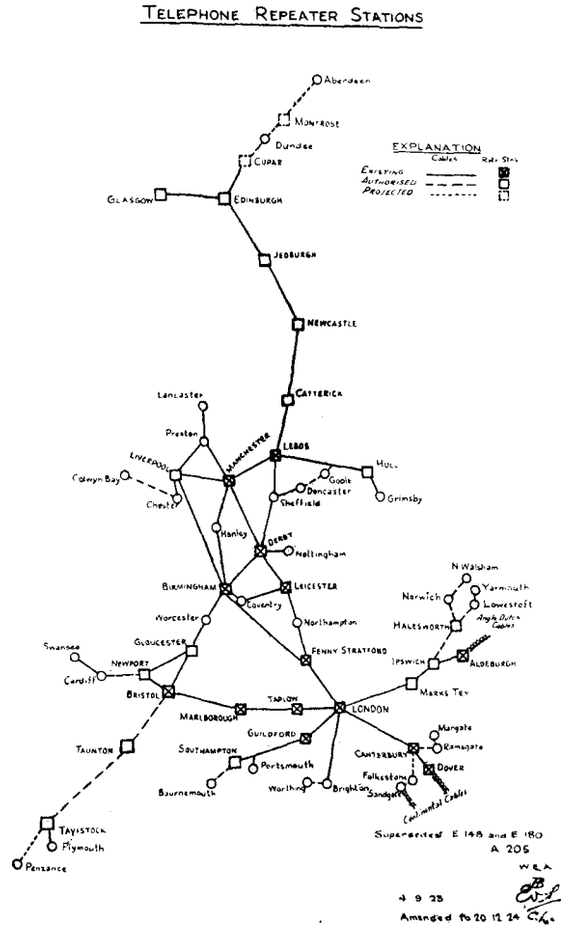


FIG. 8.

cable. This type would, it was thought, increase the difficulty in maintenance and it was ultimately decided to provide a normal type cable without a screen, the decision was arrived at as a result of the development and improvement of the methods of balancing effected by the Research Section. The cable has now been working two years and has proved of great service in affording relief to the overloaded routes through the Midlands.

Fig. 8 shows the network completed or authorised to date. Some facts relating to the London—Glasgow cable may be of interest. 443 miles in length, it contains 186,580 miles of copper wire weighing 2,350 tons, the average number of pairs is 210 and most of these will be loaded with phantom coils to provide additional channels. Telegraph pairs are included most of the distance. The lead sheathing weighs 5,800 tons and 5,300 drums of cable were manufactured. The whole of the manufacture pulling in balancing and jointing has been done by contractors. Eight contracts were placed with four of the leading cable makers.

The work of installing and jointing loading coils and the subsidiary cable's work in manholes has, north of Derby, been carried out by the Departments staff.

There are seven Repeater stations, five in buildings specially constructed, and two, Leeds and Edinburgh, in existing premises which have been modified and enlarged to meet the requirements.

When the whole of the pairs have been loaded the total cost of the cable will have exceeded £2,250,000.

MULTIPLE TWIN CABLE

60/20 + 34/40 + 62/20 + 56/40

LAYERS (QUADS) 4.10.16.17.31.28

DERBY - NEWCASTLE on TYNE

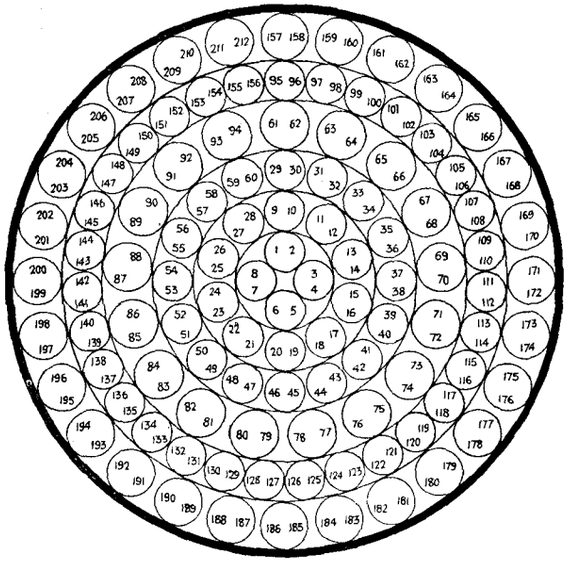


FIG. 9.

The number of pairs changes at Derby, Newcastle, and Edinburgh in accordance with the estimated traffic development. Between Derby and Newcastle there are 212 pairs, 60 pairs of 20 lb. in the centre separated from another 62 pairs of the same gauge by a layer of 40 lb. pairs. This separation is necessary to reduce the amount of cross talk between the outgoing and incoming pairs of four wire circuits. The cable is divided into four groups for balancing purposes, no crosses between the groups being allowed.

South of Derby the cable contains 244 pairs, 88 of 40 lb. and 156 of 20 lb. The 40 lb. are in the centre and the 20 lb. form the two outer layers. The division into groups for balancing purposes and four wire working is diametrical instead of concentric, and separator quads in each of the 20 lb. layers are balanced independently to prevent adjacency of circuits. The London—Derby cable is unique in this country as it is the first in which the whole of the work of manufacture, laying, jointing, balancing, and loading is associated with the provision of repeaters at Fenny Stratford and Derby, and carried out by one firm under contract the overall results to be obtained on the various circuits being guaranteed.

Finally, the whole system on March 31, 1924, consisted of 7,000 miles of ducts involving the opening up of 2,600 miles of roads and streets, have been laid since the Armistice the cables, 4,800 miles in length, contain over 1,000,000 miles of wire, the average size of cable is one containing 122 pairs

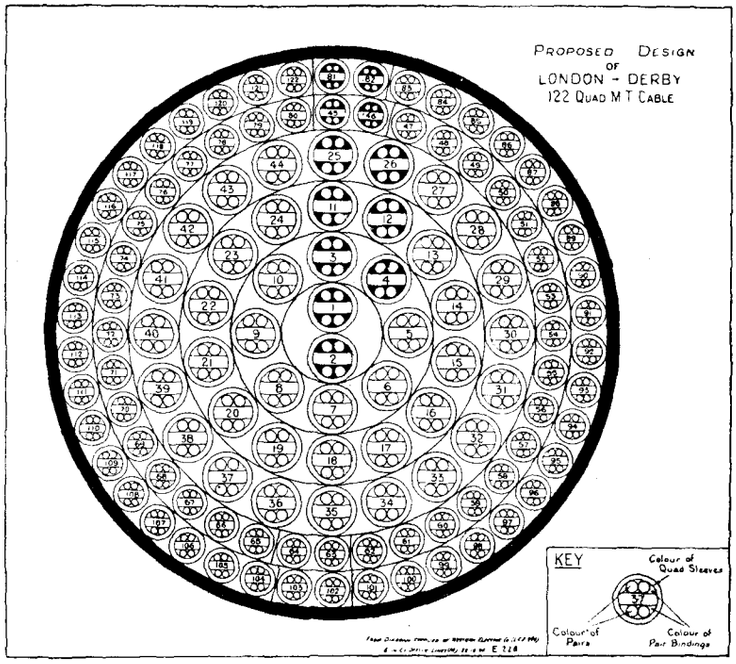


FIG. 10.

of conductors, each of which weigh 45 lb. per mile, and the total expenditure during the past six years has exceeded £10,700,000.

Great as the system is, it is but a small proportion of the network that will be required in the future; the overhead system includes over 60,000 miles of line and nearly a million miles of wire. Crossing a line drawn across the country from Sleaford to Shrewsbury are no less than six hundred trunk circuits carried on overhead lines. For many years to come we shall have to rely on overhead lines to meet the development, particularly in the more remote areas, and any idea of the wholesale removal of pole lines following the same route as the cables is out of the question.

I hope that this brief sketch of the main system, which although centred on London does not loom very largely in the day-to-day life of London officers may not have been without interest to the members of the Society.

MR. A. E. RUDDOCK, ABERDEEN.

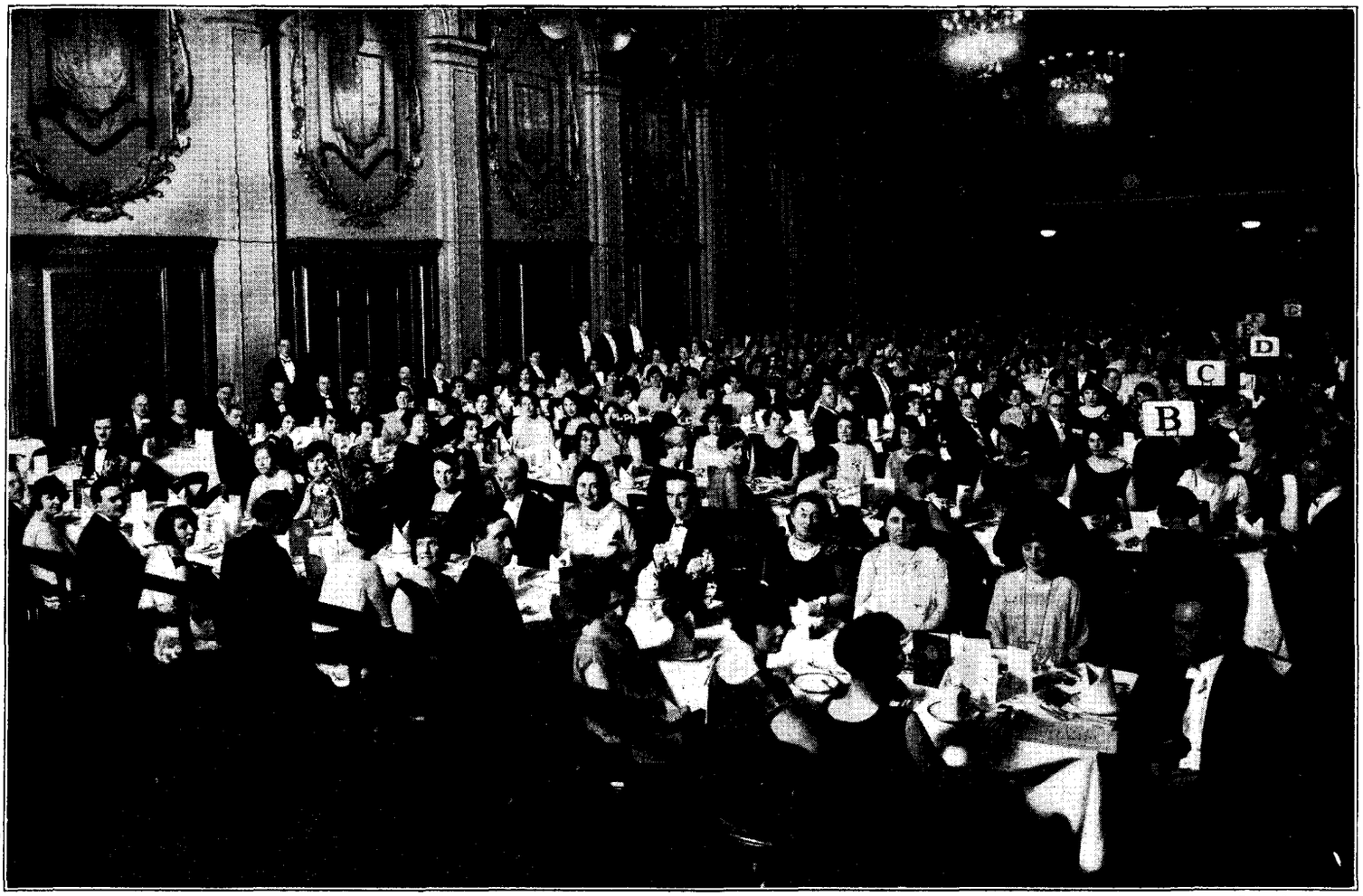
A COMPANY numbering over 100 assembled in the Douglas Hotel, Aberdeen, on Monday Feb. 2, to mark the retirement of Mr. A. E. Ruddock from the post of district manager of the Aberdeen and North of Scotland Telephone District, and to present Mr. and Mrs. Ruddock with parting gifts.

The first portion of the evening took the form of a whist drive, and thereafter, the company sat down to tea, the chair being taken by Mr. Clow, chief Clerk. After tea, the Chairman made reference to the period of Mr. Ruddock's managership, and to the exceptional growth which had marked this, especially in the opening of exchanges in the rural areas, special mention being made of the Orkney Isles and the Spey Valley.

Mr. W. S. Coulsell, Contract Manager, on behalf of the Staff, presented Mr. and Mrs. Ruddock with an antique Sheffield plate coffee pot, together with an antique silver salver. In doing so, Mr. Coulsell referred to the very happy relations which had existed between Mr. Ruddock and the whole of the staff during the term of his stay at Aberdeen.

Mr. Ord, Postmaster, Mr. Forrester, Traffic Superintendent, and Mr. Watt, representing the Engineering Department, all paid tribute to the excellent qualities possessed by Mr. Ruddock and the happy relationship which had existed between himself and all the Departments of the Post Office service.

Mr. Ruddock, in reply, thanked the staff for the cordial co-operation with him in his work as District Manager, and said that he would retain the happiest memories of his stay in the North of Scotland. Thereafter, the company adjourned to the ballroom where a short dance programme was carried out. The arrangements were excellently carried out by a committee of which Mr. A. M. Benton acted as hon. secretary.



[*Photograph by Kamra Press Studio.*

LONDON TELEPHONE SERVICE.

THE second Annual Staff Dinner of the London Telephone Service was held at the Connaught Rooms on Saturday, Jan. 31, 1925.

There is a very untrue impression abroad that a public department has neither body to be kicked nor soul to be damned. That is a fallacy. It may have an exceeding thick skin and a very tough heart, but in no case is it without a body or a soul. Civil Servants as a whole believe that the service of the State is an honourable and dignified profession demanding integrity, intelligence, and ideals. Such qualities are impossible without a soul and of what use is a dinner if there be no body ? It appeared to an onlooker that the staff of the London Telephone Service are convinced of the reality of their department and its achievements, and that they believe that an annual dinner is in accord with the dignity of a great and growing service.

The Controller, Mr. W. A. Valentine, occupied the Chair, and among the guests present were Viscount Wolmer, M.P., the Assistant Postmaster General, Mr. R. A. Dalzell, C.B., C.B.E., Director of Telegraphs and Telephones, Capt. D. O. Lumley, Private Secretary to the Postmaster General, and Miss Heap, I.S.O., late Superintendent of the exchange staff.

After the toast of "The King," Viscount Wolmer rose to propose that of "The London Telephone Service." His lordship expressed the regrets of Sir William Mitchell-Thompson, the Postmaster General, and Sir Evelyn Murray, at their inability to be present. As a layman, he said, he felt that he ought to preface his remarks by saying "Hullo." While he thought that the public realised the difficulties of the staff, yet he could wish that they knew more of the details of the working of the telephone system. Perhaps "Television" would help to this end, but in his view the best way was to take the public into our confidence and to help them to develop the telephone habit. He was reminded of the early experiments in telephony, when Mr. Graham Bell was told that the telephone would probably never be of any use. There were, his lordship said, still too many people of that opinion in England. In conclusion, he referred to the development of automatic telephony and visualised the annual staff dinner of the future as consisting of the Controller and a row of buttons.

Mr. Valentine, in replying, gave some interesting statistics illustrating the development of the service in London, and said he was looking forward to a great expansion during the next fifteen years. The quality of the service showed a steady improvement, and it was noticeable that the telephone service was not now the subject of so many cheap gibes as formerly. He referred to the programme of automatic development in the London area, and said that the first automatic exchange would probably be opened during the coming year.

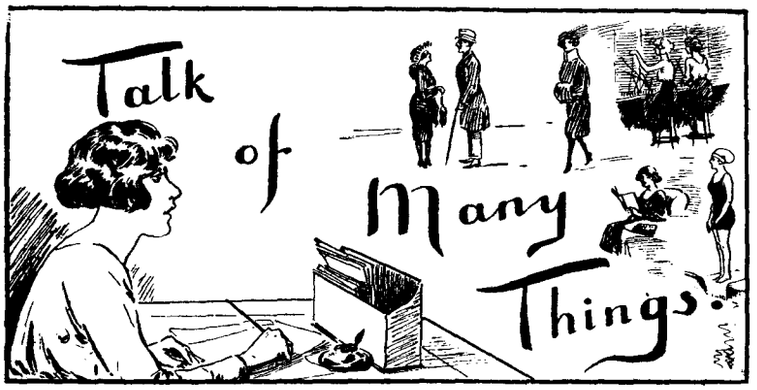
Mr. M. C. Pink, Asst. Controller (Traffic), proposed the toast to the Visitors. He said that the London Telephone Service was accustomed to receive visitors—people who were anxious to see the exchanges and to get first-hand knowledge of the system. This he thought was all to the good, and the more visitors the better for the service, since the telephone-using public would thereby be enabled to appreciate better the work of the Department. He was very pleased also to be able to extend a hearty welcome to the visitors on this occasion because he felt that such social gatherings were of undoubted benefit to all concerned. He referred to Mr. Dalzell's long association with the telephone service and the confidence with which it was possible to accept the leadership of a chief of such wide experience. Mr. Dalzell embodied for us that spirit of service which animates us all.

Mr. Dalzell replied on behalf of the visitors. He said he had been talking about telephones for forty years, and he was not tired yet. He said that we could not fail to become enthusiastic on such a subject when we realised the immense service which telephones rendered to the community at all times and on all occasions. The extension of the system was not desired for the good of the Post Office, but rather for the good of the public as a whole. He referred to the difficulties which had existed both prior to the transfer to the State and during the war, but he felt that whatever hindrances had been experienced in the past the development was now such that London was fast overtaking other great cities in the telephone world.

Mr. Jacob, in proposing the toast to the Chairman, voiced the regret which those present felt at the absence of Mrs. Valentine through illness. He spoke of the keen interest Mr. Valentine evinced in all the social functions organised by the staff, and how whole-heartedly he had supported the efforts of the Dinner Committee in making the necessary arrangements.

The musical programme which followed the dinner was supplied by members of the staff and was of a high standard of excellence, and demands for encores were insistent. The quartette, consisting of the Misses Walden and Flint and Messrs. Beck and Williams, gave "A Regular Royal Queen," and "Brightly dawns our Wedding Day." Miss Ethel Cook's "Vainkas Song" and "My Ships," Mr. Alfred Cracknell's "Eleanore" and "Sweet Early Violets," and Mr. J. R. Jacob's "Onaway, Awake Beloved," were enthusiastically received. Mr. H. A. Warton delighted us with a cornet solo very appropriately entitled "I hear you calling me." Not a few present wished that subscribers would call as sweetly. Instrumental selections were provided during the evening by Miss Jessie Wildon's band.

WE TELEPHONISTS



An Attack of the Blues.

I have it on good authority that in the near future the University Boat Race will be rowed. My informant is a small urchin who is sufficiently opulent to boast toeless boots rather than bootless toes. Perhaps that is the reason he is regarded as somewhat of an oracle in his domain for most of his companions are in the latter condition. His air is rumpled, his coat is torn and serves more as a store for marbles, chalk and string than as a shelter from the stormy blast. It has the appearance also of being an eternal home, but I fear he will outgrow it.

Despite his unkempt look he is a man of wide knowledge and experience. He has tested the sliding qualities of miles of pavement, he has tabulated a forest of lamp-posts in descending order of difficulty of ascent, he knows where to find the hiding-places of the few door-bells still unbroken, and to publish his knowledge of the haunts and habits of policemen would be to close prisons.

When I last happed upon him he was wearing a boat race favour, and it is because of that that I am able to foretell the approach of the contest. If he boasted a favour I knew that it was as certain as sunrise that the boat race would take place. In fact, I am inclined to doubt whether it would be possible for the race to commence if he had not sported a ribbon. He greeted me with a grubby grin and asked me what I was "for." Seeing that his fist was clenched and ready for action I judged it tactful to confess preference for his own colour. It appeared from the ensuing conversation that I was among friends because "all in our block are Cambridge." But it also appeared that the dwellers in the next block were benighted heathen, who stuck up for Oxford, and that the light-blue adherents were missionaries who were about to launch a peaceful and persuasive campaign into their midst, aided by sticks and stones.

My little urchin, of course, dominated the proceedings. He told me of a sad case of one small fellow whose dearest relatives—cousins it seemed—dwelt amongst the dark blue pagans. The ties of blood were strong, and he pleaded to be allowed to change from light blue to dark blue in order to preserve an amicable family unity. The request was refused, and he was painfully convinced that the claims of the clique were far stronger than consanguinity. Thus in the broader walks of life are families disrupted.

Knowing that my young friend had not so far entered upon a university career, and feeling also that the likelihood of his so doing was remote, I ventured to ask him why he stuck up for Cambridge. I discovered that it was because he had never been anything else, and although I pressed the matter I fear that the reason for his original choice is lost in oblivion.

Finding a sweetshop, I left him sticky and happy, and as I continued my walk I reviewed my opinions, and wondered whether I was, in fact, any more reasonable than that tattered, tousled urchin. The conclusion I reached was depressing.

PERCY FLAGE.

Telephone Staff Hospital Collections.

(Associated with the Hospital Saturday Fund.)

The Annual Meeting of the Telephone Staff Hospital Collections Committee was held on Feb. 2, in the Carter Lane Rest Room. Mr. Pink presided in the absence of Mr. Valentine, who was unable to attend owing to illness; and among those present were Mr. Reed, the Secretary of the Hospital Saturday Fund, and Miss Cox, the Female Superintendent.

The report of the past year disclosed further gratifying progress. The total amount collected was £2,165 2*s*. 8½*d*., more than £55 in excess of last year's total, as against an increase of £18 recorded at the last Annual Meeting. That the administration of the fund continues to be conducted with praiseworthy economy is attested by the fact that the expenses to be deducted for printing, stationery, and postage amounted only to 0.323325 . . % !

All interested in the Fund will be pleased to know that the Telephone Staff contribution heads the Collection List for the whole of London. The amount collected sets up a fresh record—which we do not doubt will be duly beaten—while a further record has been established in the number of benefits issued during the year—70 in excess of 1923.

The Misses Reekie and Wormald were unanimously re-elected Honorary Secretaries for the coming year. In acknowledging re-election, Miss Reekie faithfully kept her resolution not to *say* what she said last year as to her joy in the work and delight in the responsibilities of office—but, happily, we were not left in doubt as to what she was *thinking* !

L. T. S.

L.T.S. Annual Dinner.

A Committeeman speaks :

"The morning after the Annual D.,
I questioned many an absentee ;
And some were sorry, but 'always dance,
Whatever the place and circumstance' :
And two had measles, and one had 'flu,
And others had prior engagements, too :
And some were short of the needful cash,
And others had quarrelled with Mr. Dash.
But whatever the reason, dull or witty,
It wasn't the fault of the D. Committee."

A Diner speaks :

"The Annual D. was a *great* success :
The speeches were short—I can't say less :
The waiters waited, though hope fell flat
(Tips were inclusive, and that was that !)
And *one* of the solos, I must state,
Was really very appropriate,
For each one said, in tones of glee,
'How apt !' 'I hear you calling me !'
(They've told me since, and it seems a pity,
That *wasn't* the choice of the D. Committee)."

A Waiter speaks :

"Now *I* don't 'old with this Annual D.,
With nothink coming from them to me ;
I'm only a waiter, but, man to man,
I drops a 'int whenever I can ;
And I says to a gent., 'Excuse me, mate,
You can leave the offering at your plate' ;
And when I looks—oh, it do seem 'ard,
There was nothink there but a Woodbine card.
Now who could call such be'aviour pretty !
Why, nobody could but the D. Committee."

A Victim speaks :

"The Annual D., you may depend,
Will soon be known as 'The Doctors' Friend' :
And, though I'm difficult to evince,
I've never been quite the same man since.
I'm not complaining, my tears are dry,
There's plenty of amber round *this* fly ;
For they've sent me away for a motor run.
And, Ra be praised, I have seen the sun !
Three weeks away from the grimy city—
So here's a health to the D. Committee."

Chorus :

So now we will aptly end this ditty
With cordial thanks to the D. Committee.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

WIRELESS TELEGRAPHY AND SIGNALLING BILL.

IN view of statements which have appeared in some organs of the Press to the effect that new and inquisitorial powers of search are sought to be conferred by Clause 1 Sub-section 4, of the new Wireless Telegraphy and Signalling Bill, the Postmaster General desires it to be known that the sub-section referred to is almost purely a consolidation of the existing provisions and merely re-enacts, with minor amendments, Section 1, Sub-section 4 of the Wireless Telegraphy Act, 1904. Procedure by repeal and re-enactment with amendmnts was adopted in order to avoid the inconvenience of legislation by reference to the existing Act. The powers of search conferred thereby have existed for 20 years, exist to-day, and continue to exist, whether the new Bill becomes law or not.

No. 168,337, "Improvements in or relating to Party-line Telephone Systems."

No. 168,338, "Improvements in or relating to Party-line Telephone Systems."

No. 168,568, "Improvements in or relating to Party-line Telephone Systems."

The owner of the above patent is desirous of arranging by licence or otherwise on reasonable terms for the manufacture and commercial development of the invention. For particulars address:—HERBERT HADDAN & Co., Chartered Patent Agents, 31 & 32, Bedford Street, Strand, London, W.C.2

CORRESPONDENCE.

SPEEDING UP THE TELEGRAPHS.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

DEAR SIR,—Mr. Boyle in his letter in your last issue says I have suggested "sweeping away the telegraph system as known to us" and "scrapping the existing expensive telegraph plant."

Not guilty, your Honour! I have proposed nothing. I have pointed out the probable course of telegraph development during the next 25 years, and I have described the economic conditions that will probably lead to growth along the lines I have indicated.

If I understand Mr. Boyle aright, he seems to prophesy a dismal fate for the Teletype exchange scheme on the ground that the Telewriter has not made much progress. If by Telewriter he means the Telautograph, I may point out that the Telautograph requires two wires and will not function well over long distances and its speed is low. Start-stop printers only require one wire and will work over 5,000 miles at speeds up to 60 or 70 words a minute. Also they print in clear type and not in the average human scrawl known as handwriting. The Telautograph is an ingenious machine and gives good service in its particular field, but it is not in the same class as the start-stop printers. On the other hand, if by Telewriter Mr. Boyle refers to machines like the Siemens Teleprinter, so largely used in Germany, my reply is that this machine is essentially a stock-ticker. Its speed is much lower than the start-stop printers, and it will not work satisfactorily over long distances. As for the "Phonetic Typewriter," this is in the same class as television and death rays and other sensational nonsense of modern daily journalism. A moment's consideration will show that "Phonetic Typewriters" are ridiculously and for ever imposible and they are much more silly than television which is only commercially impossible. The commercial value of seeing a man at a distance is merely *nil*; but the idea of machines typing all our conversations is appalling, and we should have to go round with clubs to smash the beastly things.

Mr. Boyle asks several questions which he will find already answered in my paper. I welcome constructive criticism, such as that by Colonel Purves and others at the Institution meeting; but on my bended knees I beg people to read my paper before criticising it.

DONALD MURRAY.

Feb. 12, 1925.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

IN response to many requests from members of the London Telephonists' Society who were unable to attend—or were unable to gain admission to the November Meeting when Mr. F. W. Thwaites read his paper, "The Advent of Automatics," Mr. Thwaites kindly read the paper again at the Meeting of the Society which was held on Feb. 6. The Paper, which had been revised by the inclusion of a fuller and more up-to-date description of the "Director" system and supplemented by a number of additional descriptive diagrams, was enthusiastically received, and Mr. Thwaites again received many congratulations.

The preceding musical programme, which was arranged by the staff of Paddington Exchange, was much enjoyed.

The Committee have decided to hold a Whist Drive on Friday, March 27, at the Caxton House Restaurant, Tothill Street, S.W.1. An excellent supper will be provided and the cost of the tickets is to be 3*s.* each. The Hon. Secretary will be glad if those desirous of attending will make early application for tickets as the accommodation is limited to 200 persons.

Choral Society.

Much of the early enthusiasm was revived on Tuesday, Feb. 10, at Queen's Hall, when the Langham Choral Society gave a performance of Coleridge Taylor's "Hiawatha." There was a large audience, and the singing was on a very high level throughout the evening. The two parts which were sung (Parts 1 and 2) provided an admirable contrast, and the choir were equally good in the dancing light of the "Wedding Feast" as they were in representing the sombre shade of the "Death of Minnehaha."

"No Reply."

The following extract from a London newspaper throws a new light on the "no reply" problem :—

Unanswered Phone Calls.—The Telephone Statistical Department is very troubled, I hear, to account for the increasing number of unanswered calls. Perhaps I can help them. I expect it is that Scotsman. What! You haven't heard about him? Let me introduce Mr. Donald MacDougall. Donald MacD. speaking: "Aa maun hae te stey at the worrrks the nicht, Grisel, an eef aa dae aa'll telephone ye at seex precisely, but, ma dearie, dinna tak off the receiver, an' aa'l no hae to pit in the twa pennies."

If this sort of thing spreads it may be necessary to instruct Telephonists to collect the fees in advance in those cases where the caller betrays a suspicious accent.

Carnival Dance.

The Carnival Dance arranged by the East Central and Trunk Traffic Districts, and held at the Horticultural Hall on Jan. 23, was a great success. It is doubtful whether any previous function brought together so many of the staff and their friends as this one did. The attendance was 920, and it was a great sight to watch the movement of this crowd of dancers under the changing colours of the limelight. There was a large contingent in fancy dress and during the evening the most sober looking wearers of evening dress suits were enlivened by fancy hats, false noses, and other novelties of every conceivable kind.

In spite of the efforts of the Committee to spend as much money as they could, there was a favourable balance of just over £16, and it has been decided to allocate this amount to the Blue Triangle Movement organised by the Y.W.C.A.

Culled from the Exchanges.

Avenue.—On Jan. 17, at our Poor Children's Tea, 300 odd youngsters assembled with glee at the Wesleyan Mission Hall, Cable Street, East, in high expectation of having a feast. The doors were soon opened, and then what delight was expressed in each face at the ravishing sight of tables piled high with most excellent fare—not to mention a bon-bon for every child there!

When each one was seated, and grace had been sung, the children got busy with teeth and with tongue. Bread and butter, ham sandwiches, jam, buns and cake—'twas astonishing how much those youngsters could take!—the good things soon vanished like snow on the sea, washed down by consecutive bumpers of tea; while our staff hovered round them like fairies benign, and saw that each guest had no cause to repine.

When all were replete, whilst the tables were cleared, the surfeited youngsters both encored and cheered the lady who played them choice ditties galore—including "It ain't gonna rain no more!"

Arthur Allon then followed—his conjuring tricks (performed on the children) soon held them transfixed with awe and amazement, so perfectly blended, we all were quite grieved when this 'star' turn was ended. Miss Evans's dancing was also delightful, and the yells of applause correspondingly frightful.

At last came the Christmas Tree, laden with toys, which were eagerly captured by glad girls and boys, who also received, when the party was o'er, a large bag of sweets and good things at the poor.

So much for our Poor Children's Tea. By the way, there's one sincere tribute we'd all like to pay to the Night Staff, who helped us in numberless ways—their care for the kiddies is worthy all praise.

With the rest of our helpers, we give them a cheer, and trust we shall have their assistance next year.

Paddington.—Paddington Exchange again followed their tradition for hospitality and good cheer in giving a Tea and Entertainment on Saturday afternoon, Jan. 24, to over 300 boys and girls at the Senior Street, Paddington, London County Council Schools. Previous achievements were well sustained both in the excellence and abundance of everything provided, and a large platoon of willing and untiring helpers did wonders in circulating a princely spread in an amazingly short time amidst the spontaneous and full throated approval of the young guests. Prettily decked and daintily arranged Christmas Trees afforded a picturesque back ground for the festivities. Tea was followed by a really first-rate Living Marionette Show which gave full scope to the ebullient talents of Messrs. Wilkin and McGowan. Mr. Driver, the Schoolmaster, having generously voiced the unqualified approval of the audience an anti-climax was provided in the shape of Father Christmas with his cargo of toys, books, etc., who had been prevailed upon to quit his far-off snowy domains for the delight of the little boys, while a charming and elf-like Fairy Queen graciously tripped from the nebulous realms of Fairyland to the joy of the little girls and was no less prodigal in her distribution of good things. By way of a final touch to the proceedings "improving literature" and two halfpence apiece fresh from the Royal Mint were handed to the children as they filed out into the winter evening.

Merry and satisfied throngs of youngsters were seen wending their several ways in all directions of the Paddington Schools, each one of the number wondering whether it might be possible perhaps if they were very, very good another year . . ?

The Committee desire to express their sincere thanks to all those ladies and gentlemen, both in and out of the Service, who did so much at some sacrifice of time and money to bring a little joy into the lives of those whose glimpses of the brighter side of things are all too few and fleeting.

To step out of the murky, damp atmosphere of the London streets into a veritable fairyland of spring-like beauty was the fortunate experience of those who visited the Bijou Bazaar held in the Rest Room of the Paddington Exchange on Friday, 13th.

The proceeds from the sales were in aid of the Girl's Forward Movement of the Y.W.C.A., and Miss Isbbel MacDonald, who is President of this Girl's Section, graciously came and opened the bazaar. The event was further honoured by the Superintendent F.E.S., Miss Cox, who kindly came to receive Miss MacDonald, who was accompanied by Miss Nesta Morgan, the organiser of the Girl's Section. There were delightful speeches by each of these ladies, and a sheaf of flowers having been presented to Miss MacDonald, the bazaar was then opened.

Six stalls, all charmingly decorated with dainty boughs of flowers, made by Miss Oxley and her helpers, charmed the eye, and the tempting wares displayed soon found eager customers.

The stalls and stall holders represented various sections of the Switchroom, the luscious profusion and beauty of the "Fruit and Flowers" stall, by the Misses Hood, Burchett, Child, and Wigmore, representing A. and B. Sections, pleasingly contrasted with the exquisite dignified colourings of the Art Stall, by the Misses Atkinson and Trinder (Information Desk), whilst the Pound Stall of groceries by Misses Bennett, Ling, Hodder, and Roberts (F. and G. Sections), with its bold splash of flaming orange hue was also strikingly successful. Equally attractive were the Woolworth's and Needlework Stall of C. and D. Sections, by the Misses Dean, Archard, and G. Wheeler, in its dainty pink floral bower, and the A.D. Sections stall of notepaper, cigarettes and dainty hand-made underclothing by the Misses Neale, A. M. Jones, and Johnson who had a delightfully pleasing colour scheme of mauve and gold, and of the Relief Stall's Stall of Perfumery, Needlework and Fancy goods in its rich mauve and violet colourings by the Misses F. Sherwood, Darcy and Blow, and C. Sherwood. Two gaily decorated Bran Tubs under a blue and white archway of flowers represented the Supervisor's contribution, which were duly "supervised" by the Misses Chires and Gibson.

The very acceptable and enjoyable refreshments were arranged by the Catering Club, in the able hands of Misses Wraight, K. Sherwood and Oakley, and Miss Taylor of the Traffic Branch gave her valuable services by telling fortunes.

The sale resulted in the sum of £40 being sent to the Y.W.C.A. funds, and for this gratifying success the staff, under the organisation of Miss D. M. Bott, and with the much appreciated help and generosity of the Chief Supervisor, Miss K. Hooper, who, each in their several ways, contributed their share, are to be congratulated.

Putney.—There was a merry gathering at Tooting on Jan. 31, when the staff from Putney gave their annual tea and entertainment to 120 children at Fairlight Hall. A generous tea was followed by "Cinderella," which also included Felix in its cast, and great was the delight of the children when "he" walked among them and shook hands, and judging from the gusto with which they sang "Felix keeps on walking" on their own initiative "he" was a "howling" success.

After Cinderella, the clown was a great source of entertainment and interest, some of the small boys getting so excited in the proceedings that they had to stand on chairs and shout their approval.

Father Christmas, assisted by Felix and Cinderella, crowned the delight of the children by distributing to them gifts from the tree, dolls for the girls and an assortment of guns, engines, and motor cars for the boys, after which a tired but happy group of children departed to their various homes.

Streatham.—On Jan. 17 a very happy afternoon and evening were spent, when 100 children were entertained by the Streatham Exchange Staff (under Miss E. W. Wood, the Chief Supervisor).

St. John's Hall, West Streatham, which was kindly lent by the Rev. N. Larke, looked a picture of brightness and colour, but the decorations were completely shaded, when the platform curtains were drawn, displaying two fine Christmas trees laden with toys and lighted by electricity.

The cheers of the children alone were encouraging to all those who had worked so hard to make the treat a success.

After a scrumptious tea, the children were kindly entertained by the "Odds and Ends" Concert Party from the Streatham Congregational Church, all of whom charmed the kiddies with their varied programme.

These were followed by Mr. A. R. Bradman and Mr. S. Langford (*members of the Engineering Dept.*), who created much fun in their rendering of popular numbers in which the youngsters joined in full force.

Lastly, Father Christmas (Mr. A. R. Bradman) appeared, and amid much excitement, distributed the toys from the trees. A very enjoyable time was brought to a close, when the children were handed apples, oranges, sweets, bon-bons and balloons, on leaving the hall.

It was regretted by all present that Miss E. W. Wood was unable to attend, owing to indisposition.

PERSONALIA.

LONDON TELEPHONE STAFF.

Resignations on account of marriage :—

Miss A. M. BATES, Telephonist, Museum Exchange.
Miss D. A. STEWARD, Telephonist, East Exchange.
Miss L. CUNNINGHAM, Telephonist, Paddington Exchange.
Miss I. HUGHES, Telephonist, Paddington Exchange.
Miss N. SMITH, Telephonist, City Exchange.
Miss F. A. HALLS, Telephonist, City Exchange.
Miss D. V. BALDWIN, Telephonist, City Exchange.
Miss C. E. MILWARD, Telephonist, Holborn Exchange.
Miss G. L. EDWARDS, Telephonist, Putney Exchange.
Miss E. A. PARSONS Telephonist, Victoria Exchange.
Miss L. G. DAWSON, Telephonist, of Paddington Exchange.
Miss H. M. WILLIAMS, Telephonist, of Paddington Exchange.
Miss G. V. BOOTHROYD, Telephonist, of Holborn Exchange.
Miss A. E. GIBSON, Telephonist, of City Exchange.
Miss N. E. WEBSTER, Telephonist, of Victoria Exchange.
Miss P. M. FREEMAN, Telephonist, of Victoria Exchange.
Miss L. SMITH, Telephonist, of Trunk Exchange.
Miss G. R. BARTLETT, Telephonist, of Trunk Exchange.

Promotion to Supervisorship :—

Miss M. B. BAILEY, Park Exchange.

Promotions to Asst. Supervisorships, Class II. :—

Miss M. READING, Park Exchange.
Miss E. CURSON, Paddington Exchange.
Miss ETHEL ROSE, London Wall Exchange.
Miss C. P. F. MITCHELL, School.
Miss M. E. KEENAN, Paddington Exchange.
Miss D. E. MASH, School.
Miss E. L. FLATT, Clerkenwell Exchange.
Miss S. L. G. WILSON, Central Exchange.
Miss A. D. HUTHWAITE, Grosvenor Exchange.
Miss E. SULLIVAN, School.
Miss L. MITCHELL, North Exchange.
Miss C. L. SKELTON, Central Exchange.
Miss E. L. CARPENTER, Kensington Exchang.
Miss P. COOMBER, East Exchange.
Miss E. M. DUGGIN, Trunk Exchange.
Miss W. M. MITCHELL, Toll Exchange.
Miss F. E. STEGGEL, London Wall Exchange.
Miss C. Quan, Avenue Exchange.
Miss E. E. BARKER, Trunks Exchange.
Miss W. M. JONES, Trunks Exchange.

THE

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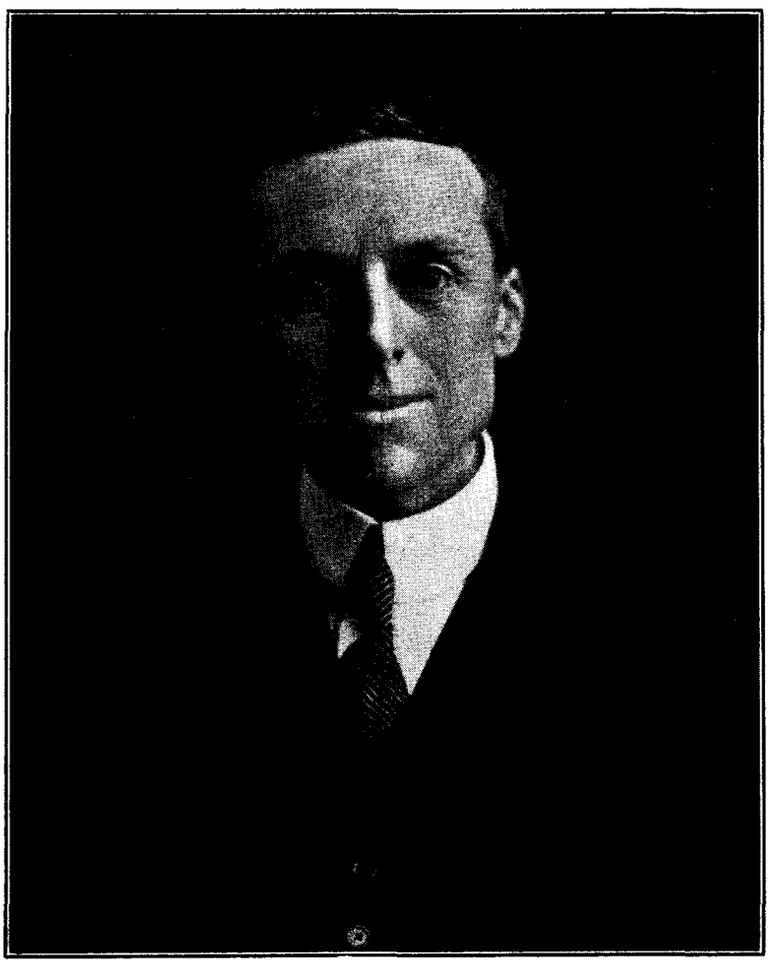
TELEGRAPH AND TELEPHONE MEN.

XV.—F. W. PHILLIPS.



MR. F. W. PHILLIPS was born in August, 1879, and entered the Post Office Service as a telegraphist in the Central Telegraph Office in January, 1895. After a short sojourn in that office, and in the Stores Department, he entered the Secretary's Office in February, 1899, and was promoted to the Higher Division in September, 1908, to the First Class in 1919, and was made a Principal on April 1, 1920. He was one of the British representatives at the Preliminary Conference of the Allied Powers at Washington in 1920 to deal with Cable and Wireless Communications.

His selection as Assistant Secretary of the newly-formed Overseas Telegraph Branch is a striking testimony to his ability, and in his new duties, particularly in respect of wireless work, he will have ample scope for his energy and talents. Mr. Phillips has a profound knowledge of the cable and wireless services, and one of his many endearing traits is the generosity with which he will impart his specialised knowledge to those seeking his assistance and guidance.

THE VOCATION OF THE ELECTRICAL ENGINEER.

(From an Address to the Institute of Electrical Engineers, North Midland Centre.)

BY T. B. JOHNSON.
(P.O. Superintending Engineer, Leeds.)

TELEPHONY.

IT seems almost incredible that the first telephone exchange was established so late as 1878, while to-day there are well over 20 million telephone exchange stations in various countries, nearly $1\frac{1}{4}$ millions being in Great Britain. The first multiple exchange was established 10 years later, and by means of these multiple boards one operator can have access to 10,000 lines. It is physically impossible for one operator to obtain access to a greater number. With the development of the automatic system, however, this limitation disappeared. The first automatic exchange in this country was opened at Epsom in May 1912, and several others were completed in 1915 and 1916. The first large city to be provided with an automatic exchange was our own city of Leeds, where, in spite of serious difficulties owing to the war, a 5-figure exchange constructed by the Automatic Telephone Manufacturing Co. was opened in May 1918. This was the largest automatic exchange in Europe, and the largest in the world to be transferred from the manual to the automatic system. It is still the only 5-figure exchange in Great Britain, but a similar one is being constructed in Sheffield; other automatic exchanges are being provided in various towns, and the conversion of the London system to automatic working has been commenced. A 4-figure exchange at Grimsby constructed by Messrs. Siemens was opened in September 1918, and proved equally satisfactory. Another 4-figure exchange has just been opened at York, and the conversion of the Leeds suburban exchanges to automatic working is proceeding steadily. A 4-figure exchange at Harrogate has been commenced, one at Halifax will be started as soon as the building is ready, and others will follow at Wakefield, Keighley, and other places within the area of the North Midland Centre. The Hull Corporation have also opened two automatic suburban exchanges. We are glad to know that the system in Leeds has proved the advantages of automatic telephone working, and that the Post Office authorities are now definitely committed to the establishment of automatic working as the standard method for large exchanges.

Another important development in telephony has been in the distance over which speech can satisfactorily be transmitted. In Graham Bell's first business circular it was stated that telephones could be furnished for the transmission of speech through instruments not more than 20 miles apart. With the improvement of lines and apparatus the distance was largely increased, but was still limited. Continued attempts were made to devise a telephonic relay to repeat telephone currents in the same way as the well-known telegraphic relay, but all these proved unsatisfactory. With the invention of the thermionic valve or repeater, however, the difficulty disappeared, and there is now practically no limit to the distances over which speech can be transmitted. Speech is already carried from East to West of the American continent, and there is no technical reason why it should not be carried equally well between the extremes of North and South America.

Improvements in the condition of the lines used for telephone working have been remarkable. For many years it was necessary to use aerial wires, owing to the limited distance possible with gutta-percha-covered or rubber-covered conductors. Air-space cables increased the distance considerably, and the invention of the loading coil straightway enabled the distance to be increased about threefold. In 1913 the first balanced cable for both telegraph and telephone wires in this country was laid between Leeds and Hull, and proved so successful that the laying of such cables for long-distance telephony became the standard practice. This balancing enables thermionic repeaters to be used, and telephonic communication by means of balanced cables, loading coils and thermionic repeaters can be carried on from one end of the country to the other.

INTERNATIONAL TELEPHONY.

It will be remembered that Mr. Gill during his presidency of the Institution devoted great attention to the development of international telephony, and the development of this phase of telephony will undoubtedly occupy a prominent position in future. Here, again, the invention of the thermionic valve opened up a new era. By its means the British military authorities were enabled to have telephonic communication between London and the Expeditionary Force Headquarters in France. The Germans with the great advantage of land frontier had circuits from Berlin to the Army Headquarters in Northern France and Russia, and also right across Austria and the Balkans to Constantinople. Owing to its geographical position, as well as for other reasons, Germany is bound to occupy a large place in any scheme of European intercommunication. At the international conference held in Paris last year, at which Belgium, England, France, Italy, Spain and Switzerland were represented, much work was done in getting unanimous approval to many important technical proposals which were officially confirmed by the Governments of those countries, and further progress was made at a record conference in Paris in April last, when no fewer than 21 European countries were represented. It is much to be hoped that Mr. Gill's plan of an international board for constructing, maintaining and operating long-distance circuits will be adopted. The influence of such an association and of international telephony would extend far beyond the boundaries of telephone working, and be of great service in creating and maintaining good feeling between the peoples of different countries, thus removing national misunderstanding, inspiring confidence and removing friction.

THE VOCATION OF THE ENGINEER.

The electrical engineer has much influence over the lives of fellow citizens and the conditions under which they live and work, and it follows that whether employed by the State, a municipality or a limited company, he is in the best and most complete sense of the term a public servant, and he should realize the obligations which this places upon him. The education and training of the engineer are of great importance and have been dealt with in various addresses to the Institution. The pay of the engineer is also of importance, and the Institution should, without undue interference in wages questions, use its influence to raise the general standard of remuneration of engineering officers and men. In this connection reference is gratefully made to the letter sent by the presidents of the professional and technical institutions to the Prime Minister in February last, in which the greater recognition of scientific and technical men in the Government service was urged. It is wrong, for instance, that engineering workmen of long experience and training, and of great skill, should be receiving less wages than unskilled labourers in some occupations.

Of greater importance is the character of the engineer and the spirit which animates him. Realizing that the public depends upon him to so great an extent, the engineer will look upon his work not merely as an occupation by which he can earn a certain amount of money, but as a vocation. The public is entitled to the best service he can give, and a high ethical conception must be put on his duties.

There is one way, in particular, in which the electrical engineer can be of very great service in an important direction. Writers and speakers generally refer to capital and labour as if these were the only two classes affected in industrial matters, whereas the great bulk of the members of the Institution do not come within either of these categories, but are supervisors, &c. The ownership of factories in the North of England has changed in such a way as to alter largely the character of local life: whereas formerly the great productive concerns were owned and conducted by strong, shrewd men who had climbed out of lower ranks, their descendants have largely sold out to company promoters. Many men who still continue to be directors have mostly gone to reside at a distance, and their interest in the place of their origin, and in the community from whom they have derived their ample means, is ended, except for the limited duties of the board-room. With the decrease of private ownership which goes on at an increasing rate year by year, the old relations between the employer and his workmen are practically dead, with the result that there is a large amount of misunderstanding, distrust and fear between them. The engineer, whatever his supervising grade may be, can do a great deal towards filling the gap. He can represent the requirements of the employers to the men in a reasonable light, instead of simply issuing orders, and can receive suggestions or, if necessary, remonstrances, from the workmen, and represent them to the employers or directors. Many of the most serious industrial troubles of recent years have undoubtedly been due to misunderstanding and suspicion, and the engineer who shows himself worthy of trust by both parties, and loyal both to those above him and those below him, can exercise a very valuable influence in minimising trouble. Engineers stand between capital and labour, and also between the public and its safety, and by their education, training, and sympathy with all classes seem specially competent to work out a solution of the industrial problem.

The engineer must look upon himself as a trustee and cultivate a high sense of the importance of his duty—which is not a question of self-importance—to his superiors, his subordinates, and the public. Employees must not be treated as machines or "hands" but as brother men engaged in improving the conditions of life and furthering the progress of mankind. There must be a spirit of real comradeship, which will have a high spiritual value and help to inspire the spirit of service in others. As has been well said, "The greatest service a man can do is to carry out his daily work in a spirit of service to God and man."

THE PROBABLE TREND OF TELEGRAPH AND TELEPHONE TRAFFIC DEVELOPMENT.*

BY J. STUART JONES.

THE purpose of my paper to-night is to endeavour to take a peep into the future by speculating a little on how the telegraph and telephone services are likely to develop in the future, not only in regard to the quantity of traffic, but as regards the machinery for dealing with that traffic.

I hope that this endeavour does not appeal to you as a profitless occupation, a mere beating of the air. When you come to think of it our thoughts, so far as they relate to our personal affairs, are much concerned about the future. We make our plans ahead and we endeavour as far as we can to adhere to these plans.

If we find it necessary, and even inevitable, to take thought for the morrow in our personal affairs, it is surely necessary to give some consideration to the future of our business, to form some idea of probable developments, and to determine our attitude towards those developments. Many of the things which will happen in the future in regard to the telegraph and telephone services will be beyond our control; others will be within our control and we shall be all the more able to deal with them if we have thought out their implications beforehand as far as we can, always bearing in mind that the supreme motive of our actions must be the good of the public.

The views I propose to put before you are merely my personal conceptions of probable developments and, in appropriate cases, how these developments should be shaped. I hope that if any of you do not concur in these conceptions you will not fail to express your views later, as it is only by frank and free discussion that the proper path of progress can be found with any certainty.

I propose to take the telegraph service first, partly because it is entitled to priority by virtue of its seniority and partly because, despite its greater age, its future development is more uncertain, and to that extent possesses greater interest from our point of view to-night, than the telephone service.

Peeps into the future have not been much of a habit in the telegraph service in the past. In the case of the telephone service they have been customary through force of circumstances, for the continuous rapid growth of that service has made it necessary that future growth of subscribers' lines should be estimated in order that exchange accommodation for those lines should be ready at the required time. In the telegraph service this impelling motive has not existed, or at all events has not existed for nearly 40 years, but in recent years two other motives have arisen, the slump in traffic and the revolution of machinery, to give cause for thought as to what is likely to happen.

Mr. Donald Murray, the telegraph inventor, has given his views to the Institution of Electrical Engineers, and the telegraph world owes so much to Mr. Murray that I propose to tell you in some detail what he said. Mr. Murray starts from the premises that the telephone possesses no inherent advantage over the telegraph in regard to intercommunication between persons, and that telephonic communications have grown while telegraphic communications have stood still and even declined, firstly, because the telephone is more accessible than the telegraph to the person employing it; secondly, because it puts a person in direct communication with his correspondent which the telegraph does not; and thirdly, because it is much quicker than the telegraph, especially when the matter of replies is considered.

Mr. Murray argues that business people would often use the telegraph service in preference to the telephone service if it were not for the present comparative disadvantages of the telegraph service, and he points out that the telegraph service has one great advantage over the telephone service; it provides an automatic record of the message.

Mr. Murray's remedy is to work the telegraph service on the same lines as the telephone service, with telegraph exchanges and communication, local and trunk, between telegraph subscribers precisely after the same manner as the telephone service. Each subscriber would have his typewriter-telegraph machine. Telegrams handed in at public offices by non-subscribers would be transmitted direct to their destinations, and the only telegrams which would be delivered by messenger would be those for persons who were neither telegraph nor telephone subscribers.

This conception of the future telegraph service may appear to be visionary, but it is not to be dismissed lightly. Mr. Murray may be a visionary, but he is also a practical man of affairs and there is nothing inherently impossible in his ideas. The most it would be safe to say is that such a telegraph organisation must, like the telephone organisation, be a matter of slow growth, and that it will be many years before a complete organisation of such a nature can be in being. If such a service is what the public wants it is the duty of the Post Office to provide it, and there is a probability that an experimental system of intercommunication between telegraph subscribers in two towns will be set up before long.

Having described Mr. Murray's conceptions, I will turn to my own, which concern a more immediate future than that contemplated by Mr. Murray.

Telegraph traffic is in the dumps in these days. For five years the number of telegrams has declined, and though the rate of decline shows a tendency to slacken—*the traffic at present is only* 1% *below that of last year*—there are no clear signs yet of a turn in the tide. The telegraph traffic at Birmingham has probably suffered less than the traffic at most of the other large provincial towns, partly because the Zone method of circulation gave to Birmingham more transmitted work. It may interest you to know that, taking telegraph transactions as the criterion, Birmingham is now the largest provincial telegraph office.

It is a little curious, and not a little significant, that the busiest year in telegraph history was as recent as the financial year ending March 31, 1920, when the number reached 94 millions. The number of telegrams at the present time is of the order of 69 millions, or a decrease of 26.6% as compared with five years ago. This decrease is very deplorable, but it is significant that, according to competent authorities, the general trade of the country has declined by at least as great a percentage as the percentage decrease in the number of telegrams.

The telegraph service is and has always been extraordinarily sensitive to trade fluctuations. One can easily tell from a scrutiny of the telegraph returns which were years of bad trade. The present slump in trade, according to economists, has had no parallel in degree since the period following the Napoleonic Wars, over a hundred years ago, and it is not surprising that telegraph traffic is at present undergoing the worst passage in its history. When trade revives, we may anticipate with some confidence a corresponding revival of telegraph traffic, but when the revival is to come along no one seems able to prophesy, and indeed there are pessimists who declare that trade will never return to its old level, a depressing view which need not be taken too seriously.

When the traffic is again definitely on the up-grade, is it likely to exceed or reach its old level? *Many people think that the development of the* telephone service will continue to stop growth of the telegraph service, as it has undoubtedly done in the past. Possibly it will to some extent, but while it is true that in the past much traffic was diverted from the telegraph service to the telephone service, I doubt whether telephone development will have much effect on the telegraph service in the future. The traffic diverted in the past was short-distance traffic, and where is the short-distance telegraph traffic that can still be diverted? There isn't any, or at all events there is no such traffic in any appreciable quantity. To-day the average inland telegram covers a distance between office of origin and office of destination of more than 150 miles. Leaving out of account the present slump in traffic, the fact that the number of telegrams was stationary for 20 years, despite the disappearance of short-distance telegrams, indicates that long-distance traffic was growing at much the same rate as short-distance traffic declined. Long-distance telephony, possibly on account of its heavier cost, does not compete with the telegraph service. Not so very long ago, a telephone cable was opened between London and Manchester. The number of circuits was greatly increased and the service much improved. The number of calls rapidly bounded up, but the number of telegrams between London and Manchester remained constant. The improved trunk service in fact created a new demand, which did not affect the telegraph service at all.

We may, I think, take some comfort in the hope that not only will traffic grow when trade conditions revive but that, as there is little short-distance traffic and little Press traffic to lose, the number of telegrams will gradually return to its old figures and possibly exceed them.

There remains the question whether active steps should be taken to foster the growth of traffic. I think most of us will agree that something should be done, but the difficulty is to decide the precise way. Some advocate a reduction in the tariff, but, in this connection, I would remark that, if the telegraph service is to be really healthy, it must pay its way, and I would commend to you Sir Henry Bunbury's paper on telegraph finances which appears in the February issue of the *T. & T. Journal.*

Publicity in some form seems very desirable, but publicity by a Government Department is difficult to arrange.

Probably the most we can do at present to foster telegraph traffic is to encourage the public to use their telephones for telegraph purposes. Mr. Murray is right in stating that the telephone has a great advantage over the telegraph in the matter of accessibility. The more we can get the public to realise that the telegraph system is as accessible from their telephones as the telephone organisation itself, the more they are likely to use the telegraph system.

Now let us look at the machinery of the telegraph service. For 50 years the service was largely a manually-operated service, a service with comparatively simple machines operated rather laboriously by hand. Morse sounder working was almost universal, Wheatstone, apart from its use on News Wires, being employed only in emergency. The craftsmanship of

* Paper read before the Birmingham Postal Telegraph and Telephone Society.

the staff reached an extraordinary high level. But I venture to think that if the British telegraph service had not been a Government monopoly and had been faced with competitors, or if its financial position had been regarded in the past as seriously as it is now, the revolution in telegraph machinery which you have seen coming about since the war would have come a great deal earlier. In outside industry for several decades past the work of the handcraftsman has been in gradual process of transfer to machines. I need not say anything here about the social and economic results which for better or worse have attended this change in the character of industry, but it was impossible for the British telegraph service to remain unaffected by this tendency. Other telegraph administrations have moved much more rapidly than we have, and we are far from being in the forefront in such telegraph progress as is represented by the introduction of machine telegraphs. When I was in the United States 14 years ago, the Western Union Company had several types of machine telegraphs in use, and the experience with them has led to-day to such an evolution of machine telegraphs in America as there is little conception of in this country.

We have made a beginning as you will see from your own instrument room, but I would impress on you that it is only a beginning. Some of you may very properly say that the beginning is bad in certain respects. I agree. The working of Baudot circuits, and particularly of the Split Baudots, is not what it should be, but I would ask you to believe that these are the troubles of infancy and that they will disappear as the machines are improved and knowledge of them grows. The older persons among you will remember how we jeered at motor-cars when they were first seen on our streets, and how we sang music-hall songs about the troubles incidental to motor-car journeys in those days. Look at the motor-cars of to-day.

But I have said that we are only at the beginning of the development of machine telegraphs. The Baudots which you have are mere birds of passage. All over the world, wherever Baudots are in use, even in France the home of the Baudot, the tendency, the inevitable tendency, is to replace the 5-key transmitter by typewriter-keyboard perforators providing a punched slip which passes through an automatic transmitter at a speed of 40 words or more a minute. The effort on the part of the sending operator is probably less than with the 5-key sender. The gummer at the receiving station, in consequence of the higher speed, would have more to do, but it is very likely that tape reception will give way to page-printing reception which abolishes gumming altogether. Already we have three installations with keyboard perforation, automatic transmission and page reception and these installations are doing excellently. It seems to be merely a question of time, to permit the evolution of standard approved types, before all multiplex circuits are equipped in this way.

But, you will say, there are after all comparatively few routes with sufficient traffic to justify multiplex circuits. What about the others? Well, a beginning has been made with machines suitable for the less heavy routes. These are the "start-stop" machines, so called because, in contrast with the continuous movement of the Baudot distributor, the mechanism functions only at the touch of the operator. You have some of these machines in your office, and your experience of them may not have been happy, but I would again, as with the Baudots, ask you to believe that the present difficulties are merely the troubles of infancy.

We are experimenting with several types of start-stop machines and it is merely a matter of the time necessary to evolve a standard reliable type before the process of altering circuits commences. The process of alteration, like the process of altering the present Baudots to keyboard working, may, probably will, be slow, because there are many factors to be taken into account, but it is, in my view, certain that all morse quadruplexes and duplexes will, in course of time, disappear in favour of machine telegraphs of one kind or another.

I will now take my courage in my hands and speak about the telephone as an instrument for the transmission of telegrams. I have already referred to the use of telephones for handing-in and delivering telegrams, and I have now in mind the use of telephones for the transmission of telegrams between telegraph offices. The percentage of telegraph transactions which are carried on by telephone is about 10%, and the question at issue is whether the efficiency of the telegraph service would be promoted by a greater use of the telephone. As a beginning let me state what has happened in America. When Mr. Lee, Colonel Purves (now Engineer-in-Chief) and I were in the United States in 1911, the telephone was little used by the two great telegraph companies, the Western Union Telegraph Company and the Postal Telegraph Company. The phonogram rooms of these Companies were almost negligible, and, being at a disadvantage in many other respects, we made the most of our superiority in utilising the telephone service for telegraph purposes. Some time afterwards the American Telephone and Telegraph Company—the controlling power in American telephones—acquired a controlling interest in the Western Union and it sent one of its Vice-Presidents to this country to study our telephone-telegram system. The Anti-Trust laws, some time afterwards, dissociated the Western Union from the American Telephone and Telegraph Company, but the Western Union had evidently learned something and got some fresh ideas. It has developed its telephone-telegram and phonogram service so rapidly that to-day, in its telephone bureau at New York, the Western Union Company deals with 65,000 messages daily, twice the number of messages dealt with in the Birmingham instrument room and five times the number dealt with in the phonogram room in the Central Telegraph Office, London. That number includes both phonograms and telephone-telegrams, but the latter preponderate, and it seems that telegrams are now interchanged between the numerous offices of the Company in New York mainly by telephone.

The Western Union Company has no statutory monopoly. It has a strong competitor in its rival company, and it is liable to damages if telegrams are incorrectly transmitted. This immense development of the telephone implies, apart from anything else, that the Western Union Company is satisfied with the telephone as an instrument of accuracy.

I give these facts regarding the telephone-telegram position in the United States merely as indicating that we have in all probability not reached finality in the use of the telephone for telegraph purposes. The telephone is a very adaptable and convenient instrument and it would be folly to oppose its extended use, merely on grounds of craftsmanship, where it can be employed to the advantage of the public service.

The controversial question as to the remuneration to be paid for this class of work is quite apart from the main factors which may lead to an extended use of the telephone.

There is no doubt in my mind that morse operating, which has held the British telegraph field for so long, is bound before many years have passed to be reduced to comparatively small dimensions. We may sincerely regret the passing of the old morse telegraphist, but it would be unwise to suppose that the changes involve a degradation of the telegraph craft. The changes involve an alteration in the nature of the skill required and it may be, probably will be, that a higher order of craftsmanship than the morse craftsmanship will evolve from this. These complicated machines demand a high scientific knowledge, and there will be scope enough and interest enough for all who acquire that knowledge. Moreover, it is by no means improbable that the revolution in telegraph machinery will lead to changes in the organisation of the service.

Before I pass to the telephone service, I may perhaps mention two probable developments in telegraphy. One is a recent telegraph discovery in Germany which promises to have far-reaching results. The Germans have discovered a method by which, on the foundation of a loop, they can establish six circuits, by sending currents of different frequency, on something like the wired wireless method. Each of these six circuits is independent and can be used for simplex, duplex, or multiplex working as may be desired. On one loop, therefore, it is possible, if they were wanted, to form no less than six quadruple duplex services, or 48 channels. Each of the circuits can be extended by substantive wires to other points and the combinations which may be made open up enormous possibilities.

The other development is a new method of forming telegraph lines by superposing on telephone lines. Superposition is, of course, no new thing, but the methods hitherto employed had the serious defect of interfering with the signalling facilities on the telephone lines employed. By the new method, which is known as compositing, the telephone signalling facilities are retained. Composited circuits have been formed between London and Penzance and between London and Chester, and though the initial difficulties have not yet been overcome, the experiment is shaping favourably.

If these new methods prove satisfactory, they may exercise considerable influence on telegraph finances.

Now I come to the telephone service and I may at once say that there is less room for speculation about the telephone service than about the telegraph service. The telephone service has an assured future; the telegraph service has not, and that is why there is more room for theorising about it.

The telephone service has been more fortunate than its sister service; bad trade conditions have not affected it adversely. It is growing with steady rapidity and it is quite probable that, if trade had been normal, it would have been very difficult to keep pace with the demand for service. It would be interesting to speculate a little on the social and economic causes which have led to the telephone service growing at a time when the telegraph service and many other businesses have been feeling the pinch of the times, but that is not my purpose to-night.

The number of telephone subscribers in this country grew last year at the rate of 10%. If that rate of increase is kept up the number of telephones will double itself in a little over 7 years, and there will be four times as many, or about 5 million telephones, in 15 years. That sounds a large number, but even then it will mean only 8 or 9 telephones per 100 of the population. To-day in the United States there are 13 telephones per 100 of population, 10½ in Canada, 8 in Denmark and in New Zealand, and 7 in Sweden. The telephone density in Germany at the present time is 50% greater than the telephone density of Great Britain and Northern Ireland. A country which has a well-developed telephone service is better equipped for its industrial activities and for its social amenities than a country with a less well developed telephone service, and Great Britain is too far behind many other countries. If it is quickly to bring itself more on a level with these other countries, the service will have to grow at a more rapid rate than 10% per annum.

It is a little difficult to foretell what will probably be the point of telephone saturation, that is to say, the point at which rapid development will cease, and increase in the number of telephones will increase only with population. It is perhaps improbable that the telephone density in Great Britain will ever equal the telephone density of the United States. The conditions are are not the same. Because of our smaller territory we have a quicker postal service, and letters posted one day will be delivered next day in almost any part of the country. The telegraph service here, though behind the American

service in many respects, is comparatively more widespread than in America. These facilities react on the demand for telephones, but it is difficult to estimate to what extent. It is noteworthy that of the 14½ millions of telephones in the United States some 60% are instruments in residences. In this country only 30% of the 1,300,000 telephones are in residences.

Looking at the question all round, I believe that the number of telephones in this country could be increased five-fold at least, but the period of time within which such a density can be reached depends *mainly* on our own activities. The enormous telephone development in America was not due initially to a demand from the public for telephone service, but to the activities of the telephone companies in making known to the public the advantages of telephone facilities and the cost of obtaining them. The supply preceded the demand, and the demand was in fact created by the supply.

If we canvass energetically and connect up lines quickly, the increase will come in a comparatively short time, but if we do not, and if we make our plans for development on too cautious a scale, then it will take a long time before Gt. Britain is on anything approaching the same level of telephone development as the countries which are or will be its commercial rivals.

Local telephone calls at present number about 900 millions a year. They are growing at present faster than the increase in the number of telephones, indicating an increasing use by the subscribers, but, as it may be presumed that the growth of telephones in the future will be largely in residential instruments, the daily use of which is not great, we may perhaps anticipate that the growth in the number of local calls will not continue to keep pace with the growth of instruments.

The number of trunk calls at the present time is about 75,000,000 per annum, and for the first time the number of trunk calls has exceeded the number of telegrams. Trunk traffic is growing at the rate of 18%, and it is quite likely that that rate will continue for some years, having regard to the improvements which are being made in the trunk service through the laying of underground cables. It looks as if the number of trunk calls will be doubled within five years, but as time goes on many circuits now worked from the trunk exchanges will be converted into "no delay" services and operated either at the local exchanges or at separate toll exchanges.

As regards exchange equipment, the great change which is coming is the conversion of local exchanges to machine or automatic switching. Already 22 exchanges have been converted to automatic working and plans for converting about 200 are in varying stages of progress. The change will take a long time to come about. For instance, the conversion of the exchanges in the London area will probably be spread over a period of 15 years.

Telephone subscribers are apt to imagine that, when they get an automatic exchange, their telephone troubles will disappear. Some of them will, but not all of them, and it is a melancholy fact that at one large automatic exchange, and probably at others, the number of "wrong numbers" is larger than when the exchange was a manual one, not owing to the machines, which work with extraordinary precision, but to the subscribers dialling wrongly.

It is pretty certain that, in course of time, all local exchanges will be converted to automatic working, but it will be so long a process that not many of us will be left in the service by the time the conversions are completed.

There are many changes ahead of us in both the telegraph and the telephone service. Whether we like it or not they will come about and, unless we are to fall behind individually or as a body, we must rise to each occasion as it presents itself. The quality of the telegraph and telephone service afforded to the public is in our keeping, and we must do our utmost to be loyal to our trust.

"PRIVATE" TELEGRAPH OFFICES.

THE following extract from a paper read this winter to Post Office societies in Edinburgh and Birmingham, by Major A. A. Jayne, D.S.O., O.B.E., M.C., Deputy Controller of the Edinburgh Postal and Telegraph District, refers to an interesting development of the telegraph and telephone services :—

Now that the transmission of telegrams by telephone is recognised, the problem of overcoming the cost of providing telegraph circuits for private telegraph offices is more or less solved, and the Department has agreed to allow large stores to accept telegrams from the public for onward transmission by telephone to the central offices in large towns. I should like to quote the procedure of one such firm that has availed itself of this facility at Edinburgh. Entirely at its own expense the cashier's department on the ground floor of the stores, has been turned into some resemblance of a small Post Office. Prominent notices are placed round the cashier's desks, indicating that telegrams can be accepted, that telephones are available, and that stamps are sold. It is a restricted Post Office, but it serves the purpose of supplying the immediate needs of the public. The Imperial Cable forms and Foreign and Inland forms are exposed for use, and writing space is set apart for the purpose. In the lifts, dining rooms, lounges and smoke rooms, tasteful notices are exhibited exhorting the public to use the telegraph and telephone services available on the ground floor of the building. At every writing table in the lounges and smoke rooms, similar notices are placed, and message pads of both Imperial and Inland telegrams are placed in position. The firm takes the money from the public for the telegrams and pays for them in the usual way with the telephone account—the proprietors of the stores being regarded of course as the telephone subscriber for the purpose of these phonograms. During the past 4 months the firm in question has dealt with nearly 400 telegrams, and from a close inspection of the traffic, it would appear that it is mainly fresh traffic which would not have come otherwise to the telegraphs. In order to ascertain whether such was the case, the "A" traffic for the town district has been carefully studied and compared with the same period the previous year. It is found that there was a general increase in spite of a bad season when a decrease would be normally expected. It should be made quite clear, perhaps, that it is not desired to divert traffic from Post Offices to private firms. That is not the objective, but I am convinced that although here and there some small offices might be slightly affected adversely, the traffic as a whole would increase as a result of the publicity.

Local telephone calls from the firm mentioned during the 4 months under notice show an increase approaching 1,000, while the number of trunk calls increased by about 200.

The foregoing figures are the result of one firm's efforts. If this can be multiplied by, say 12, as I hope it will in the Edinburgh district, there will be a decided general increase in both telegraph and telephone traffic. If therefore, other large districts take this matter up and probably multiply the figures by 50, it seems to be clear that a field is open which it would be well to exploit. It should be noted that under this system there is an automatic advertisement of the Imperial Cable, for it is brought prominently and regularly under the notice of hundreds of different people daily, and the effect of this is already being felt in the desired direction.

The point to be remembered is that we have to get these firms to carry out the publicity at their own expense, but as they in the end gain in increased business from their clients, it seems to me to be quite a good proposition. It is hoped that as the result of the general publicity gained the "telegraph habit" in the public will be revived, and that telegraph traffic will increase steadily I am certain if we all put our shoulders to the wheel. The telegraphs should expand in direct ratio with the development of the telephones, but the public require to know more about the communications of the world being open to them from their offices and homes.

Every telegram we deal with should be regarded as an advertisement of our service. Speed, accuracy, and a well written and otherwise "well turned out" delivered copy should be the individual aim of all of us.

I have often expressed the opinion that if business men would experiment for three months by conducting practically all their correspondence by telegraph, they would find their business increase by leaps and bounds. I mentioned this to a business man the other day, and to my surprise he was most emphatically in agreement that a liberal use of the Telegraphs in business was a paying proposition.

NOTES ON TELEGRAPH PRACTICE.

BY G. T. ARCHIBALD.

IV—*Concerning Public Facilities for the Handing-In of Telegrams.*

THERE are three ways in which telegrams may be accepted from the public. They may be handed over the counter at a Post Office at which telegraph facilities are provided, or at a railway station which is also a telegraph office; they may be transmitted over a private telegraph circuit or they may be dictated over a telephone circuit.

Prior to the transfer to the State of the National Telephone Company's undertaking, many persons exchanged their telegrams over private telegraph and Post Office telephone circuits. With the development of the phonogram system since 1912, these circuits have largely disappeared. There are signs, however, that the introduction of a cheap form of printing telegraph apparatus, which can be operated by a typist, is creating a certain amount of interest in commercial circles, and it seems not unlikely that there may soon be an increased demand for this facility. There is less risk of error in signalling under this system than is the case with telephone speech, and there is no waiting for confirmatory copies.

During the past few years there has been a remarkable increase in the number of telegrams handed to the Post Office over telephone subscribers' circuits. Extensive use was made of the system by Government departments and others during the war, and nothing has interfered with its progress. Whereas in 1908 only 4,000,000 telegrams were dealt with by telephone, the number has now increased to upwards of 7,000,000 per annum, and is still increasing. Telephone subscribers are able to send and receive telegrams at any hour of the day or night. They are independent of their local telegraph office, if it should be closed when they wish to send telegrams, since they can be connected to the nearest open telegraph office on payment of the appropriate trunk telephone fee in addition to the charge for the telegram. For a similar consideration they may be put through to the office of delivery or to the open office nearest to the point of delivery if they so desire. One great advantage of the phonogram service is that telegrams passed over telephone circuits are expedited, by reason of the fact that they usually escape handling at branch and sub-offices.

Special facilities for handing in telegrams are not, however, confined to telephone subscribers. Telegrams may be posted in letter boxes, if properly prepaid, for collection by postman: on reaching the Letter Sorting Office all such telegrams are quickly transferred to the Telegraph Branch. Posted telegrams which have not been fully prepaid are not held up, the addressee being asked either to pay the short charge or furnish the name and address of the sender. Rural postman and boy messengers are authorised to accept telegrams from the public if properly prepaid, and telegrams may even be posted to another town for transmission thence, but in these cases the delivered copy bears an indication of the town at which the telegram was posted (see Chapter II).

A further facility and one of especial value in cases of sudden emergency is that telegrams may be accepted at Post Offices after the usual hours of business on payment of "late" fees, if the offices through which the telegrams would have to pass are open, and their attention can be gained. Persons wishing to telegraph to other offices after the usual hours of business may, subject to proper notice and on payment of "late" fees, arrange for any office or offices through which the telegrams would pass, to be kept open.

Telegrams may also be dictated from certain telephone call offices where telephone trunk calls are accepted, as well as from telephone call offices, which are kept open at telegraph offices after the ordinary hours of telegraph business. The sender is put through to the nearest open Head Telegraph Office on payment of the usual telephone fee in addition to the cost of the telegram. An interesting experiment is being made at one or two towns with the object of providing still further telegraph facilities by enabling the public to dictate telegrams over unattended telephone call office circuits. It is too early to express a definite opinion on the value of the experiment; the system is rather cumbersome at the moment, because the customer must provide himself with a sufficient number of pennies to cover the cost of the telegram and the telephone fee. The pennies have to be placed in a slot machine, one at a time—a laborious process—and the telephone operator must check each penny separately. It is hoped soon to introduce the Hall multi-coin box which registers silver coins; when this has been done the facility may be more attractive to the public. This coin box is fitted with three slots, one for shillings, one for sixpenny pieces and one for pennies. Two gongs are provided against which the coins strike. Pennies give a deep note and silver coins a high and distinctive note. The Telephone Exchange is signalled by the insertion of two pennies. The gong for silver coins is sounded once on the insertion of a sixpence, and twice by each shilling. Coins inserted in the wrong slot are returned to the caller. The machine is also fitted with two buttons, A and B. When the caller depresses button A the coins drop into the cash receptacle. Button B is depressed at the request of the operator only if the money deposited has to be returned to the caller.

The private companies responsible for the telegraph service of the United States of America go a step farther in undertaking, on receipt of a telephone request, to send a messenger to collect a telegram from the sender's address in those towns where both companies operate. It is doubtful, having regard to the popularity of the phonogram service, whether a messenger service would prove successful in this country, even if the cost was not too great; indeed it is probable that the American people might not enjoy such a facility but for the fact that there is keen competition between the companies concerned for long-distance traffic which bears a higher tariff than that in operation in this country.

Forms are provided for writing telegrams, but persons may, with the permission of the Postmaster General, provide their own specially printed forms. Many large users of the telegraph service who require duplicate or triplicate copies of their telegrams avail themselves of this permission. The Post Office issues books of forms (with duplicates) each of which bears an embossed stamp of the value of 1*s*. A sheet of carbon paper is supplied with each book. These forms are used largely on the Stock Exchanges at London, Birmingham, Edinburgh, Glasgow, Leeds, Liverpool, and Manchester.

Distinctive forms are used for telegrams according to their destination, whether Inland, European, North American, "Via Imperial," &c., and to their nature whether Press, Ordinary (single or multiple address, phonograms, &c.,) or Deferred. Although so much care is taken in the provision of forms the public are not compelled to use them. A telegram may be written upon any odd scrap of paper, but the scrap must be affixed by the counter clerk to the appropriate form. As Mr. Lee says: "The British system, like the American, is more separated in character from the international system than the French or German system, and this is indicated by the forms on which the public write their messages."

Another facility in connexion with the handing in of telegrams, a facility very popular amongst the members of Stock Exchanges and firms dealing with large numbers of telegrams who prefer not to use the phonogram service, is the Deposit Account System. Deposit accounts may be opened for the acceptance at Post Office counters of (*a*) Inland telegrams, (*b*) Foreign and Colonial telegrams

and (c) Imperial Cable telegrams. The charges for account keeping (except for the Imperial Cable which is free) are :—

(1) For accounts rendered in detailed form, an annual fee of £2 payable in advance, covering 1,000 telegrams.

(2) For summary accounts, giving only a simple statement of the total amount, an annual fee of £2 payable in advance covering 2,000 telegrams.

Summary accounts are not rendered in respect of foreign and colonial telegrams. A deposit account is available only at the particular office at which it is opened, and a deposit sufficient to cover the estimated amount of credit is required. As a rule accounts are rendered either weekly or monthly.

The sender of a telegram may pre-pay the cost of a reply telegram not exceeding 48 words with a minimum of 12 words.

To ensure accuracy the sender of a telegram, on payment of a fee equivalent to half the cost of the telegram, may have it repeated from office to office throughout its transmission.

Telegraph facilities are provided, usually under guarantee against loss to public funds, at race meetings, at cricket and football grounds, at military camps, at conferences of all kinds and in connexion with important political speeches, &c. Before the war these facilities were provided in many cases without guarantee, and a special staff in charge of an officer attached to the Secretary's Office, and telegraphists from all parts of the country, who were called upon to undergo a severe manipulative test, were specially selected for this class of work. Of recent years, however, partly owing to telephone competition, partly because the newspaper tipster has largely taken the place of the once popular private tipster who sent his selections by telegraph each day, partly by reason of the fact that newspapers do not now publish such long reports of individual events as formerly, and partly by reason of the development of the News Agencies press distribution schemes, there has been a considerable decrease in press telegraph work handled by the Post Office, and except in the case of the Derby Race Meeting at Epsom, the aristocractic Ascot Race Meeting, and the St. Leger Race Meeting at Doncaster, there are few occasions upon which it is necessary to arrange for more than a dozen telegraphists to attend a special event, and these are supervised by an officer from an adjacent town, the special supervising force attached to the Secretary's Office having been disbanded.

There are upwards of 11,000 head, sub, and town sub-offices and railway stations at which the public may hand in telegrams.

Post Office Surveyors are empowered to authorise telegraph extensions in the case of a town sub-office if there is no telegraph office within half a mile, and the estimated new business, calculated at 1s. 3d. a telegram, is sufficient, or nearly sufficient, to cover the cost of the extension, savings at neighbouring offices being taken into account.

In the case of country sub-offices the Surveyor may authorise extensions if either there is no telegraph office within about two miles and the estimated revenue from forwarded telegrams covers or nearly covers the estimated annual cost, or if there is no telegraph office within about two miles and the estimated new revenue together with the estimated savings at neighbouring offices due to the extension covers or nearly covers the estimated annual cost.

If there is any doubt as to the realisation of the conditions laid down not being met a guarantee must be obtained. A telegraph office is not usually opened under guarantee unless the nearest office to the proposed new office is not less than two miles distant and the estimated traffic is not less than 300 telegrams a year.

The guarantee required under agreement is an amount sufficient to cover the gross annual expenses. In all cases where an office is opened under guarantee the guarantors are informed that if the telegraph office does not prove remunerative at the expiration of the agreement it will be necessary to consider whether the office shall be closed or continued subject to a fresh guarantee.

Surveyors may also arrange with railway companies to collect and deliver telegrams on commission terms at suitable stations where Post Office extensions are not warranted. Railway stations are opened for telegraph business only when no Post Office is near to undertake the work and then only if the work is small.

It is a matter of some interest to note that a telegraph office cannot be closed without the authority of the Secretary of the Post Office.

It remains to be said that telegraph facilities, once granted, are seldom withdrawn, and that in the past an extension of the guarantee period has not been demanded in every case. The result is that the traffic at a large number of offices is not sufficient to cover expenses, a factor which has an important bearing upon telegraph finances.

It is generally agreed that telegraph facilities in this country are adequate; certainly no other country in the world is so solicitous for the telegraphing public.

TELEGRAPHIC MEMORABILIA.

It is a healthy sign when the editor is at his wit's end to know what to leave over till next issue. This has been the state of affairs in connexion with the *T. and T. Journal* for some months. Now that the above has been penned the writer has begun to question the advisability of revealing this editorial secret, lest some of our more timid and modest contributors should withhold their ever welcome assistance. Should this prove to be the effect no one would regret the consequences more than the editor, unless it be your monthly scribbler in these columns, who is not infrequently asked, "Do you have any difficulty in obtaining sufficient copy?" To such this opening paragraph, it is hoped, will prove an all-sufficient reply, but a reply nevertheless which is not intended to detract one iota from the cordiality of the reception of any item of interest with which our London and provincial colleagues may favour the management. Having made this much ado about the matter, let the following account of an interview with Mr. Newcomb Carlton, president of one of the largest of the American Telegraph combines, by a correspondent of the London *Times* some four or five weeks ago tell its own story. Mr. Carlton is in England in connexion with the scheme to lay a new cable across the Atlantic.

Mr. Carlton said "that there were about 15 cables between North America and Great Britain, but all of them were obsolete, though not useless. In the light of the success of the new loaded cable between America and the Azores, which was laid for communication with Germany and Italy, the traffic capacity of that cable had been demonstrated to be eight to ten times greater than an old cable of the same length. The traffic between Great Britain and North America was increasing, and the reduced cost of working, due to the introduction of the new type of cable, had led the company to decide to lay the new cable to Newfoundland, which would have a capacity of 6,000,000 words a year. It allowed of practically any capacity, and the limit was only caused by the desirability of not having too much on a single cable. It was unlikely that cables of a greater capacity than the new one would be laid. It would mark the most important era of development in marine telegraphy since Cyrus Field and his associates laid the first cable in 1858.

The first length of the cable will be laid between Penzance and Newfoundland at a cost of about $3,000,000, and next year another length will be laid between Newfoundland and New York at a cost of $2,000,000. The cables will weigh well over 10,000 tons, and the scheme will involve the enlargement of the Penzance station."

If by "capacity," traffic carrying capacity is intended, then the statement that the new cable "allowed of practically any capacity" is hardly compatible with the further statement that "it was unlikely that cables of a greater capacity than the new one would be laid." Having reached the superlative—!

Most of us are admittedly *amateurs* as regards wireless, and have rather preened ourselves not so much on the result of our own contributions to this science, but to the one or two non-professionals who have startled the newspaper world by speaking to the Antipodes with microscopic power, and by making audible the colonial whispers of our brethren in Yukon. We have, as it were, basked in the reflected glory of these peers among the amateur brethren. Alas! one of these has failed us, and humiliating as it may be, truth demands that we should tell the story.

Here it is, as related by a correspondent of the *Central News*. Czecho-Slovakia is the country which gave him birth, Praha the city and centre of his experiments. He possesses a specially good receiving set and informed the Czecho newspaper, *Narodny Listi*, that on a certain evening while he was listening in he suddenly heard, through the music of a concert, a call for help from a ship in distress. He even heard the blowing of sirens, the tossing of waves and the screams of the passengers. He was also able to record the latitude and longitude of the disaster.

Upon working out the latter, cool and calculating mathematicians made the interesting discovery that the sinking vessel must have been in the middle of the Sahara, while a comparison of dates and times revealed the fact that the shipwreck was a realistic reproduction by 2LO !

The connexion between geology and submarine telegraphy was again evidenced by a recent interview between a representative of the London *Westminster Gazette* and Commander Robinson of the Western Union Telegraph Company who has had very considerable experience in North Atlantic waters. The commander in pointing out the sub-ocean changes, referred to Saint Brandon Island, mentioned in the *T. and T. Journal* some time ago, and which though charted as an island in 1582, is now several hundred fathoms below the surface. The legendary island of Atlantis also came in for some discussion, and Commander Robinson went on to say : "We have had a good deal of trouble with our cables in the neighbourhood, but it is impossible to say whether the interruptions have been due to seismic disturbances about the island. Masters of cable ships have reported that in attempting to draw up the cable they have brought up pieces of lava."

Some geological experts do not, however, accept the theory that traces of submerged land in the Atlantic prove the existence of Atlantis. Dr. J. W. Evans, Adviser to the Colonial Office on Minerals, says :—

"There are several small tracts of land which have been submerged and worn away, but they do not support the idea that there was a continent stretching across the Atlantic.

"There was an island about 500 miles off the coast of Ireland, about as big as the Isle of Wight, upon which trees grew. It was discovered by Portuguese voyagers, and became known as Rockall.

"In Western Europe, particularly off the coast of Cornwall and Brittany, there are also islands which have disappeared. The Scilly Isles were probably of the group."

It may be added that volcanic deposits have been dredged up round the Azores, and should a geological fault of any extent appear in this neighbourhood there would be work enough for a dozen long-distance wireless stations for a month or two !

The sixty-first Ordinary Meeting of the Telegraph Construction and Maintenance Company was a particularly interesting one, not only to those who were financially interested in the prosperity of this old-established undertaking, but to students of electrical science and to those of us who, while welcoming each and every wireless development, are nevertheless convinced that there is still a wide and even *growing* need for wire and cable telegraphy. The outstanding feature of the Chairman's speech, so far as concerns our craft, was the following statement : "I wish to explain to you that during the year under review we have carried out a most important experiment, one which will probably be of great value to cable-owning companies generally, and, although the experiment has proved a complete success, it was not, of course, a profitable one, and we did not embark on it from this point of view.

It is not generally realised that there have been very great developments in submarine cables during the last year. Research had shown, and it was known theoretically for a long time, that if the central copper core, the wire that actually carried the signal, was surrounded by a fine wire or ribbon of an alloy of high permeability, the carrying capacity of a cable would be greatly increased.

The late Oliver Heaviside, F.R.S., the great mathematical genius, was from the first a strong advocate for increasing the inductance of submarine cables. More than 20 years ago he wrote : 'It is not unlikely that a new type of cable can be designed in which iron can be brought into use to increase the self-induction largely, and in a uniform manner,' and again : 'Solely by increasing the inductance we could make Atlantic fast-speed telegraphy possible with little attenuation or distortion.'

This suggestion of Heaviside's was brought into practical use in submarine cables by our company in the continuously loaded telephone cable which we laid across the Channel in the year 1912, and again in the three continuously loaded telephone and telegraph cables which we laid from Havana to Key West in 1921.

It was due to the bold enterprise of the president of the Western Union Telegraph Company that this theory was carried out on a long ocean cable, and by placing the order with us for a loaded cable to be laid between New York and the Azores, a length of 2,300 miles, the Telegraph Construction and Maintenance Company was enabled to become the first manufacturers of a long cable of this type. The Western Electric Company of America, whose research department had for some time studied this subject, supplied the alloy and co-operated with us in order to obtain the very best results, and the success has been complete, the working speed obtained on the new cable after we had laid it being in excess of all calculations. Experts say that this is the answer to the threat of competition by wireless, and certainly there is no doubt that cables of this type will bring about much more rapid services.

We have had to build an extension to our factory to make room for the machinery and appliances which were necessary, so that our works are now completely fitted up for the manufacture of this type of high-speed loaded cable."

In the House of Commons, in reply to Col. Woodcock, Mr. Amery, the Colonial Secretary, said that the extension of the "All-Red" cable system from the West Caribbean to Barbados, &c., was now in working order. The cable from Barbados operated by the Pacific Cable Board linked up at Turks Island with the existing cables from that island to Jamaica and to Bermuda.

Answering a further question, Mr. Amery said that the wireless stations at St. Kitts, Antigua, Dominica, St. Vincent, Grenada and Barbados, had been completed and handed over to the Pacific Cable Board for operation. The only station remaining under the general scheme was that at St. Lucia which it was expected would be handed over to the Pacific Cable by the end of February. In addition to the stations provided for under the scheme a contract had been made by the Government of Montserrat for the erection of a station in that island.

Mr. Arthur E. Cotterell in an early March number of *The Electrical Review* damps down very considerably the ardour of certain wireless enthusiasts who observed, or thought they observed, abnormally good wireless signals during the recent eclipse of the sun. Under the title of *Wireless and the Solar Eclipse* he writes : "It is, of course, well known that the range and strength of wireless waves are greater during the night than in the daytime, and that winter is more favourable to their propagation than summer, the explanation being advanced that the solar rays ionise the atmosphere, thereby rendering it less suitable for the conveyance of electric waves ; hence it follows that advantage arises at night when solar rays are absent from that particular side of the earth, and in winter when the sun attains a lower altitude in the daytime.

Considerations such as these naturally suggested that the obscuration of solar rays during the recent eclipse presented a somewhat rare and favourable occasion for further investigation of the subject.

As, however, the eclipse was not total in this country, it would appear that any local tests were shorn of much of their possible value. Whilst it is conceivable that some improvement may have been noticed in broadcast reception within the immediate area affected by the eclipse at any given time, it would be interesting to know precisely what steps were taken to measure the results.

Whatever may have been the results in such cases, any expectations of improved transmission between America and England could have been based only on some oversight of the actual conditions relating to the eclipse.

Had this astronomical event caused *simultaneous* darkening of the whole tract of ocean and land, say between New York and London—an impossible thing, of course—there would have been excellent reasons for expecting striking results and some addition to our knowledge. As a matter of fact, however, the shadow cast by the moon on our earth at any moment on the recent occasion only covered a circular patch something like 100 miles in diameter, or, roughly speaking, about one-thirtieth part of the distance between New York and London (roughly 3,000 miles)."

The development of radio-telegraphy between ship and shore proceeds apace. The White Star liner *Majestic* received and sent over 35,000 messages, totalling 750,000 words, during 1924, equal to 3¼ words per minute throughout each voyage, a considerable increase on her record for the previous year.

Among the many new signalling devices at the Queen's Hotel, Birmingham, is included a "morning call signal" which the attendant maid is able to bring into action by a linking device which operates a low tone buzzer in the room of the visitor. This is adjustable according to whether such visitor is a light or heavy sleeper !

The retirement of Miss Russell, the *doyenne* of the Chief Supervisors of the C.T.O., London, took place on the 9th ult., and was marked by many tangible expressions of goodwill from staff and supervision alike.

The writer, a mere man, with others of the same stern sex, was privileged to be present at a private view of these outward and visible signs of the inward and affectionate state of various donors, individual and collective. One facetious individual inquired if we were looking at a *trousseau*, when he saw the array which included umbrellas, eider-downs, a clock, a wristlet watch, a coal-vase, a hammered metal fire-screen, fire-irons, &c., &c., but was quickly silenced !

The Controller, Mr. John Lee, a day or two later voiced the good wishes of the entire C.T.O., and, probably with the memory of this list of useful articles still fresh in his mind, appeared to be visibly moved at the departure of so beloved a member of his supervising staff, and so notable a link with the past supervision of another member of the same much-respected family.

From Paris through the International Telegraph Bureau, we learn that the much talked-of International Telegraph Conference, now many years overdue, has been definitely fixed to open on Tuesday Sept. 1, 1925. The Conference will hold its sittings in the Sarbonne.

In contrast to the almost silent lamp signalling of the Queen's Hotel, at Birmingham, it is proposed to place a loud speaker over the big clock at St. Pancras Station, London, and an official, speaking into a microphone in his office, will announce the arrival and departure of trains in tones which will, it is hoped, be heard all over the station. Thus are the amenities of our civilised life increased from two opposite directions—less and more noise !

A London daily paper states that an official French commission is to make final trials at Istres, near Marseilles, of apparatus for the radio control of aeroplanes. An operator at a switchboard on the ground controls the machine by the pressure of keys. Its equilibrium is made automatic by gyroscopes, and its engine plant is automatic also. The feature which is said to be of importance is a new means of controlling the machine after it has passed beyond the visual range of ground operators. It is stated that after it has traversed a certain distance it emits automatically a series of radio signals. These enable the position of the machine to be ascertained by

ground operators, who, if necessary, can send signals correcting or altering its course.

In a periodical devoted exclusively to electrical engineering the inset of a paragraph struck the eye, "TURKEY—PRICES," but upon reading more closely it appears that it referred to the cost of thermionic valves, which according to *Commerce Reports* are quoted at 200% (two hundred) higher by American firms than those of European competitors. Complete radio sets made in the U.S.A. are also 30% dearer. The staid *Reports* however, adds, apparently as some solace to our cousins, that the Turks are showing very little interest in these articles!

WIRELESS TELEPHONE AND BELL SIGNALLING DEVELOPMENTS AT HOME AND ABROAD.—The Basrah port authorities have arranged for Marconi radio-telephone installations of the YB type to be fitted on their dredgers *Liger* and *Tiger*, and also for a shore station with similar equipment. A wireless bell will be included in the installation, thus obviating the necessity for maintaining a continuous watch; the equipment will enable any of the stations to call the others with the facility of an ordinary telephone. The 100-watt transmitter has a range for telephony of from 35 to 80 miles; the telegraphy radius is from 100 to 200 miles. Similar installations have been in service for some time in various British lightships and dock and harbour authorities' buildings. Another group of Trinity House light vessels and a shore station at Cromer are also to be equipped with 200-watt YD telephone sets. This is the third group of light vessels to be equipped with radio-telephone apparatus for Trinity House by the Marconi Co. The aerial of the Cromer shore station will be supported by two towers, each 70 ft. in height.

BERLIN.—The special correspondent of the London *Times* informs us that a delegation representative of the Western Union and Commercial Cables Companies arrived in Berlin last month with the object of entering into an agreement with the German Post Office and the Deutsche Atlantische Telegraphen-Gesellschaft in order to hasten the re-establishment of direct cable communication between Germany and the United States.

Before the war Germany possessed three Transatlantic cables, of which two covered the distance between Emden, the Azores, and New York, while the third maintained communication between Emden, Teneriffe, Monrovia, and Pernambuco. All were seized during the war by the Allies and were finally expropriated from Germany under the Peace Treaty. A project for the construction of a new cable between Emden and the Azores, to connect with the lines of the Commercial Cable Company, was approved at a conference of German cable companies held on May 30, 1922, but since that date the scheme has had to suffer inevitable postponements.

CANADA.—Canadian Radio "Beam" stations are now being erected near Montreal by Marconi's Wireless Telegraph Co. of Canada, for communication with England by means of short-wave "beam" telegraphy, says the *Electrical Review*. Construction has reached an advanced stage, both at the transmitting station at Drummondville and at the receiving station at Yamachiche, and all the masts which will carry the aerial system for the English services have been completed. There are five masts at the Drummondville station which are 300 ft. in height and 650 ft. apart. Stations are also being built at the same places for "beam" radio communication with Australia. This group of Canadian stations, working with Great Britain and Australia, will be the first of the Imperial chain of stations to be ready for service.

INDIA.—The Government of India has signed a contract with the Indian Radio Telegraph, for the erection of a "beam" radio-telegraph station for communication with England in connexion with the Empire "chain." The company, whose head-quarters are in Bombay, has an authorised capital of three crores of rupees, and almost all the directors are prominent Indians. It is proposed to erect one "beam" station at Kirkee, near Poona, which will be followed by three others as traffic increases. The first station will will be completed by the end of 1925. The contract with the company, which is directed by a board of prominent Indian business men and has close links with the Marconi Co., lately entered into for the establishment of a "beam" radio-telegraph station in India, imposes on the company the obligation to train Indian apprentices and employ Indians as far as possible, and it provides that 60% of any increase of capital determined on shall be offered for public subscription in India.

The Times Trade & Engineering Supplement states that the Government has not yet formulated a policy regarding broadcasting. Radio clubs in Calcutta, Bombay, Madras, and Karachi are licensed to broadcast entertainment and news. The stations are very small and practically only serve the cities in which they are situated.

ITALY.—The new telegraph cable between Porto d'Auzio in Italy and Malaga in Spain, which links Italy with New York, is now said to be complete.

NORWAY.—The large new radio-telegraph receiving station which has been erected by the Norwegian Government at Fornebo, says Reuters agent at Oslo, has reached completion. Preliminary tests conducted prior to the station being taken over by the Telegraph Department gave the utmost satisfaction, communications being received with great clarity from Buenos Aires, Honolulu, Tananarivo, Saigon, and other far distant stations. The Fornebo station has been designed to handle the incoming traffic which up to now has been dealt with by the Stavanger station. It has been constructed by the Société Française Radiotélégraphique at a cost of about 150,000 kroner. The steel lattice masts are 250 ft. high.

SWEDEN.—According to *Commerce Reports* the new radio broadcasting station at Varberg is completed, making direct radio communication between Sweden and the United States possible for the first time.

There are more than 37,000 licences held by operators of receiving sets in Sweden, and the Government is building a number of broadcasting stations throughout the kingdom. About 81% of the wireless, telephone, and telegraph apparatus imported in 1923 came from the United States.

TANGANYIKA TERRITORY.—*The British South African Gazette* states that the erection of a large radio-telegraph station at Dar-es-Salaam is understood to be under the very serious consideration of the Secretary of State for the Colonies.

It was with the deepest feelings of regret that the Cable Room staff and supervision learnt of the death after much suffering of Mr. G. Jay, a telegraphist who had spent well nigh forty years in the combined service of the late Submarine Telegraph Company and the Post Office. "George" had made himself a veritable specialist in International Telegraph circulation and was a worthy specimen of the man who throughout his humble career had never failed to do the one thing faithfully and well, and this despite physical disabilities which would have proved the despair of many a stronger constitution. In the case of our departed colleague to *know* was to admire the courage and will-power of a brave man. To his wife and family and his much-respected brother our sincerest sympathy.

Editorial apologies to the Secretary and members of the C.T.O. Library for the omission of an account of the Annual Report in last issue, an omission which it is hoped will be remedied in the current number.

Sunset.—"When the sun through heaven descending like a red and burning cinder. . . . Floating on the waters westward, as a red leaf in the Autumn, falls and floats upon the water, falls and sinks into his bosom."
"Hiawatha"—LONGFELLOW.

J. J. T.

HIC ET UBIQUE.

WE feel that we owe an explanation to several of our correspondents and contributors whose articles have not yet appeared in our columns. Several interesting contributions are in type, but are perforce held over by pressure of space until another month. We are especially gratified to observe an increasing flow of articles from provincial contributors whose co-operation we are at all times eager to secure.

We have received the balance sheet of the Guernsey States Telephone Department, showing a net profit for the year of £320 7*s.* 11*d.* The number of subscribers' lines has increased during 1924 from 3,215 to 3,441.

Messrs. Sells have sent to us a copy of their well-known *Directory of Registered Telegraphic Addresses*, a colossal volume numbering nearly 3,000 pages, containing not only the telegraphic addresses of all firms and persons who register one, but also the telephone numbers of such registrants. This information, we understand, is published free of charge to the firms. The book contains a copious Classified Trades List.

Sir Harry Britain recently tackled the Assistant Postmaster General in the House of Commons concerning the "stile-strip" method of giving in telephone numbers to the exchange. Viscount Wolmer explained that it was for the purpose of helping the telephonists to locate more quickly the number on the switchboard, and to minimise the danger of wrong connexions.

Sir H. Brittain nevertheless asked: "Is it not an unnecessary change? Is it not easier to say "One O O Six Hop" than "Hop One Double O Six"?

Lord Wolmer replied: "What the hon. member should say is, "Hop One-O O-Six." (Laughter.)

Sir H. Brittain rose again, but the Labour members broke into hilarious shouts of "Hop! Hop! Hop!" Sir Harry tried to put a further question, but in the words of Bürger's immortal ballad:

"Weiter, weiter, Hop! Hop! Hop!
Gings fort in sausendem Galopp!"

The
Telegraph and Telephone Journal.

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Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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TELEPHONE EXPANSION AND LOW RATES.

RESOLUTIONS are from time to time passed by public bodies on the desirability of developing the telephone system of this country more intensively. With this desire we are cordially in agreement, and we may add that the best energies of the Post Office are being constantly and earnestly directed to that end. These resolutions are, however, often coupled with a recommendation of reduced rates, and it would seem, unfortunately, as though this were the only panacea which our well-wishers—and others—could suggest for the furtherance of British telephone development.

Many people still labour under the delusion that if only you supply telephone service under cost price to sufficient millions, it will pay for itself in the long run; this fallacy is hard to dislodge, and the Administration is faced with the unhappy alternative of earning the blessing of the sound economist at the expense of the curses invoked on its head by the apostles of a cheap telephone service. These, like the poor, are always with us, and their ideas, as expressed in letters to the Press are not less instructive than astounding. Some apparently do not rate the value of rapid communication very high, or else daily familiarity with the boon has blunted their appreciation of its possibilities. For example, correspondents of a Liverpool and a Bristol paper seem to take exception to a statement of the District Manager that the telephone at a penny a call is the cheapest form of communication. They produce tables to show that it is necessary to make 8 calls a day to reduce the cost of telephoning below the cost of writing a letter, and add that the telephone can never be as cheap as writing a penny post card. How can a telephone conversation be compared with a letter or a postcard? An ordinary telephone message is at least equivalent to a letter, a reply, and counter-reply, and it would be difficult to estimate how many postcards sent backwards and forwards would be required to contain the messages exchanged in two or three minutes' conversation—and this without taking account of the fact that the series of messages and replies occupies but a few minutes by telephone, whilst by post it would take several days to convey. By the correspondent's own showing, one message a day (including a due proportion of the installation charge) costs about $4\frac{1}{2}d.$, and two messages a day $2\frac{3}{4}d.$ each. At the latter rate a telephone call is cheaper than three postcards, conveys more information, and is incomparably quicker. Besides which the advantage of answering and re-answering points as they arise in a conversation cannot be weighed in terms of cost and value against the slow process of sending a series of written communications.

An amusing light is thrown on the cheap telephone question by a correspondence in the *Daily Express*. One writer claims that the inhabitants of Mexico City have more facilities for using the telephone than any other people in the world. (By the way, 2.7% of the population of Mexico have a telephone, and 7.4% of the inhabitants of London.) "In the General Post Office," he continues, "there are about twenty telephones, and the public may use them without payment." A second correspondent learns these glad tidings with interest. "Presumably," he says, "that is why for some years I have received no dividends on a quantity of Mexican Telephone and Telegraph bonds of which I am the unfortunate possessor." But it is notoriously difficult to please all parties; the recipient of gifts sees things from a different angle from the forced donor.

Civil Service Commission.

Forthcoming Examination.—Male Assistant Superintendent of Traffic (Class II) in the London Telephone Service, and Male Assistant Traffic Superintendent in the Provinces, General Post Office (18-23); regulations and particulars are obtainable from The Secretary, CIVIL SERVICE COMMISSION, Burlington Gardens, London, W.1, together with the form on which application must be made. The latest date for the receipt of application forms is April 16.

THE POST OFFICE AND AUTOMATIC TELEPHONES.*

BY COLONEL T. F. PURVES, O.B.E., M.I.E.E.

(1) INTRODUCTORY.

IN the art and practice of telephony the development of means whereby one talking circuit can be connected, at will, with any other has always presented a leading problem, second only to those involved in the actual transmission of speech.

Although its study has been accompanied by a large amount of invention, it is essentially a problem in pure engineering. The object accomplished is one which, in itself, is simple, and the immense amount of effort and ingenuity which has been expended upon it by many hundreds of engineers has been directed wholly to securing its accomplishment at minimum cost in money and time.

The various systems of switching classed as "automatic" perform no new function in telephony; rather do they represent the culmination of a continuous process, in which electrical and mechanical devices have been increasingly utilised, in order to reduce the amount of human effort required to place a telephone subscriber in communication with the correspondent with whom he desires to speak. In this economy of effort the subscriber has shared, and in modern "manual" switching systems the only manipulative act required of him is that he should lift the telephone receiver from its rest before speaking, and replace it when he has finished.

The adoption of the automatic system represents a reversal of this policy of economy of operation, so far as the subscriber is concerned, since it throws upon him the whole of the manipulation required to effect the ordinary local calls which generally constitute the bulk of his transactions, and for that reason the introduction of automatic exchanges in any telephone area is generally a matter of considerable public interest.

The desire of the general public for information is catered for by the daily Press, and, at the other extreme, the professional telephone engineer has at his disposal a great mass of technical literature in many forms, in the multitudinous details of which the electrical engineer who is interested in only a general way may be pardoned for sometimes complaining that he "cannot see the wood for the trees." I shall therefore endeavour to give a general description of the function of automatic switching apparatus in telephony, with a few main details of the most recent innovations incorporated in the system which is now being installed in new exchanges in London.

The fact that the inception of automatic telephony dates from a time only about three years later than that of the telephone itself is often overlooked. The electrical telephone was invented—or at least *effectively* invented—in 1876 by Dr. Graham Bell, a native of Edinburgh domiciled in the United States.

Although the first telephones were used only for point-to-point communication on private wires, Dr. Bell from the earliest days visualised the use of his invention for general communication among members of the public. At a meeting in New York, held for the purpose of raising capital, he expressed himself as follows:—"It is conceivable that cables of telephone wires could be laid underground, or suspended overhead, communicating by branch wires with private dwellings, country houses, shops, factories, &c., &c.; uniting them through the main cable with a central office where the wires could be connected as desired, establishing direct communication between any two places in the city. Such a plan as this, though impracticable at the present moment, will, I firmly believe, be the outcome of the introduction of the telephone to the public. Not only so, but I believe that, in the future, wires will unite the head offices in different cities, and a man in one part of the country may communicate by word of mouth with another in a distant part. Believing, as I do, that such a scheme will be the ultimate result of introducing the telephone to the public, I will impress upon you all the advisability of keeping this end in view."

It has been given to few pioneers in a matter of such magnitude to see their early visions so fully realised. The telephone has indeed provided a notable illustration of the rapid application of scientific discoveries to commercial life and to the home requirements of the people, and this applies with equal force to its most modern developments, such as inductively loaded land and sea cables and thermionic valve repeaters, and coupled wire and wireless transmission, which have so greatly increased the stability and range of communication. In this connexion it is noteworthy that the fundamental elements of telephony have undergone only slight modification. The receiver of to-day is almost identical with that of 30 years ago, and the standard transmitter is still the box of carbon granules invented about the same time, while these, in turn, differ only in minor characteristics from the receiver first devised by Dr. Bell and the original carbon transmitter introduced a few years later.

The first exchange switchboard was brought into use at Newhaven, Conn., in 1878 and was equipped with switching apparatus of the "rheostat switch" type, now so well known to wireless amateurs. The limiting possibilities of such apparatus were soon reached and the necessity for the design and manufacture of entirely new types of equipment became evident.

"Plug and cord" exchanges quickly followed. Every operation of signalling and connecting had to be performed by hand. The subscriber had to switch in a generator to call the exchange and had to connect and disconnect his speaking battery by means of another switch. The operator had to restore the shutters of the drop indicators by hand; to connect his speaking set by a plug to the calling line; to plug his generator to the called line and turn the handle; to transfer his speaking set to that line; and, after obtaining a reply, to connect the two lines together by a separate pair of plugs and cord. From time to time he had to reconnect his speaking set and listen in order to ascertain before severing the connexion, whether the conversation had been completed.

As the numbers of lines and the amount of traffic increased it was found possible to facilitate the work of the operator by the introduction of such devices as connecting jacks, with auxiliary contact springs for signalling, self-restoring indicators for calling and clearing purposes, and fixed pairs of cords and plugs equipped with pulleys and with ringing and speaking keys which automatically effected all the circuit changes required to send calling signals and to enable the operator to speak and listen on any line. Automatic switching receiver-hooks were also added to the subscribers' telephones.

The increasing size of switchboards made it necessary to employ several operators in one exchange and the difficulties so introduced were solved by the invention of the multiple switchboard in 1879 by Mr. Scribner, who was until a few years ago chief engineer of the Western Electric Co. in America. This notable invention enormously increased the number of lines which could be handled in a single exchange. It enabled the lines to be apportioned in suitable groups to an indefinite number of operators, each of whom answered the calls arising in his particular group and was enabled to complete the connexion to any required line in the exchange by means of a compact panel of connecting jacks in which the whole of the lines appeared. Such panels were provided within reach of all operators and every line was multipled to a jack in the same numbered position on every panel of the entire suite. This necessitated the provision of many additional operating aids and refinements, including the simple electrical "engaged" signal which has ever since been a feature of large manual exchanges.

The introduction of the "common battery" system represents another important advance. The first such exchange was opened in Louisville, Kentucky, in 1897; the first in England was opened at Bristol in 1900. The essential feature of the common battery system is the elimination of batteries from the subscriber's telephone set by the supply of talking current from a large central battery located at the exchange; but the system as launched by the engineers of the American Bell Association included a great many new developments of a subsidiary character, among which may be mentioned the use of small electric glow lamps in place of mechanical indicators.

It introduced, for the first time, the use of electrical power to the telephone system, and the current requirements of a large exchange began to be measured in hundreds of amperes instead of in milliamperes. Many types of relays and other electro-mechanical devices were designed and introduced in combinations which greatly extended the automatic signalling and connecting features of exchange working.

Since then the telephone engineers of all the leading nations have participated in the further development of the common battery system, both as applied to subscribers' lines and to the junction circuits which are required in great numbers in large multi-exchange areas.

The object throughout has been to reduce the cost of giving a rapid and reliable service by simplifying in every possible way the operations of the telephonist in handling calls. Such savings affect the engineering and other costs as well as the service operating costs. If we assume that the introduction of a certain amount of automatic aid to the operator results in halving the amount of time taken to deal with a call, not only is the effect to double the number of average lines which an operator can handle and so reduce the number of operations by half, but the costly multiple switchboard suites will also be reduced to half the previous length, the necessary dimensions of switch-rooms and operatting-staff accommodation rooms will likewise be halved and a large economy effected in the cost of sites and buildings.

The amount of assistance given to the operators in all modern manual exchanges by the introduction of automatic devices is very great. In the case of some of the small telephone companies in the United States, where the whole service is given from a single exchange at a "flat rate" charge, it has been possible to combine these devices in such a way that the normal manipulative action of the operator is reduced to the mere insertion and withdrawal of a single plug for each communication effected. The call is indicated by the glowing of a lamp adjacent to a particular plug. When the operator lifts the plug, her speaking set is automatically connected to the line and the number of the called party is ascertained. The insertion of the plug in the jack of the wanted line automatically disconnects the operator's speaking set and connects a periodic ringing machine to the line. When the called subscriber lifts his receiver to reply he actuates a trip magnet which disconnects the ringing machine and places the two parties in communication. The replacement of the receivers at the end of the conversation sends a clearing signal, on observing which the operator withdraws the connecting plug. With so simple a manipulative system the number of calls which an operator can normally deal with in an hour is naturally very high.

* Paper read before the Post Office Telephone & Telegraph Society of London.

Side by side with the foregoing development of so-called "manual" systems many inventors and engineers have been devoting their attention to the devising of purely automatic systems in which the intervention of an operator in connexion with ordinary local calls is entirely dispensed with.

Probably the first recorded proposal for an automatic system is that of Connolly, which is covered by the joint patent of Messrs. M. D. and T. A. Connolly and T. J. McTighe, United States patent 22458, dated Dec. 9, 1879. This system bears a remarkable resemblance to the Wheatstone "ABC" dial telegraph, and although the patent refers to a system of 100 lines the drawings associated with it only illustrate one of 25 lines. The face of the dial was marked with letters, each of which represented one subscriber on the system.

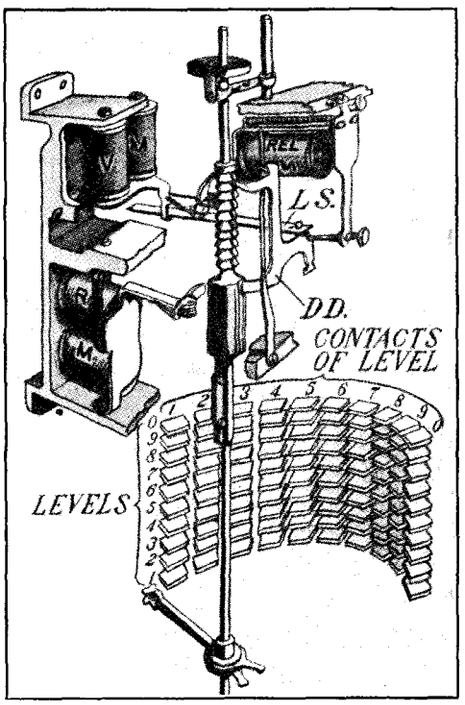


FIG 1.

The first really important development of automatic telephony is represented by the inventions of Mr. Strowger, whose name was destined to become universally known as its pioneer. Strowger's first patent is dated March 10, 1891, United States Patent No. 447918. This early system required five wires between each subscriber's station and the exchange. Subsequent improvements enabled the number of wires to be reduced to two, which brought the system into line with standard telephone engineering practice and led to its fairly extensive adoption among the smaller telephone companies in America and elsewhere.

The Strowger system is the basis of what is known as "step by step" automatic telephony, and at the present day there are more automatic telephones served by exchanges of that type than by any other. Its fundamental idea is the simple one of straight decimal selection, digit by digit, in a forward direction. Fig. 1 gives a diagrammatic view of the well-known Strowger selector switch. It consists essentially of a set of insulated contact brushes, or wipers, with means for bringing them into connexion with any one of 100 sets of contacts, 10 of which are placed side by side, in the arc of a circle, on each of 10 levels. The brushes are carried on a vertical spindle to which step-by-step vertical movement and rotation can be imparted by means of electromagnets actuated by the trains of signalling impulses produced by the calling dial of the subscriber's telephone. The brushes rest normally slightly below, and to the left-hand side of, the banks of contacts, being held in that position by gravity and by means of a spiral spring, shown at the top of the figure, which acts upon the spindle. Impulses in the vertical magnet (VM) step up the brushes to a position opposite any required level by means of a pawl which engages with a vertical ratchet on the spindle. A subsequent train of impulses in the rotary magnet (RM) will cause the brushes to enter the bank of contacts on that level and will rotate them into connexion with any desired set of contacts, representing the line of the called subscriber, by means of a pawl and horizontal ratchet. So long as the connexion is required the vertical and horizontal ratchets of the spindle are engaged by a double detent (DD) which locks it in position. When the calling subscriber restores his receiver on the completion of conversation, a release magnet (Rel.M) is actuated and disengages the double detent; the spiral spring then restores the brushes to a position horizontally clear of the contacts bank, and the spindle and wipers drop by gravity to the normal position of rest.

The foregoing description applies to the operation of the final selector switch of 100 lines, which completes the connexion to the called subscriber and is governed by the impulses representing the tens and units digits.

In order to effect the selections represented by the hundreds, thousands, and other digits, a switch of the same general design is employed, but the digit impulses are utilised to govern only the vertical selection of a level of 10 contacts, all of which are connected to further selector switches instead of to the actual subscribers' lines. In this case the function of the rotary magnet and of the horizontal movement of the brushes within the bank of contacts, is known as "trunk hunting"; the brushes are driven rapidly forward by local impulses until they find, and come to rest upon, a set of contacts connected with an *idle* selector in the next rank of switches, which will receive, and deal with, the next train of digit impulses sent in by the calling subscriber. The bank contacts of all ranks of switches are multipled together in groups, in a manner analogous to the multiplying of subscribers' and junction lines at a manual exchange.

Fig. 2 gives a view of a final selector switch of present-day pattern, without its protective cover. It will be seen that in addition to the double brush and bank contacts carrying the talking-circuit connexions, a separate brush and set of bank contacts—known as the "private bank"—is also provided. The latter carry a third conductor used for preventing the making of connexions with engaged lines or switches, a function similar to that of the third or "sleeve" conductor used in the plugs and cords of manual exchanges. The eight relays shown at the top of the figure control the circuit re-arrangements associated with each step of the operation of the selecting mechanism, and perform other necessary duties which, *inter alia*, enable the switch:—

To ascertain whether the wanted line is disengaged, and, if not,
To transmit a "busy" signal to the calling subscriber;
To provide against interruption by other calls for the same line;
To disconnect the called line from its call-receiving equipment;
To ring the wanted subscriber;
To disconnect the ringer, join the circuit through, and operate the caller's meter when the called subscriber has replied;
To supply talking current;
To release the connexions when conversation has finished.

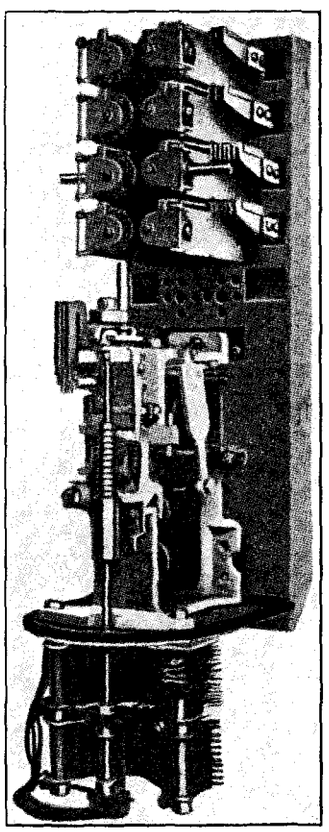


FIG 2.

In early Strowger exchanges it was necessary to provide a selector switch for every subscriber's line, the line being connected to the brushes and finding its outlets via the banks of multipled contacts. This practice involved the use of a very large number of these comparatively expensive pieces of mechanism, each of which was utilised, on the average, for only a very short time daily. Great economic advantage therefore resulted from the invention in 1907 by Mr. Alexander Keith, one of the engineers of the Automatic Electric Co. of Chicago, of a simple form of line switch, which took the place

of the selector on the subscriber's line, and connected the line to an idle selector in a common group before the operation of dialling impulses began. The use of the Keith line switch thus enabled the number of selector switches in an exchange to be very much reduced and to be proportioned in accordance with the total traffic to be carried, without regard to the number of subscribers' lines connected. The Keith switch has recently been superseded by a simple form of rotary line switch which serves the same purpose.

Although the Strowger step-by-step system, with many variants, has reached a high state of development in many lands, it is very far from holding the field alone. Its basic principle of straightforward decimal selection of circuits in comparatively small groups, although simple both in theory and in practice, undoubtedly tends to multiplicity of switches. The fact that all the motions of its parts are energised by the attraction of the armatures of electromagnets has also appeared to some highly competent authorities to be a weakness.

The development of forms of automatic exchanges in which the motive power of all the main elements is derived directly from a power motor has therefore received much attention and has attracted the efforts of many exceedingly able inventors and engineers. The earliest achievements in that direction are marked by the names of E. A. Faller, the Lorimer brothers and F. R. McBerty. Faller was responsible for United States patent 686892 of Nov. 19, 1901, which provides for the use of "well-designed mechanism performing a definite cycle of operations and driven by some source of power." He also provided at the subscriber's telephone a calling device which enabled the required number to be visibly set up before any impulses were transmitted over the line.

Both these features were adopted in the Lorimer system, which had its origin in Canada and was installed in two public exchanges—Brantford and Peterborough—in Ontario. It was one of the first systems to be tried by the British Post Office and was installed in 1914 at the Hereford exchange, where it is still giving good service. Although the manufacture of this system for new installation has apparently now been abandoned, it contributed important ideas to the general subject.

The principle of power-driven machine switching has been further developed by the Western Electric Co., in association with the American Bell telephone organisation, in two forms known as the "rotary system" and the "panel system." These two systems differ widely from each other in mechanical design, but are electrically analogous. The rotary system, devised by Mr. McBerty, was installed experimentally in the company's New York factory in 1910, but the subsequent development and ultimate adoption by the Bell organisation of the panel system, to which fuller reference will be made later, led to the abandonment of manufacture of the rotary system in the United States, where it has not been installed in any public exchange. Its manufacture was transferred to the Western Electric Co.'s factory in Antwerp, and it has been adopted with success in many European and other cities. The system, which is in operation in the Post Office exchanges at Darlington and Dudley, is undoubtedly an excellent one.

(2) POST OFFICE EXPERIENCE AND PRACTICE.

For more than 15 years the Post Office has studied the development of automatic exchanges very closely. In the early stages it adopted the policy of giving an actual working trial to such systems as promised to be capable of providing good and reliable public service.

The exchanges which it has, so far, installed are as follows :—

Exchange.	*System.*	*Opened.*
Headquarters Official	Automatic Electric Co. (step-by-step)	1912
Epsom	" "	1912
Hereford	Canadian Machine Telephone Co.'s (Lorimer)	1914
Darlington	Western Electric Co. (rotary)	1914
Accrington	Automatic Telephone Mfg. Co. (step-by-step)	1915
Newport (Mon.)	" "	1915
Chepstow	" "	1915
Portsmouth	" "	1916
Paisley	" "	1916
Dudley	Western Electric Co. (rotary)	1916
Blackburn	Automatic Telephone Mfg. Co. (step-by-step)	1916
Leeds	" "	1918
Grimsby	Siemens Bros. (step-by-step)	1918
Stockport	" "	1919
Ramsey	" (village)	1921
Hurley	" "	1921
Fleetwood	Relay Automatic Co.	1922
Southampton	Siemens Bros. (step-by-step)	1923
Swansea	" "	1924
Sketty	" "	1924
Dundee	Peel Conner: North Electric Co. (step-by-step)	1924
		1924
Broughty Ferry	" "	1924
Marton	Auto. Tele. Mfg. Co. (village)	1924
York	Automatic Telephone Mfg. Co. (step-by-step)	1924
Hadleigh	P.O. (Rural Auto. System)	1924
Blockley	" "	1924

In some of these cases installation was seriously delayed by the war. The behaviour and the running expenses of all the exchanges mentioned have been critically watched and it may be mentioned that in no case has there been reason to regret the selection of any of the systems for installation. All have given, and continue to give, good service at reasonable maintenance cost.

It was also proved that the automatic method of working was generally acceptable to the British public and that the linking up of the automatic plant with the manually operated switchboards, required at all exchanges for toll junction and trunk traffic, could be effected satisfactorily.

The first exchanges of each type were installed, for the sake of experience, at places where new switchboards were needed, and it was quite recognised that some of them would operate under conditions which would not enable the automatic system to produce its best economic results in comparison with the cost of manual service. This arose mainly from the need for associating with each automatic exchange an unduly large proportion of manual switchboards for the purpose of dealing with external traffic. Much of this traffic fell within the unit-fee area and would, in a fully equipped area system, have been disposed of by automatic means. The total expenses were, in some cases, found to be somewhat higher than those which would have resulted from the use of manual exchanges, but they provided data by means of which financial comparisons could be made between the economic results to be anticipated in multi-office unit-fee areas fully equipped with the automatic or with the manual system. Such comparisons are made on the basis of inclusive annual costs, taking into account interest on capital, depreciation, maintenance and operating, with a calculated proportion of commercial and overhead charges. Many typical areas were studied in this way and the results were generally favourable to the full equipment of the area with automatic plant. In the Sheffield and Newcastle areas, for example, savings of over £14,000 a year and of nearly £7,000 a year respectively were indicated. After the various factors entering into these calculations had been investigated it was found that the policy of providing automatic or manual equipment could in many cases be determined, without detailed calculation, by the application of the following general principles :—

(1) In an area where the anticipated development on all exchanges in a period of 20 years does not exceed 1,000 subscribers' lines, manual equipment is to be provided.

(2) In all other cases automatic equipment is to be installed, provided that the following traffic conditions obtain :—

(*a*) The "calling rate" to average not less than 1.2 calls per subscriber in the busy hour of the day.

(*b*) The proportion of local traffic to be not less than 70%.

(*c*) The number of manual operators' positions required, in association with the automatic exchange, not to exceed 55% of the number of positions required for a manual system.

The fulfilment of conditions (*a*), (*b*) and (*c*) provides a safe case for the adoption of the automatic system. Cases which fail to satisfy these conditions are treated as border-line cases, and are subjected to detailed calculation. The result of the investigation of these doubtful cases has, so far, shown that in more than 80% of them the automatic system represents an economy.

Appendix 1 shows the results of the calculations made up to a 10-years' period in three such border-line cases : Keighley, Maidstone, and Macclesfield. Experience has shown that there are few areas, where the 10-years' development will reach or exceed 2,000 subscribers' lines, in which the automatic system will not show a comparative saving, and, as a result, it has just been decided that it is safe to install the automatic system without detailed financial comparison with manual, if the following conditions will be satisfied within that period :—

(1) The average subscribers' calling rate to be not less than 5 calls per day.

(2) The number of local calls switched automatically to be not less than 4,000 per day.

(3) The proportion of originated calls requiring to be handled manually to be not more than 40%.

On the other hand, if the number of local calls which might be switched automatically will not exceed 3,000 per day within the 10 years' period, manual equipment will be installed without question.

The introduction of the automatic system does not necessarily involve any appreciable modification of the private branch exchange switchboards working in the area. A great many private automatic exchanges have nevertheless been installed by the Post Office to meet the wishes of its subscribers. Some of these exchanges provide for over 500 lines. The majority of them are of the Relay Automatic Telephone Co.'s type.

(3) THE SEMI-AUTOMATIC SYSTEM.

Many telephone authorities, while constrained by the force of facts to admit that automatic selecting and switching mechanisms had been shown to be capable of furnishing reliable and economical service, yet hesitated to entrust the means of operating them to the general body of subscribers. It was argued that personal communication with an operator was necessary in order to reassure the public and to ensure proper use of the plant. To meet this frame of mind several systems known as "semi-automatic" have been introduced. These utilise the complete mechanical switching equipment of a full automatic exchange, in addition to a suite of manual switchboards,

the operators at which receive all calls through the medium of an automatic "traffic distributor," ascertain the required connexions verbally, and manipulate impulsing keyboards which steer the connexion through the automatic selecting switches to the desired line. The subscriber is provided with an ordinary common-battery telephone set, and his procedure may be identical with that of a manual exchange system.

In effect, the semi-automatic system carries to its extreme the principle of reducing the work of the operator to a minimum, and its economic justification, as compared with manual systems, mainly depends upon the very high traffic load which it enables an operator to carry without strain. In addition, the cost of training operators is somewhat reduced and the setting up and severance of connexions are effected more rapidly.

Its claims to superiority over the full automatic system are mainly based upon the simplicity of the subscribers' apparatus and procedure, the personal supervision of each call by an operator, the generation of signalling impulses by easily maintained mechanism at the exchange, and restriction of the transmission of these impulses to circuits which are either within the exchange or are carried to other exchanges over junction circuits which are likely to be in more perfect condition than the subscribers' lines. All these claims are valid, so far as they go. It is also true that, from a service standpoint, it is much easier to introduce semi-automatic than full automatic in substitution for the manual system, especially in a multi-office area. There is no need to make wholesale changes in the subscribers' numbers or in the names of exchanges, or to worry subscribers by troublesome alterations, in directories, and working instructions as the various exchanges in the area are successively converted to the automatic system. So great and so real did these difficulties appear that many convinced advocates of the full automatic system recommended the adoption of semi-automatic as an interim system during the long period of years that must elapse in an extensive telephone area before all its exchanges are transformed, notwithstanding the large wastage of distinctively semi-automatic equipment which must necessarily take place when full automatic working is finally introduced in the area as a whole.

A few years ago the Post Office was seriously considering the installation of one or more semi-automatic exchanges, mainly with a view to gaining experience which would be useful in connexion with the treatment of very large areas such as London, and endeavours were being made, in association with contracting companies, to develop a system embodying the following prescribed features :—

(1) Standard manual-exchange operating supervision for all classes of calls.

(2) Control and release of all connexions to be vested in the operator.

(3) Manual registration of successful calls.

(4) Even distribution of calls to operators in a regular indicated sequence ; no waiting traffic to be hidden.

(5) Automatic team work and traffic concentration facilities to be provided.

(6) Facilities to be provided for holding switching plant for observation when faulty connexions are established.

(7) Facilities to be provided for transferring special calls to separate positions for completion.

(8) Automatic selection of outgoing junction circuits for non-fee junction calls.

The quantity and complexity of equipment required to furnish the service and traffic facilities stipulated are, on a semi-automatic basis, considerably greater than are necessary for the full automatic system, and both the capital and the annual costs are higher. After careful study and valuation of all the pros and cons, the Post Office Engineering Department has reached the conclusion that, in general, when a change from manual working is justified the full automatic system presents a greater balance of advantage than the semi-automatic.

As regards the interim use of the latter to overcome the special difficulties of introducing full automatic in large multi-office areas, recent inventions have, as described later, indicated a way out of these difficulties which permits of direct conversion, exchange by exchange, without any need for utilising the semi-automatic system as a stepping-stone.

(To be continued.)

COLCHESTER.

ON the occasion of his transfer to Exeter on Jan. 11, Mr. G. A. MacDonald, District Manager, was presented with a handsome silver tea service from the District Office Staff and Postmasters.

C.T.O. LIBRARY ANNUAL REPORT.

FOUNDED—DECEMBER 1, 1887.

President : John Lee, Esq., C.B.E., M.A., M.Com.S.

Vice-Presidents : A. W. Edwards, Esq., F. T. Wadley, Esq., D. M. Ford, Esq., W. E. Halfpenny, Esq.

IN presenting the 37th Annual Report and Balance Sheet, the Committee have much pleasure in recording steady progress in every direction and the statistics show that the year's working has proved very successful.

The membership figures for the 4 quarters of 1924, stand as follows :—386, 410, 412, and 440.

The female membership has advanced from 60 to 83, showing that the policy of women serving on the Committee has been amply justified.

The amount received by subscriptions is higher than the previous best by £14 11*s.* 6*d.*, and the period under review is the seventh successive year in which an increase has been recorded.

Constant efforts have been made to maintain the stock in good condition, and radical alterations have taken place. Since the last report, 844 books have been added, 809 withdrawn, and 78 rebound.

A feature of the year's work has been the help given by Messrs. S. R. Allen, Junr., H. R. Evans, J. M. Roe, and E. H. Wallace, who each gave up many hours of their own time to library service. Messrs. Bartington, L., and A. W. York of the committee also rendered valuable aid.

The committee desires to emphasise the importance of the interest shown by various junior members of the staff, which promises well for the future administration of the library.

26,173 books have been exchanged during the year—an increase of 2,292 over the previous term.

Gifts of books have been gratefully received, and thanks are expressed to the following gentlemen :—The Controller, Messrs. Bartington, Buckmaster, Dekin, Ellisdon, Hastings, How, Impey, Oliver, Orange, Mills, R., W. H. Wight and the Misses C. E. Baker, and G. E. Mathieson.

In this connexion the Controller invited the librarian to choose 5 volumes from his collection, and five excellent works were duly selected.

On the expenditure side the heaviest item is on account of new books and rebindings, which together amount to £102 17*s.* 1*d.* It is mentioned that this is the first time on record that more than £100 has been spent in one year on the purchase and renewal of stock.

Consisting now of nearly 200 personally recommended addresses, the holiday book and the complete collection of guides have again been freely consulted. In the rare event of an unfavourable report of any particular address, the person reporting is asked to state reasons and to initial the complaint, in order that future applicants may know where to obtain first hand information. Great care is taken to delete addresses which are no longer available, immediately information to this effect is received.

At the meeting in March, Mr. W. H. Bates tendered his resignation as Assistant Librarian on the ground of indifferent health. It was received with very great regret, and in a letter thanking him for past services special mention was made of his valuable work from 1915 to 1919, when he performed the duties of librarian during a critical and trying period, whilst Mr. Pethurst was on active service. In view of this, and also his subsequent work in connexion with the library, the Committee unanimously voted him the sum of £5 as a bonus. The vacant position has not yet been filled.

In the meantime Messrs. York and Figg have acted as efficient deputies when the occasion needed.

It is regretted that Messrs. Kensington and Woodfield, who had acted as Auditors for the past 14 years, retired on pension in June. A suitable presentation was made to each, accompanied by an acknowledgment for their past work.

A very long association with the C.T.O. Library will be broken this year by the impending retirement of the Chairman.

Commencing as one of the founders of the library, Mr. Belsten took a prominent part in committee until January 1889, when he was called upon to succeed Mr. A. E. P. Butt as librarian. He occupied the chief position for 22 years, and from 1911 onwards has acted as Deputy Chairman and Chairman.

In honouring the passing of a valued officer, and in expressing regret at his departure, the committee believe that Mr. Caleb Belsten in his final year of office will be proud to leave the C.T.O. Library in a sound financial condition, and more successful than at any time in the whole of its 37 years' history.

REVIEWS.

"*The Main Currents of Social and Industrial Change*, 1870-1924." *Sir Isaac Pitman & Sons, Ltd. Cloth*, 320 *pp. 5s. net. By T. G. Williams, M.A., F.R.Hist.S., F.R.Econ.S.*

Mr. Williams is the popular principal of the City Literary Institute, and is therefore well known to officials who may be members of the Post Office branch of this organisation.

There is therefore something of the personal touch in this review which may perhaps be open to the suspicion of a certain bias towards Mr. Williams. However this may be, the progressive character of the City Literary Institute itself needs no advertisement as one of the most efficiently organised Adult Educational Centres in the country, while it is equally undeniable that this efficiency is a direct result of the unique capabilities of its principal.

In this volume the treatment of the subject, though scholarly, nevertheless makes no pretension of proving useful to those who have already read and studied widely; the author has especially kept in mind the needs of the inexperienced, but intelligent student.

The purpose of the book is to outline the growth of Society, Industry, and State, during a very definite phase of development. Mr. Williams deals with the extension of the power and functions of the State since 1870, the broadening of the franchise, the beginnings of democratic control of industry, the achievements of science and technology, and the organization of the collective resources of the community for purposes for which individual enterprise was considered to have proved inadequate. Chapter XIII, and last, closes with the General Election of October, 1924, which ushered in an era of—Who can tell?

We have also received a copy of *Electra* published in Madrid in the interests of telegraphy. It is an excellent little magazine well printed and well illustrated. Two pages are devoted to the Post Office Telegraphs exhibit at Wembley, an article apparently the replica of one which we can so far trace as having been originally written in English, was translated into French, thence into Esperanto, and now into Spanish! J. J. T.

"*The History of the Telephone in the United Kingdom.*" *By F. C. G. Baldwin, with a foreword by Frank Gill, pp.* 728 *and* 14. *Messrs. Chapman & Hall.* £2 2*s. net.*

If we judge the art of telephony by what it has achieved since 1875, its history seems long and eventful and pregnant with importance, and its beginnings seem remote; if, however, we measure its life in the ordinary terms of time we are forcibly struck by the fact that only a brief span of fifty years has elapsed since the first words were transmitted by telephone, that not forty-six years have passed since the first rudimentary exchange was opened in this country. Many of the pioneers of the art are with us still, and it is only within the last few years that some of the most distinguished of them have passed to their rest. To the middle-aged man, therefore, every chapter of Mr. Baldwin's exhaustive and interesting work of research will call up vivid memories of the stages through which telephony has passed, of the physical and political difficulties which it has encountered and overcome, of its development from an intriguing novelty, to a means of rapid communication adopted by the more enterprising far-seeing members of the business community, and thence to an almost universal necessity of life. The names of engineers and administrators—Brand, Morgan, Preece, Phillips, Fletcher, Sinclair, Clay, Hawes, Heaviside, Forbes, Gaine, Bennet, Gavey, Gill and many others which pass in procession through its pages will be as familiar to many of our readers as household words. To the student, young and old, the book is a painstaking record of the struggles and achievements of the early telephone companies down to their amalgamation and finally to their acquisition by the State; of the further progress of the system under the Post Office; of the unconquerable ingenuity of engineers; of the imperfect gradually brought nearer perfection; of the superseding of patiently developed apparatus and methods of working by ever more modern inventions and processes; and of the part played in this great work by past and present Telephone Men.

Mr. Baldwin has got together a wonderful collection of photographs and pictures to illustrate his history, a large number of which are from the collection of the late J. W. Ullett. All sources, however, have been drawn upon, and it is not too much to say that the illustrations and diagrams alone would furnish a very instructive history of telephone development since its earliest days. Views of primitive switch rooms, diagrams of early apparatus, pictures of operators in the costumes of the 'eighties and 'nineties and of business men of the same period at the telephone enliven the pages of the work. More than this, they illustrate the connexions and methods of wiring of successive forms of instrument and switchboard in a manner which will be invaluable to the student of comparative telephony, and from a careful study of them it would be possible to reconstruct the telephonic life of the past throughout its various stages.

The first five chapters of the book deal with the invention of the telephone, its introduction into this country, and its establishment and development in London and the provinces. Incidentally Mr. Baldwin's researches upset all received opinions as to the first telephone exchange in Great Britain. Both in this *Journal* and in the Electrical Press discussion has arisen in the past as to whether the exchange at Coleman Street, London, or that in Faulkner Street, Manchester (both were opened in the late summer of 1879) was the first. Mr. Faulkner, however, adduces evidence to show that Glasgow had the first exchange in the March of that year. These chapters are illustrated by documents, photographs of early exchanges, of Edison, Blake, Hunnings, Gower, and other antediluvian instruments, views of slipper-jack boards, Hawes-troughs and other early multiple boards, with, as we have already indicated, diagrams of their connexions. Chapters VII and VIII deal with the development of the multiple boards and of early experiments in underground construction. These chapters are a mine of chronological information.

Chapters 9 and 10 treat of the policy and development of the National Telephone companies between 1884 and 1912, and especially of its wayleave difficulties and efforts to overcome them. The Company had no statutory wayleave rights and failed in its efforts to persuade Parliament to accord them. When the need for underground routes became pressing the Company was enabled, under agreement with the principal large cities in the provinces, to place its lines underground. The London County Council, however, refused to accord this privilege unless it was allowed to dictate to the Company the rates to be charged for telephone service. Mr. Baldwin relates how the Council's action was circumvented by the Company, who obtained the necessary powers by applying to the Postmaster General to provide the necessary pipes and wires—upon payment of course—for his licensee; and how, much to the chagrin of the Highway Authority, the action of the Post Office was upheld by the Courts. The following paragraphs give an interesting account of what may be called the "overworld" of London as seen by a telephone man.

> The sewers, subways, tubes and other railways and artesian wells which comprise underground London have all received literary mention on various occasions, but the London overhead world has been accorded scant attention, in spite of its novelty. A visit by the uninitiated to the roofs of the City of London when the telephone service was administered by the National Telephone Company would, no doubt, have been a matter of considerable interest. On many of the roofs of these high buildings one might walk without impediment for considerable distances, crossing from one building to another either direct, or by means of gangways specially provided for the purpose. A peculiar quiet reigned in spite of the noise of the traffic in the busy streets below. One seemed translated from the world of the London streets to quite a different and remote world, seemingly without any relation to the London of common conception. In all directions amidst chimney stacks, ventilators, water tanks, and other peculiar appurtenances, radiated innumerable wires and cables of various sizes, supported on huge derricks, roof poles and standards, with their numerous stays, the whole inanimate, without apparent purpose, yet constituting the principal medium by which the citizens of London conducted their communications. This realm of wire, both insulated and bare, was as well known, or even better than the streets below, to the

men who lived their daily lives within it, attending to its peculiar needs, extending it or adding to or subtracting from it as occasion demanded.

This distributing system, although unsatisfactory from many points of view—no telephone engineer would have objected to its wholesale demolition following its replacement by a modern underground system—possessed certain advantages, however. Its arrangement was such that a high degree of flexibility was attained, and so long as serious disturbance due to wayleave or other trouble did not arise, alterations could be made with commendable rapidity. With an underground system in a city like London, street traffic considerations and the congestion of mains and pipes of all classes which exists beneath the surface exercise an important influence in the construction, extension, and maintenance of the plant, and introduce no little difficulty and obstruction in the way of the responsible engineers.

The eleventh chapter deals in turn with the call-wire system, the self restoring indicator system, and multiple magneto boards, both with earth circuit and metallic circuit working. Other chapters deal with the development of dry-core insulated cable work, the rise of the common battery system, the history of overhead line construction 1893-1922, the rise and fall of municipal competition, the building up of the Post Office system and the history of the progress of transmission. Later chapters cover the development of long-distance telephony and of automatic switching between 1879 and 1922. There are chapters on Distribution, and Telephonic Legislation, whilst a final miscellaneous chapter discusses Rates and Charges, the Post Office Telephones during the Great War, and the rise of Radio-Telephony. It will be seen that no aspect of the subject has been lost sight of, and it will be appreciated what amount of patient research and special knowledge must have been exercised to produce so complete a record. Of the excellently reproduced illustrations there are 186, and the book is further illustrated by 24 tables and 6 appendices. It is certainly a work which no scientific or sociological library should be without, and one which will make a special appeal to the libraries of our telephone and telegraph societies.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE gross number of telephone stations added to the system during the month of January was 19,067. The number recovered was 10,836, January normally recording the heaviest cessations for any month of the year. With a net increase of 8,231 for the month the total number of stations working at Jan. 31 was 1,251,852.

The following statement shows the growth in the system for the month of January :—

	London.	Provinces.
Total Stations at Jan. 31	441,995	809,857
Net increase for month	2,772	5,459
Residence Rate Installations :—		
Total	79,688	135,528
Net Increase	1,124	1,778
Exchanges :—		
Total	104	3,655
Net Increase	—	14
Call Office Stations :—		
Total	4,153	14,523
Net Increase	18	53
Street Kiosks :—		
Total	53	911
Net Increase	1	32
Rural Party-Line Stations :—		
Total	—	9,253
Net Increase	—	17
Rural Exchanges opened under 1922 Development Scheme :—		
Total	—	632
Net Increase	—	11

The latest records of inland trunk traffic show that 6,255,925 calls were dealt with during November, an increase of 350,311 over the corresponding period of the previous year.

Further progress was made during the month of February with the development of the local exchange system. Among the more important exchanges extended were :—

LONDON—Putney, Sutton (Surrey), Sydenham, Tottenham, Wanstead.

PROVINCES—Birmingham (East), Deal, Ilkley, Lytham, Oldham, Paignton, Sale, Worthing.

During the month the following additions to the main underground system were completed and brought into use :—

Nottingham—Grantham,
Newcastle-on-Tyne—North Shields,
Northwich—Crewe,
Glasgow—Sterling—Falkirk,
Stirling—Dunfermline (Section of Inverkeithing—Stirling Cable),
Pontypridd—Merthyr Tydvil,
Falkirk—Grangemouth,

while 72 new overhead trunk circuits were completed, and 70 additional circuits were provided by means of spare wires in underground cables.

TELEPHONE NOTES.

"Silence in the Telephones!"

IT was altogether fitting that the first notification of Oliver Heaviside's death should reach so many of us by wireless. Besides being one of the supermen of the Wireless world, he was literally the "inventor" of long-distance telephony. But whereas his radio activities were instantly recognised, his work on the distortionless circuit, which laid the corner stone of long-distance telephony, especially as we knew it before the advent of the valve, was unrecognised for a long time. "The Bourbons of the new industry (telephony) took their revenge" says B. A. Behrind in the *Electrical World*. "Like Haman, in the Book of Esther, they coveted worship, and like Mordecai, Heaviside refused it. That is why they hanged him on the high gibbet of poverty." Sir Oliver Lodge, however, in the same journal gives an opinion which one hopes and believes to be nearer the truth. "Part of the difficulty of recognising Heaviside's achievements," he says, "lay, no doubt, in his own personality. . . . It was not an easy matter to help Heaviside. . . . He had a pride which discouraged" attempts to do so. . . "At one time he was rather embittered by the misunderstanding and hostility of those in authority, an attitude which a genial man like Sir William Preece would have been the first to lament had he been better informed. . . . In the telephone field, however, recognition, though tardy, came at last—perhaps too late to be consoling"—and one is glad to feel that Sir Oliver does "not think the man was unhappy. . . . No doubt his insight into nature must have given him moments of sincere pleasure."

Wired Wireless.

"Fredonia's enterprising telephone company is now giving its patrons a new service," says *Telephone Engineer*. "Those who wish may 'listen-in' by simply asking by 'phone to be connected. Loud speakers are installed, if preferred to telephone receivers. While this Kansas town of 4,000 persons has been the first in the United States to inaugurate such a service for its customers, several other towns are now following suit, and the innovation promises to become widespread. . . . If a loud speaker is installed, a monthly rental is paid to the company as a separate line is necessary. . . . Forty loud speakers are thus operated in a town eleven miles from the central receiving set. . . . A number of power amplifiers are used in supplying this service, each amplifier operating 60 to 75 horns. . . . Miss Ruth Fuegham is the radio-telephone operator for the new system. So far she has never failed to give the best possible presentation of any program, eliminating static to a greater extent, say the the users of the service, than they have been able to do themselves on their own individual sets." Some of the American Telephone companies appear also to encourage their "fault shooters" (linemen) to put themselves in the position of being able to rectify faults in wireless apparatus as well as wire telephone, and *Telephony* has been running a series of instructional articles on wireless reception. There must eventually come a time when even in America it will be asked where telephony ends and wireless begins. In England it would doubtless have been asked long ago if a like attempt to combine the two had been made.

London's Automatic Telephones.

Elsewhere in this issue of the *Journal* will be found a reprint of an instalment of the paper which Col. T. F. Purves read before the London Telephone and Telegraph Society on the 16th March. Mr. B. O. Anson, of the Engineer-in-Chief's Department, also recently gave a paper on the same subject. This was before the Institution of Professional Civil Servants, which Institution had been invited to hold its February meeting in the Post Office Engineers' Automatic School. Mr. Anson's audience had the advantage of seeing calls actually passed by means of the "Director." The usual discussion had to be eliminated from the proceedings at the latter meeting. At the former, however, in the limited time available for discussion, Mr. Dive succeeded in raising an issue which has not in these papers received the consideration it deserves—the financial one. While he had no doubts as to the ability of the "Director" system to meet the traffic conditions peculiar to large areas, his mind was clearly exercised by questions of the ultimate effect of its cost on the development. Might we suggest that a competent official read a paper on the economics of automatic telephones at an early public or Institutional meeting? In all automatic areas, from the village up to the "Director," the interest is universal.

A Telephone in every Home.

This is the ideal which Mr. Anson declared for in the discussion on Col. T. E. Purves' paper. He was a "whole-hogger" for automatics, believing that any near approach to the development which any approach to that ideal involved would run manual operating to a standstill. That being so, it was lucky that the automatic system was less expensive than manual operating. During his own lecture on automatic telephony, Mr. Anson projected a slide showing the telephone development in England compared with that in America. He will perhaps not object therefore to an American opinion on the cause of the huge demand for telephones in America being quoted from *Telephony* . . . "commenting on the advance made in the telephone business in the last 10 years, in America, H. B. Thayer, chairman of the American T. and T. Board, pointed out that in 1914 it required 5 hours' labour, at the average wage, to pay for the average cost of a month's telephone service, while in 1924 it required only about 3½ hours' labour. This increased buying power of the public accounts largely for the growing demand for telephone facilities." An answer given to Mr. Ammon in the House of Commons on Feb. 16 showed the following percentage increase :—

	1921	1922	1923	1924
Telephone Rates ...	80	66	56	45
Cost of Living Index Figures	119	84	69	70

The figures are significant to a very high degree and the present development in England tends to confirm the American experience.

"The Voice with the Smile."

One of the features of our American telephone contemporaries is the frequency with which this phrase is used. Over there, the deliberate cultivation of such a voice is not left to the inclination of the individual telephonist. Special courses in voice technique are given. It appears however that the possession of perfect enunciation with a resonant voice is an accomplishment generally prized by the operators. The current issue of the *Telephone Review*, an admirably illustrated monthly journal published by the American Telephone and Telegraph Company, contains an article headed "The Voice with the Smile speeds the Telegram." In the course of this, several instances are quoted to illustrate the value of voice training to operators and subscribers. "I beg your pardon," said a patron on being told the rate of a telegram in answer to an inquiry, whereupon the operator repeated what she had said. "Operator," then said the inquirer, "I heard you the first time, but your voice is so pleasant, I wanted to hear you say it again." Again, from an operator's letter to her Chief Operator: "I realise with each message that our voice training has surely been helpful, for me as well as the patron, and it is gratifying to feel that each day ends with recollections of pleasant dealings with the public." It is interesting to note from the article referred to that "in New York City alone 65,000 messages a day are handled at the Telephone Bureau" of the Western Union. Our largest Phonogram Room, the Central Telegraph Office, handles some 13,000.

The Telephone Development Association.

No doubt the activities of the Telephone Development Association are being watched as closely inside the Service as they appear to be outside, and in a not less sympathetic spirit. Commenting on a correspondent's characterisation of the Telephone Development Association's "clever drawing showing a number of little devils engaged in clipping the telephone wires in a busy city" as "fantastic and impracticable in conception," the *India Rubber Journal* opines that the value of that Association's advertising campaign cannot be judged on one of a series of advertisements. It then proceeds to say that "the section of the public to be influenced is that which makes no use of the telephone at home," and to offer an outline of the points which it thinks should be driven home. Coincidently with such an effort to induce people to put a value on their time we would suggest a campaign to induce shopkeepers and stores to stop such practices as that of adding coppers to the prices of most things when orders are received by telephone. In short, the attitude of regarding the telephone as something beyond the purse of the masses must be dispelled.

Telephone Traffic Manager for the Malay States.

The appointment of Mr. W. J. Porter of the Head-quarters Traffic Section to the recently advertised position of Telephone Manager in the Malay States is a matter for hearty congratulations to all concerned. If, as has been said, it is the policy of the more advanced of the Protectorates to attract the best of the home service, this is a case in which that policy has been singularly successful. "W. J. P." carries with him the best wishes of all who knew him whether personally or only as the officer at head-quarters thus identified.

An Enigma.

"Medical Student Passes His Examination with the Aid of Radiophone," runs a heading in the *Telegraph and Telephone Age*. The story is of a medical student of the Strasbourg University who had recently to sit for an examination in a subject of which he knew very little. "Instead of his name appearing in the 'pass list' it has burst into the Press, famous as the first man to apply wireless to the answering of examination questions." "There were discovered under the table in the examination room thin strips of copper from which two thin copper wires led along the wall and through several corridors to the door of the ingenious students' room. There, a five-lamp amplifier, a battery and, in short, a complete telephone receiving set was found, together with a LADY friend, who had been concealed." While confessing to fixing the set, he added to his trumpery explanation "the ALLEGATION (sic) was absurd as there was no microphone." But, "the student had a bandaged finger; he said he had scratched it and fearing blood-poisoning wrapped it up. When the Professor took off the bandage, he found no lesion of the skin, but under the bandage a TINY MICROPHONE." In England a student doesn't pass unless his name is on the "pass list"; such a set as that described is called a "wireless" not a "telephone receiving set," and we *speak into* the microphone not *listen with* it. Even allowing for these slight national differences in phrascology and practice the writer has so far been unable to see where the radio comes into the question.

E. S.

GOLF.

SECRETARY'S OFFICE *v.* ACCOUNTANT-GENERAL'S DEPT.

March 18, 1925—*Banstead Downs Golf Club.*

RESULT.

S.O.	SINGLES.	*A.-G. D.*
C. L. K. Peel	1	C. Cross 0
W. E. Weston	0	G. E. Pitcairn 1
De G. Gavey	½	H. Buckland ... ... ½
F. Hardwick	0	A. C. Smith 1
W. R. Birchall	1	H. E. Eckford 0
Capt. Foakes	1	S. W. Briggs 0
T. A. Prout	0	J. Hardie 1
H. H. Kilby	1	H. Dunn 0
C. W. Whitehurst	1	A. J. Ratcliffe 0
W. T. Leech	1	Sir H. Bunbury 0
A. Gordon	1	P. J. Pert 0
H. E. Gallaher	1	G. Baker 0
	8½	3½

S.O.	FOURSOMES.	*A.-G. D.*
Leech and Peel...	1	Bunbury and Pitcairn 0
Weston and Gavey	1	Cross and Smith 0
Birchall and Hardwick ...	0	Eckford and Buckland 1
Foakes and Whitehurst ...	0	Briggs and Ratcliffe 1
Prout and Gallaher	½	Pert and Baker ... ... ½
Kilby and Gordon	1	Hardie and Dunn... 0
	3½	2½

MR. JOHN LEE'S LECTURE TO THE EDINBURGH TELEGRAPH AND TELEPHONE SOCIETY.

ON the evening of Feb. 3, Mr. John Lee, Controller of the Central Telegraph Office delivered an address on "International Communications" to the Edinburgh Telegraph and Telephone Society, and the lecture was much appreciated. Mr. F. G. Milne, Secretary to the Post Office in Scotland, presided, and among those present were Mr. Charles Creighton, Controller of the Edinburgh Postal and Telegraph District, Major Jayne, Deputy Controller, Mr. Gilbert, Assistant Superintending Engineer, and Mr. Griffith and Mr. Gall, Assistant Controllers. In inviting Mr. Milne to take the chair, Mr. Creighton mentioned that the meeting was the first gathering in connexion with the Edinburgh Telegraph and Telephone Society at which Mr. Milne had been present, and he extended to the new Secretary a cordial welcome to the capital of his own country. Mr. Milne expressed his pleasure at being present, and wished the Society success.

Mr. Lee has great oratorial gifts, and he employed them to full advantage in describing what well may be called the romance of telegraphy. He showed the amazing ramifications of the Imperial telegraphic communications, and fascinated his audience with an explanation of the way they are being used for the political, social, and economical advantage of the people of the British Empire. Then Mr. Lee dealt with the telegraph systems of Europe and America, and, among many interesting illustrations of the methods of working employed alike over land lines and cables, alluded to the probable rehabilitation of wheatstone working in connexion with the development of wireless telegraphy. Not the least interesting part of Mr. Lee's lecture was that in which he explained the marvellous success of the transmission of Christmas Greetings between Great Britain and the Antipodes as well as between this country and America. He characterised the Americans as a more sentimental people in this connexion than the English, and showed how the policy of leaving the English people to formulate their own Christmas Greetings instead of standardising Greetings, as the Americans did at the outset, not only proved satisfactory to all concerned, but revealed that this freedom in the choice of words really had practically the same effect as the use of pre-arranged phrases, since most people actually used nearly the same expressions.

A Scottish audience enjoys Mr. Lee's kind of oratory, and to many it was a revelation to hear him speak so intimately of the telegraph systems of practically the whole world without the use of paper. Many a parliamentary man would envy Mr. Lee his gifts as a speaker.

The lecture was a great success, and it was generally hoped that Mr. Lee will come back to Edinburgh again soon. If the Post Office authorities ever think of doing something more than they have done to popularise the various branches of their service, a few lectures from Mr. Lee would do it. Of course he has already done much in this direction, and no doubt his good work will not be limited as the years go on, and the need for public knowledge of the wonders of the Post Office becomes increasingly necessary. Mr. Lee is full of originality, and his energy is phenomenal. Surely the telegraphists of Great Britain are proud that they have produced such a man. It is really astonishing how many outstanding men have been thrown up by the telegraphists during the past thirty or forty years, but for catholicity of interest and dynamic personality there has been no one so impressive as the youthful-looking Controller of the Central Telegraph Office.

R. G. D.

RE-UNION OF OLD CHIEFS OF THE NATIONAL TELEPHONE COMPANY.

THERE was an interesting gathering on Feb. 25 when the old chiefs of the late National Telephone Company held a re-union and dinner at the Engineers' Club, London.

Covers were laid for twenty-four, and twenty-one were present, the three absentees, who were prevented from attending through illness being Lord Harris, the only surviving Director; Col. C. B. Clay, V.D., who was the Metropolitan Superintendent; and Mr. W. A. Valentine, District Manager of Glasgow (now Controller of the London Telephone Service), the absence of all three being much regretted.

The following is a list of those who were present and their former titles:—

Mr. Albert Anns, Secretary; Mr. Frank Gill, O.B.E., Engineer-in-Chief; Mr. Dane Sinclair, former Engineer-in-Chief; Mr. Stanley J. Goddard, General Superintendent; William E. Hart, Solicitor; Messrs. J. C. Chambers, A. Coleman, F. Cowley, R. A. Dalzell, C.B., C.B.E., C. J. Phillips, G. F. Preston, R. Shepherd, and F. Douglas Watson, Provincial Superintendents; Mr. W. W. Cook, Assistant Engineer-in-Chief; Mr. Eustace Hare, Assist. General Superintendent; Mr. L. Harvey Lowe, Assist. Metropolitan Superintendent; and Messrs. A. E. Cotterell, T. A. Prout, and John Scott, M.B.E., Assist. Provincial Superintendents; Mr. J. E. Kingsbury and Mr. H. Lawes Webb, who had close associations with the old company.

Happily all those present appeared to be in good health, and there was a lively manifestation of the *esprit de corps* which was an outstanding characteristic of the relations in the days of the old company.

True, some of the heads were whiter, as might be expected with a few who have attained three score and ten or thereabouts, but the general bearings were sprightly and vigorous.

The menu, which was done ample justice to, was as follows:—

Native Oysters or Hors d'Oeuvres.

Consommé Brunoise.
Crème Windsor.

Boiled Salmon, Sauce Mousseline.

Cutlets Reforme.

Roast Capon.
Salade.

Bombe Glacé Fedora.

Dessert.

Coffee.

There was a pleasant surprise when the waitresses stated that they had orders not to take payment for the wines consumed, as that matter had been generously arranged by some donor or donors whose name or names remain unknown to the writer of these notes.

There was no toast list, but the Chairman proposed the health of His Majesty, remarking that he was sure it would be drunk with special cordiality at that time when the King was ill. The toast was drunk upstanding. At his, the Chairman's, invitation, several gentlemen spoke, after which others got up and made suitable remarks, which gradually led up to each of those present rising and saying something reminiscent and suitable to the occasion.

It was very pleasant to hear the well-known voices and to hear words characteristic of the speakers.

Altogether the re-union was a very great success, and the opinion was voiced and agreed that the gathering should become an annual one.

A special message was sent to Col. Clay, regretting his absence, which was all the more unfortunate seeing that he had played so active a part in organizing the re-union. A kindly and appreciative reply was received from him.

THE G.P.O. PLAYERS.

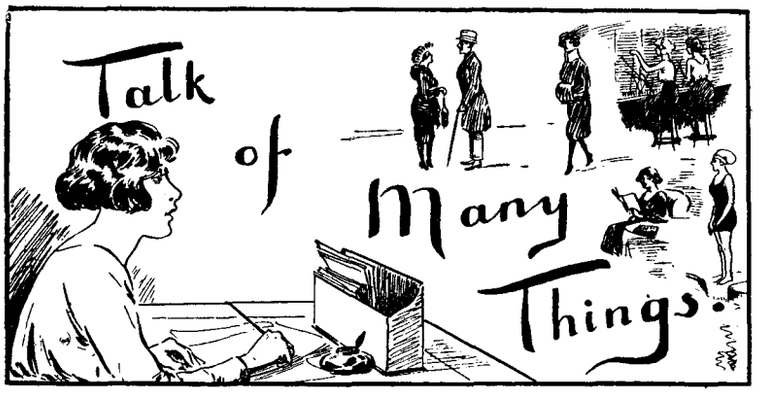
The recent revival of interest in the plays of Sheridan receives a further impetus in the production by the G.P.O. Players of "The School for Scandal," under the able direction of Miss Charlotte Davies, on Saturday, April 18, 1925, at 7.30 p.m., in the Birkbeck College Theatre, Breams Buildings, Chancery Lane. Miss Davies on this occasion will herself appear in the rôle of "Lady Teazle."

Those who were present at previous (Shakespearian) performances by the same players will welcome the opportunity of seeing them in this 18th Century Comedy of Manners, generally considered to be Sheridan's masterpiece. Added interest attaches to this production, as a prize is being offered by the City Literary Institute at its Eisteddfod in May for the best original dramatic critique of the performance.

The number of reserved seats is limited; and early application for tickets (reserved 3*s.* 6*d.* and 2*s.* 4*d.*, unreserved 1*s.* 2*d.*) should be made to Mr. J. E. White, Registry Branch, Secretary's Office, G.P.O., E.C.1. A certain number of tickets will be available at the door.

WHERE TO STAY.

WE TELEPHONISTS



"Aye, there's the rub!"

THE other afternoon a gleam of sunshine rested momentarily on my desk. I am still unable to decide which was the more remarkable—the fact that the sun shone during a London winter or the fact that my office window was sufficiently transparent to permit sunlight to enter. Faith bade me believe that there was a sun, hope encouraged me to think that I might see it again, and in face of the earnest conviction of the astronomers it was bare charity to accept their statements. But it was a much greater test of all three virtues to believe that my office window had been cleaned.

It really does not matter, however, because it is a fact that my desk and papers gleamed gold on that afternoon. It seemed to me that the sun had poked a finger at me and, having disturbed my hibernation, had beckoned me out into the open. Obediently I rose and I went out to devour a supplementary day.

When I don mud-stained tramping boots, take a stick in my hand and sling a ruck-sack over my shoulders, the world looks different, smells different, and is different. Oh, sun, if the rain comes, who cares? "We have left far behind us the dwellings of men" and "Who will o'er the downs so free." With a careless abandon I whistle, and with a cautious look round I even sing and note amusedly the mild surprise of the sheep and the astonished expression of the cows. The birds fly busily and their early twitters bring memories of the sweeter notes that are to come. The hedges, lately dormant, show specks of green, and the wet footpath, faint but familiar, climbs uncertainly up the hill. Across the valley the woods are black and the trees around are gaunt and still.

Yesterday I should have picked my way carefully and complainingly 'twixt mud and puddle; to-day I cheerfully stride through them. Yesterday I should have hated the rain; to-day I can smile at it. Yesterday I should have gone up the hill in a bus; to-day I breast it happily, and miles have a glory rather than a terror. The wind which yesterday was cold and spiteful is to-day keen and joyous, and to-day's fallen tree trunk is more welcome than yesterday's Berkeley. My ruck-sack, replete with sandwiches, fruit, and a thermos, is better than the Lucullus.

As my wife reads this I can detect a derisive smile playing round her lips. She knows intimate little secrets about me. She is aware of my views on slippers warming in the fender, bed-socks, correct suburban behaviour, the dignity of spats, and the poverty of cold mutton. She knows of the holes in my bohemian guise. And I can offer no defence save that we are all willing to sustain a great deal of trouble to gain a little pleasure, and that whether we grouse or grin depends upon whether we are working hard or playing hard.

But I think she is unfair when she suggests that I might take that other supplementary day, and share with her the rigours of spring-cleaning.

PERCY FLAGE.

We print some of the limericks submitted in connexion with the recent competition. A contributor to this column was successful in carrying off the prize:—

An Exchange girl of just the right fibre,
Used the "stile strip" to every subscriber;
But the way she said "fife"
Enslaved one for life—
And soon to resign he did bribe her!

Said a self-possessed learner named Kit,
"This job doesn't scare me a bit!
I should manage quite well
If I only could tell
A straight order wire from a split!"

There was a young fellow named Cox,
Who once used a Multi-Coin box,
He pressed button "B",
And regained two and three,
Which bought him a new pair of sox.

A ride in a 'plane takes some beating
As a means for dull Boredom's unseating;
But the climax of thrills
Will be found—though it kills—
At—a good Traffic Officer's Meeting!

There was a subscriber pedantic
Who'd a hatred for all things romantic;
From the "voice with the smile"
He would run quite a mile;
While the thought of bobbed hair drove him frantic!

The Blue Triangle Forward Movement.

An enjoyable and profitable evening was spent on a recent occasion in the Gerrard Dining Room in aid of the above funds.

Representatives from Regent, Toll, City, Central, Museum, and Bromley were present, and helped in the success of the evening. We had dancing, a sale of fancy goods, a weighing machine, raffles, bran tub and guessing competitions.

The net result from the Social was £36, of which the Committee and especially the representatives are justly proud. The total amount collected for the fund is now £50.

Miss Morgan, one of the organisers of the Blue Triangle Forward Movement, visited the Exchange and made an apt little speech. We wish all the representatives equal, if not greater success, in their efforts towards the same excellent object.

A Message from Rome.

If only I were pretty! If only I were rich! If only! If only! Oh! the sighs and groans that go up from the hearts of so many hundreds of women (and let me whisper, from the hearts of men, too) as they sit and plod away at the daily round and the common task. What useless thoughts, because if you are not pretty, no amount of wishing will make you so; and if you are not rich, well, you know you can't go and dig up a fortune at the bottom of the garden. What a hopeless state of affairs. Is it? Listen to what Marcus Aurelius has to say about it:—

> "Let it not be in any man's power to say truly of thee that thou art not simple or that thou art not good."

(No question of surface prettiness here; but beauty, real and lasting, the beauty of the soul.)

> "Love the art, poor as it may be, which thou hast learned, and be content with it."

(A hard doctrine, but one that will bring its own reward).

> "Is it not better to use what is in thy power like a free man, than to desire in a slavish and abject way *what is not thy power*?

(Again, a hard doctrine, for who is entirely free from envy, but one that is worth considering, at any rate!) L. R.

A Successful Season.

By common consent the London Telephonists' Society has added another item to its list of successful sessions. Founded originally for the reading and discussion of papers on subjects connected with the work of the Telephone Service, the great appeal of the Society to members of the Telephone craft has always been its intensely democratic spirit. To its meetings the scattered units—great and small—of a vast organisation are brought together in a common bond of Brotherhood in Service. Here the new-born Telephone maiden to whom the single-syllabled "foer" is an insoluble mystery, whose "threes" are carefully unrolled, and who views the stile-strip method as an ingenious device for stripping numbers of their style, may meet on a common level the austere Traffic Officer, with his furrowed brows "sicklied o'er with the pale cast of thought;" in his eyes a far-away look born of midnight revels with the elusive Calculus of Probabilities; weary of "pulsing in" and "pulsing out" of the phantom "network" which the ingenious Mr. Strowger and his merry men have already thrown over a bewildered London! It is in juxtapositions of this kind that one of the great charms of the Society lies: here extremes meet—and meeting, lose their sense of separateness.

It is not surprising therefore that the social side of the Society has developed—and is developing; and that without detriment to its more technical side. The past session gives evidence of this and of our members' catholicity of taste, for the centres of attraction at the two meetings at which records were broken were Mr. Thwaites' admirable paper on Automatics, and Miss McMillan's delightful telephone play "As You'd Like It—or Much Ado About Something"—each complementary to the other in the nature of its appeal. The last-mentioned item—the presentation by the Society of a play with music—was unique. Its success was unprecedented, and like Oliver Twist, the Society will doubtless ask for more. Many members have already done so, and are looking forward to a repetition of the play next session.

Reference to the more social side of the Society's activities would be incomplete without mention of the Annual Dance, which, thanks to the untiring efforts of the Dance Committee, repeated its successes of previous years. More than this it could not do.

Everyone is looking forward to the setting up of further records next session under the presidency of Mr. White, of the Lines Section, Traffic Branch. The intention of the Society—the expression of a common brotherhood in the service—is one which appeals to all; and, with this central idea, there is no doubt that with the help of its members both in missionary work and the contribution of papers for the Papers Competition the Society's position in the minds of all members of the London Service will strengthen as the years pass. (XVI)n.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

LONDON TELEPHONE SERVICE NOTES.

The London Telephonists' Society.

The members of the London Telephonists' Society held their final meeting of the session at the London Central Y.M.C.A. on Friday, the 6th instant, which was well attended.

As usual the proceedings opened with a half-hour concert, the items—which on this occasion were entirely instrumental—were provided by Mr. H. A. Warton and Mr. M. W. Clarke, who delighted the audience with cornet and banjo solos. Pianoforte solos by Mr. L. G. Hawker and Miss Clarke were equally enjoyed.

The principal feature of the evening was the reading of four "prize" papers written by successful competitors in connexion with the Society's Annual Competition. The papers, although short, were well written, well read and well received.

It was generally regretted that Mr. Valentine was unable, in consequence of his illness, to attend this meeting and distribute the prizes as is his usual custom, but neverthe'ess everyone present was glad to welcome Mr. Napier who kindly took his place and distributed the prizes awarded to the successful competitors.

Members will be glad to learn that Mr. W. J. White was unanimously elected President of the Society for the 1925-26 Session.

* * * *

At Random.

The compiler of these notes depends, as a rule, upon the various social and semi-official events to provide enough material to fill a page of the *Journal*, but this month, for some unaccountable reason, there is a shortage of supplies and he has perforce to make a frantic hunt round.

What has happened recently in the L.T.S. ? A mishap in the Tele. Exchange. Good ! Not, of course, good that there was an accident, but the incident comes to the rescue of the compiler. Well, what happened is that in the night of Saturday, March 7, a flaw developed in one of the radiators connected to the hot-water heating system and caused a flood in the cloakroom. A cable run between the floors served for drainage with the result that a large number of cables between the apparatus frames and the switchboards became saturated with water, and many of the central positions and most of the incoming positions were rendered unserviceable.

The engineers were quickly on the scene and were soon busy attempting to dry the cables with the aid of a number of electric radiators. This proved a slow job and there was no prospect of removing the trouble by Monday morning. There was sufficient equipment in order to enable the week-end traffic to be handled, but something had to be done if the public service was to be maintained without interruption. Something was done. A large number of incoming Toll circuits were transferred to Central Exchange. Suitable day and night staffing arrangements were made, and by the time Monday morning came round, everything was in readiness for the full flood of traffic.

It is rather interesting to reflect that whereas adequate precautions are taken to guard against an outbreak of fire, an outbreak of water (if it may be put that way) does not appear to have been contemplated. However, all's well that ends well.

* * * *

A few remarks on telephone traffic in the London area may not be out of place. The 447,180 telephones are producing about 8,600,000 calls a week. This is fairly good going and is more than half a million better than this time last year. By Easter it is anticipated that the nine million mark will be passed. One may perhaps be permitted to take a leaf out of the journalist's book and speculate how far these calls would reach if placed end on end. The answer is 53 years and some odd days.

* * * *

The annual influenza epidemic is a source of annoyance to most people, but is especially inconvenient where large staffs are concerned. It is an anxious job weighing the absentees against the reserve force. A sigh of relief escapes the observer when the curve flattens out, a smile appears when the curve takes a downward tendency, and a groan follows when it makes a further upward spurt before its final descent. Fortunately it can be recorded that the reserves were adequate for the occasion, and the effective force remaining in the exchanges was more than equal to the demands of the service.

* * * *

"Christmas Deferred."

The season of Yuletide festivities is over for most folk, but the children of the Wright-Kingsford Orphan Home were fortunate one Saturday in February last in having provided yet another Christmas party by a small section of the Finchley community, which is usually overlooked because it plays its part so much in the background. The Supervisors and Staff of the Finchley Telephone Exchange have been waiting for an opportunity of sharing their Christmas joys and expressing their corporate Christmas sentiment of good will to that other small section of the Finchley community residing in Granville Road, and it was not until that Saturday that the usual Christmas tea and party could be arranged. It was evident that the children had not lost the "Christmas feeling." They sat down to the feast of good things which was provided and served by the ladies who say "Number, please," with a keener zest than they would have had if it had been preceded by a Christmas dinner. What a lovely cake—a lighted candle for every child ; what gorgeous buns ; what dainty sandwiches—scrumptious !

Tea being served, the floor was quickly cleared for games and fun, and it was difficult to say who enjoyed these most—the hostesses or the guests. All went *rollicking on* the floor together in the fine old children's games. There wasn't one who didn't know the game—all joined in and sang and danced, and screamed with delight in the good old-fashioned way. The recitations and songs, which, as an interlude some of the tiny tots were able to render, was a tribute to the care and interest that is taken in the children as individuals by the Principal and Assistants in the Home.

But the greatest fun and pleasure of all came when the door opened and there appeared a young lady dressed as a pierrot—a perfect pink pierrot smothered all over with toy balloons and drawing a beautiful sleigh on which was loaded heaps and heaps of wonderful dolls and toys. A present for every child in the Home, and for every child by name. There was no general post about it. Every doll or ball or parcel was the individual gift of an individual telephonist to an individual orphan, who had been selected by name and to whom a separate little poetic note was written. During the evening it was interesting to see each little toddler being fostered and fondled in the intervals between the games, by the operator who had selected Mary, Joan, or Peggy, or whoever it might be, as her own particular protégée.

MR. R. L. DAVISON, TRAFFIC SUPERINTENDENT, CLASS II, NEWCASTLE-ON-TYNE.

One of the most successful and enjoyable Post Office functions held in the Newcastle district for a long time was that on Feb. 21, at the Central Exchange Hotel, when Mr. R. L. Davison, Traffic Superintendent, Class II, was presented with a diamond ring, and Mrs. Davison with a solid silver tea service, on the occasion of Mr. Davison's retirement after 46 years' service in the Telegraphs and Telephones.

The chair was occupied by Mr. J. D. W. Stewart, District Manager, and the presentation was made by Mr. J. Gwyther, Traffic Superintendent.

The gathering which was drawn from all sections of the Post Office, to do honour to Mr. Davison, included Mr. J. R. M. Elliott, Superintending Engineer, and Messrs. Pickering and Cunningham, Telegraph Branch, Members of the Telephone Supervising and Operating staffs, were present.

Letters were read from Mr. Le Fevre and Mr. Bainbridge apologising for inability to be present, and in the course of the evening a telegram conveying best wishes was received from Mr. Charles Anderson of the Headquarters-Traffic Section.

Several speeches were made testifying to Mr. Davison's sterling qualities, to which he suitably and ably replied.

An excellent entertainment was provided by friends from the Sorting Office and Telegraphs, and Mr. Will Knowles' Domino Concert Party.

A PARTING.

On Friday, March 13 (fateful date !) a large number of friends and colleagues of Miss A. J. Taffs, Assistant Superintendent of Accounts (Division B), London Telephone Service, assembled to bid her "Good-bye," and to present her, on the occasion of her approaching marriage, with some token of the high regard and esteem in which she is held. A ceremony with a parting as its *motif* is never a pleasant one, and when the departing person is as popular as is Miss Taffs, the regret is trebled.

Miss Taffs had endeared herself to all with whom she came in contact, by her great charm of manner, her keen wit, and her unfailing tact, and by the scrupulous fairness which she brought to bear on any problem submitted to her. She will be very much missed by all.

Miss Liddiard referred to the invaluable assistance that she had always received from Miss Taffs, and to her bright and cheery outlook, which was a very great asset.

Mr. Dive, to quote *Horace*, "consumes in his brilliancy," and was successful, as usual, in extracting smiles from the audience instead of sighs. He made many happy allusions to Miss Taffs, and, referring to Miss Liddiard's remark that in the competition by which Miss Taffs entered the Service, she had come out seventh in 1,000, said that Miss Taffs had now broken her own record, as in the competition by which she left the Service, she had achieved the remarkable distinction of coming out first in seven million ! He then informed an indignant, albeit highly amused, audience (consisting mainly of the shingled sex) that Miss Taffs, having supervised 500 girls, was about to supervise 1 man, thereby proving conclusively that 1 man is equal to 500 girls ! "We had no need for that hypothesis."

But our jesting was merely a mask to hide the penalty of all friendship :—

"Farewell ! a word that must be, and hath been,
A sound which makes us linger—yet—farewell !"

J. McM.

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TELEGRAPH AND TELEPHONE MEN.

XVI.—MR. L. SIMON.

MR. LEON SIMON, Assistant Secretary in charge of the Inland Telegraph Branch of the Secretary's Office, was born in 1881 and educationally is a product of that famous school, the Manchester Grammar School. In 1900 he went to Balliol College, Oxford, where he was Ireland and Craven Scholar. In 1904 he entered the Higher Division of the Civil Service and was assigned to the Post Office. During the past twenty years he has served in every branch of the Secretary's Office and, as a consequence, his knowledge of Post Office administrative practice is unusually extensive.

[*Reproduced by kind permission of the Editor of "St. Martin's-le-Grand."*

Mr. Simon has taken charge of the Inland Telegraph Service at a critical stage in its history. It, like all telegraph and some other public services, is passing through a bad time, due mainly to trade depression, and it is fortunate that, at such a juncture, a man of Mr. Simon's calibre has the control of its destinies.

Despite his assiduity in his official duties Mr. Simon finds time for other activities. He is, for example, an authority on the Zionist movement. What he does he does thoroughly, and that characteristic forms a happy augury for the telegraph service.

NOTES ON TELEGRAPH PRACTICE.

BY G. T. ARCHIBALD.

V. *Concerning the Telegraph Counter Clerk and the Act of Acceptance of Telegrams from the Public.*

A TELEGRAPH counter clerk is necessarily expected to be qualified to deal with every class of telegraph business. Although supplied with all the requisite rule books, &c., he must, if he is to perform his duties to the satisfaction of the public and with credit to himself and to the Post Office, possess such a knowledge of the regulations, tariffs, &c., as to render himself independent of rule books except in extreme and unusual circumstances. He *is not, and cannot be, expected to memorise the many different* rates for foreign telegrams: these are published in the Post Office Guide. Copies of this book are available at every telegram accepting point, so that in the majority of cases no time need be lost in assessing the charge for a telegram addressed to the most remote part of the world.

A recent addition to the information contained in the Post Office Guide is the list of the principal places abroad to which telegrams are sent. The office of destination in the first column of the list, e.g. Broken-Hill-New-South-Wales, is shown as it appears in the International (Berne) list of Telegraph Offices, and is, therefore, chargeable as one word according to the rule quoted in Chapter III. As the list contains the names of places to which 80% of the foreign telegraph traffic is forwarded, reference to the Berne list and its numerous annexes is avoided in all but a few cases.

Not every Post Office is a telegraph office; the counter clerk knows that an address ordinarily used for letters is not necessarily correct or sufficient for telegrams, and that he must satisfy himself that the address of every telegram handed to him is a proper address for telegraph purposes. If he is in doubt he must consult the Post Office Guide—the counter clerk's friend—which contains a list of all Postal and Telegraph Offices in Great Britain and Ireland.

In this list the name of an office is sufficient in the address of a telegram without the addition of a post town or county unless the name (*a*) appears in the third column followed by the name of a post town or county or (*b*) is printed in *italics*, in which case the name of the post town must be added. Exceptions are shown in the third column prefixed by the symbol †. The following are examples :—

Name of Office and Postal address.	Character of Office.	Nearest Money Order Office (M) Tel. Dely. Office (T). Exceptional Hour of Tel. Business.
Burgh, Lincs	† **Ex. MT.**	—
Burgh, Woodbridge, Suffolk ...	—	Grundisburgh, M.T.
Burley, Brockenhurst, Hants	† **Ex. M.T.**	Burley, Hants. T.
Burley, Leeds	**M.**	—

Since 1870, when the telegraph service was transferred to the State, the charge for telegrams has, usually, been brought to account by means of adhesive stamps or labels affixed to the originating or "A" form. Postage stamps were used from 1870 until 1875, but early in the latter year distinctive stamps of the value of 1*d.*, 3*d.*, 1*s.*, and 5*s.* were introduced, it being assumed that by this means telegraph revenue would be more readily assessed than would be the case if postage stamps were used. Later it was found that telegraph receipts could be ascertained by an examination of the "A" forms, and in 1881 the special telegraph stamps were superseded by the ordinary postage and revenue stamps. The philatelist, and perhaps the telegraphist, may regret the passing of the telegraph stamp, but the present arrangements are satisfactory from a public point of view, and in these day of Insurance stamps, War Savings Certificates, &c., the counter clerk may be very well pleased that the telegraph stamp is no more. That this system of accounting is a satisfactory check on telegraph receipts is proved by the fact that it has stood the test of time and that so far no very serious effort has been made to make any alteration. It is a simple system and one which provides proof of each transaction. At the cost of one penny the sender of a telegram may be supplied with a receipt for the amount paid; there is not, however, much demand for this form of acknowledgment.

Mr. Lee referred, in his book, to the possible introduction of a machine which will stamp the form with the chargeable amount &c., such instruments having already been developed in America. Within the last few years machines of this kind have been introduced at telegraph counters in Australasia and India, but it was not until 1923 that a serious attempt was made to utilise mechanical accounting in this country. A small cash register capable of recording amounts up to £4 19*s.* 11*d.* was obtained and installed at a busy London office. The trial was not entirely satisfactory and the machine was transferred to the Fish Docks Branch Office, Grimsby, where, owing to the peculiar features of the traffic, it again proved unsuccessful. These failures were due solely to the traffic requirements of the offices concerned and not to any deficiency in the machine, which was next tried at Nottingham. The result at that office was so far encouraging that a second machine was purchased and installed at the Telegraph Office at the British Empire Exhibition. Further experiments are now being made.

What are the advantages of mechanical accounting, from a telegraph point of view? In the first place the sender of a telegram is relieved of the necessity for stamp licking or damping; reports on the experiment show that the public appreciate the change. The machine records the charge on the "A" form, and registers it on a running record strip. It prints on the form the name of the office of origin, the date, the serial number of the telegram, items in the acceptance of a telegram which were formerly entered separately by hand. All that the counter clerk is called upon to do is to insert the official handing in or code time. At the end of the day the total amount received is obtained from the running record and the total number of forms passed through the machine is indicated also. The running record is transferred along with the cash to the accountant. Under this system the counter clerk is not required to carry a heavy stamp stock which he must check at the end of each day, and renew each morning; separate dated stamps, serial numbering machines and forms and ink pads are dispensed with, and the whole process of dealing with telegrams is appreciably expedited. Telegrams bearing stamps when handed in are passed through the machine for date stamping and serial numbering, but the charge is not of course recorded on the running record. The trials have proved satisfactory in a few cases, but it would obviously be uneconomical to instal cash register machines at offices carrying only a small telegraph traffic, and the future of this form of telegraph accounting is problematical. If, however, a cheap and efficient machine were available development might be rapid.

The form of acceptance of telegrams next to be consideerd is that of telephoned telegrams. As has already been stated every telephone subscriber can make arrangements with the Post Office to pass his telegrams by telephone. All such telegrams, whether forwarded by the subscriber or dictated to him, are called "Phonograms." As a rule only Head Post Offices are authorised to accept phonograms, these offices being known as "Appointed Offices." The appointed office for any subscriber may be the Head Post Office in his district, or it may be that the subscriber is connected to a more distant office in order that a telegraph transmission may be saved and the telegram expedited. Telephone subscribers are, however, allowed to telephone telegrams to offices other than their appointed offices, on payment of the appropriate trunk telephone fees.

The office of origin of phonograms is the appointed office. In order to distinguish between a telegram handed in at the counter, and one dictated over the telephone to the Head Post Office in the town in which the subscriber's exchange is situated the usual practice is to use an indicator letter "T." Thus, the office of origin of a telegram handed in at the Birmingham Head Post Office counter is "Birmingham," and that of a telegram dictated by a Birmingham subscriber or over a Birmingham Call Office circuit is "Birmingham T." Phonograms received at one appointed office from a subscriber connected to a telephone exchange outside the Town Postal Area of that office, bear the name of the place in which the exchange is situated as the "Office of Origin" followed by the code letters of the appointed office, e.g. Eastwood NG. This means that the telegram is sent by an Eastwood subscriber and is written down at Nottingham. The code has no significance to the public, but its use facilitates the treatment of such telegrams in the Post Office.

A subscriber wishing to send a phonogram asks his exchange for "Telegrams" and is at once connected to the Phonogram Room at the appointed office where the operator, who writes down the telegram on a distinctive form known as the A2 form, plays the part of counter clerk. She must possess a good knowledge of telegraph tariffs, and all the rules regarding the acceptance of telegrams, and except in the case of foreign telegrams, must enter the appropriate charge on the A2 form and also on the ticket used for accounting purposes. This ticket contains spaces for the name of the exchange, the number of the telephone subscriber, the destination of the telegram, and the date of the transaction. It will be obvious that special care is necessary in dealing with phonograms, so that the particulars are correctly entered on the accounting ticket in order to avoid the possibility of charging one subscriber with the cost of a telegram sent by another subscriber.

Before the subscriber commences to dictate his telegram, the name of his exchange and his telephone number must be obtained and be carefully repeated, and the particulars entered on the accounting ticket. The sender is asked to spell all proper names and difficult words and numbers, and, when dictation is completed, and in order to reduce the liability to error through phonetic difficulties, the telephonist is required to repeat the message to the subscriber, spelling by analogy words and letters with similar sounds. The following list of words suitable for purposes of anlaogy is generally adopted, but strict adherence to these words is not essential :—

A—Alfred.	N—Nellie.
B—Benjamin.	O—Oliver.
C—Charlie.	P—Peter.
D—David.	Q—Queenie.
E—Edward.	R—Robert.
F—Frederick.	S—Sally.
G—George.	T—Tommy.
H—Harry.	U—Uncle.
I—Isaac.	V—Victor.
J—Jack.	W—William.
K—King.	X—Xmas.
L—Lucy.	Y—Yellow.
M—Mary.	Z—Zebra.

The accounting tickets for phonograms are passed ultimately to the District Manager, Telephones, so that the charges for the services may be included in subscribers' monthly accounts.

The procedure involved in the acceptance and accounting of telegrams passed over private telegraph circuits and Call Office telephone circuits is similar; but deposit accounts in connexion with telegrams handed in at a Post Office counter are prepared by the local postmaster.

From the point at which the stamps are affixed by the sender, in the case of a telegram accepted at the telegraph counter and at which a phonogram has been repeated back to the subscriber by the receiving telephonist, the treatment of all telegrams is similar in all respects. A telegram is not regarded as having been formally accepted from a member of the public until the stamps have been affixed by the sender, and the form has been returned to the counter clerk (see Chapter 2). The counter clerk must then enter the time of acceptance in figures in the space provided at the top of the "A" form; this space is indicated by the word "Code." Code time (see Fig. 1) consists of an arrangement of letters designed to abbreviate Morse telegraph symbols, the Morse symbols for figures being somewhat cumbrous.

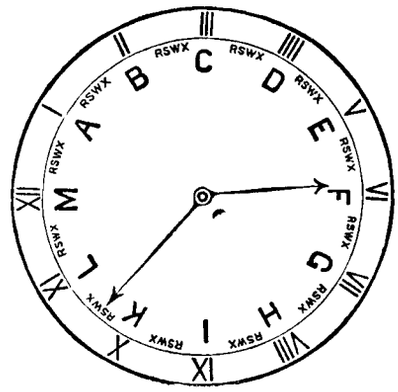


FIG. 1.—Diagram of Code Symbols.

Formerly it was the practice to record the time in code on the "A" form, but in 1918, owing to the fact that clock time was shown on phonogram A2 forms, it was decided that for the sake of uniformity the clock time should be shown on all "A" forms.

The counter clerk having accepted and timed the telegram must then cancel the charge stamps by means of the office dated stamps, an impression of which is also made in the space for Office of Origin, and place a serial number in the space provided at the top right hand corner of the form. At the larger offices numbering machines are used for serially numbering the forms. At the smaller offices a "numbering sheet" is used, a number being crossed off the sheet for every telegram handed in. After the form has been numbered the telegram is placed either in a tube carrier or shute, for conveyance to the telegraph instrument room. At offices where the telegraph circuit is at the counter, the form is merely passed on by hand. It is then ready to make the first step on its journey to its destination, a journey which will be fully described in subsequent chapters.

The numbering of telegrams is a simple-looking matter, but very great care must be taken in numbering, as precise records are required by the Comptroller and Accountant General. Each telegram as handed in must be numbered consecutively, and multiple address telegrams must be given only one number irrespective of the number of addresses.

It will be clear from this description that the counter clerk is an important link in the chain of telegraphic communication, and that he or she must absorb and be able to use a considerable amount of information, especially at the larger towns where both home and foreign commercial telegrams form the bulk of the traffic.

The counter clerk must see that all the words of a telegram are legible before passing it to the Instrument Room, he must warn senders of telegrams handed in after 6 p.m., if for offices which close at 7 p.m., that they may not be delivered before the next morning; he must be able to answer the thousand and one questions which are addressed to him; he must be courteous and helpful to all his customers, and he must be prepared to act as guide, counsellor and friend to visitors from abroad and to those who use the telegraph only under the stress of domestic anxiety and grief. If the counter clerk is a student of human nature he will find enough in the daily display of emotions which he is called upon to witness to provide him with food for study in his quieter moments, and although at times he may feel that his craft is being used for improper purposes, he will be satisfied in the end that it is also a powerful agent for good.

THE POST OFFICE AND AUTOMATIC TELEPHONES.*

BY COLONEL T. F. PURVES, O.B.E., M.I.E.E.

Continued from page 134.

(4) LAYOUT OF EXCHANGE POSITIONS AND EXTERNAL LINES.

The determination of the most economical number and location of exchanges to serve a telephone area involves an exhaustive study of all the costs of providing and maintaining external and internal plant and buildings, and also the cost of operating the plant. This is necessarily prefaced by development studies of all parts of the area, and general traffic estimates, extending many years ahead. Comparison of the costs of alternative schemes is made on the basis of annual charges, capital cost being converted into interest and depreciation and added to the direct annual costs of maintenance and operation.

The main items of cost to be considered in designing the layout are represented by :—Subscribers' lines, junction circuits, exchange buildings, equipment and power plant, "A" (answering) operators, "B" (junction) operators.

An increase in the number of exchanges reduces the area to be served by each of them, and consequently reduces the cost of subscribers' lines, both by shortening their average length and by enabling standard transmission efficiency to be attained by the use of a lighter gauge of copper wire. On the other hand, it increases the requirements for junction circuits, buildings and power plant. The optimum number of exchanges is represented by the layout which reduces the summation of all these costs to a minimum.

The number of exchanges required for the most economical service of an area on the automatic system differs materially from that required for the service of the same area on the manual system.

The main reason for this is the fact that junction circuits can be provided much more freely in an automatic system, since they do not carry with them the heavy operating costs which accompany their use in a manual system. In the automatic case only the plant costs of the junction system come into the calculation, and fuller advantage can therefore be taken of the economies represented by shortening the subscribers' lines. As a consequence, the adoption of automatic service in any large area generally involves an increase in the number of exchanges and a reduction in their average capacity.

The foregoing does not apply to portions of an area in which the telephonic density is such that exchanges of 10,000 lines' capacity are justified under either system. This number of lines happens to represent the practical limiting capacity of both manual and automatic exchange units, the limit in the manual case being the maximum number of connecting points which an operator is physically able to reach, and in the automatic case the decimal limit of the number of lines ever required at one point. The theoretical locations of exchanges in a dense city area are therefore the same for both systems. In either case two or more 10,000-line units are housed in the same building if convenience so dictates.

The economies in line plant that can be realised in a properly laid-out automatic system, as compared with a good layout on a manual basis, are considerable. Calculations made about three years ago in connexion with the layout of the London area showed that the costs of the line plant for the automatic system, at or about the year 1945, would be nearly 30% below those of a manual system.

In the matter of exchange buildings the automatic system also enjoys a certain advantage. Accommodation for operators is not required at many of the smaller exchanges, while at larger centres, where provision is made for inquiries and certain classes of traffic to be dealt with by operators, the amount of such accommodation required is comparatively small. The plant serving a given number of lines can therefore be housed in smaller and cheaper buildings. This advantage is partly discounted by the fact that the average number of lines per exchange is less in the automatic system, and more buildings are required than would be the case in a manual layout. In general, the cost per line of small buildings is greater than that of larger buildings, but it is found that the automatic system introduces an overall economy of about 13% in the cost of exchange sites and buildings. The total economy in external line plant, sites and buildings, which may be credited to the automatic system is about 23% as compared with the manual system.

Reduction in the size of exchanges below a critical figure of about 3,000 lines also increases to a certain extent the cost per line of power plant and of automatic switching equipment for handling a given amount of traffic. These factors therefore tend, so far as they go, to keep up the size of exchanges of smaller capacity than 3,000 lines. In this respect automatic conditions differ markedly from those of the manual system, in which the high cost of the multiple equipment and its cabling causes the cost of exchanges, per line, to increase very rapidly with their size; this increase is, of course, much more than counterbalanced by the economies in junction working which attend the gathering up of the lines into large exchange groups.

The methods of calculation adopted in determining the layout of automatic exchange areas can be referred to only briefly.

The telephone system in this country is laid out in local fee areas covering all territory within a radius of 5 miles of a main exchange, with the exception of some of the largest towns which have a greater radius, up to 10 miles in the case of London. It is usual to consider the layout for one of these areas as a whole, but in making a detailed study the area has, of course, to be divided up into small portions, each covering the maximum territory that might be served from one exchange. The costs of serving this portion from one, two, or more exchanges are then calculated, and the most economical arrangement ascertained.

In order to calculate quickly the economical layout of various telephone areas it is first necessary to prepare graphs showing the cost variation of each of the following items for different sizes of exchange :—

(*a*) Subscribers' lines.

(*b*) Junctions to carry traffic which would be created by increasing the number of exchanges serving each portion of the area, as explained above (these will be referred to later as "local junctions").

(*c*) Junctions to other exchanges, in so far as they vary with the size of exchange.

(*d*) Building and power plant.

Other costs, such as that of subscribers' instruments, are independent of the size of exchange and therefore do not enter into the calculation.

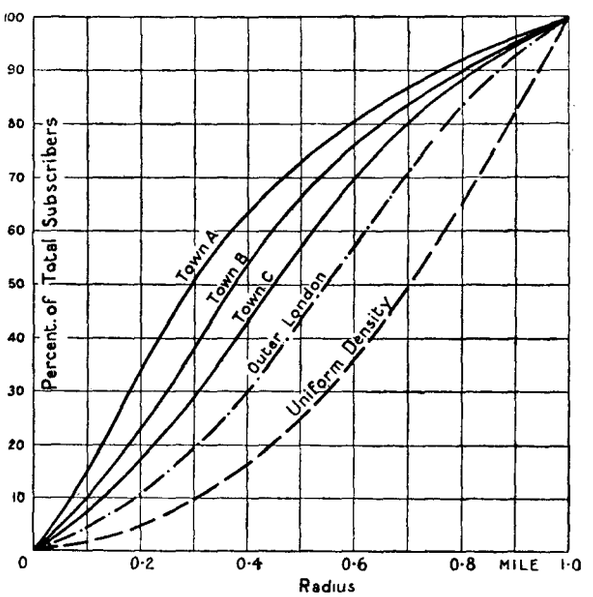


FIG. 3.—Number of Subscribers within various radii shown as percentage of subscribers within 1-mile radius.

In applying these factors to the problem of determining the most economical size of exchange in areas of various densities, they are all expressed in the form of annual cost per subscriber's line and plotted against the size of exchange.

The calculation of the cost of the subscribers' line plant is somewhat complicated, but certain approximations can be made which simplify the work considerably. To determine the basic costs involves numerous calculations of the capital costs of various cable routes comprising different types of cable and different numbers of ducts laid under all classes of roads, with additions for overcoming difficulties depending on the particular locality being considered. From these and investigations into the lives of the various components of the plant, the interest and depreciation charges are derived. An allowance for maintenance is then added giving the total annual cost per mile of each type of circuit. Fig. 3 shows the distribution of subscribers in a few typical cases, expressed as percentages of the total within a 1-mile radius of the exchange. The curve for "uniform density," which is of course the simple geometrical curve representing increase of area, gives the largest percentage of subscribers in the outer portions of the area and represents one extreme condition. The nearest approach in practice to uniform distribution is found in the central districts of large cities. The curve for the districts of outer London, which is also shown, approaches more closely to the curves for smaller cities. The other curves represent towns in which the density diminishes, in various degrees, from the centre outwards. The curve most nearly representative of the area being studied is taken.

From this graph, curves are prepared showing the average length of subscribers' lines within any maximum radius, due allowance being made

* Paper read before the Post Office Telephone & Telegraph Society of London.

for the difference between route mileage and radial mileage. Owing to the fact that the cable routes have to follow the lines of streets, the route distance is much in excess of the radial, and generally the ratio is highest for the lines nearest to the exchange. From an analysis of a large number of exchange areas an average ratio of route to radial measurement at various distances from the exchange has been arrived at and is used for working purposes.

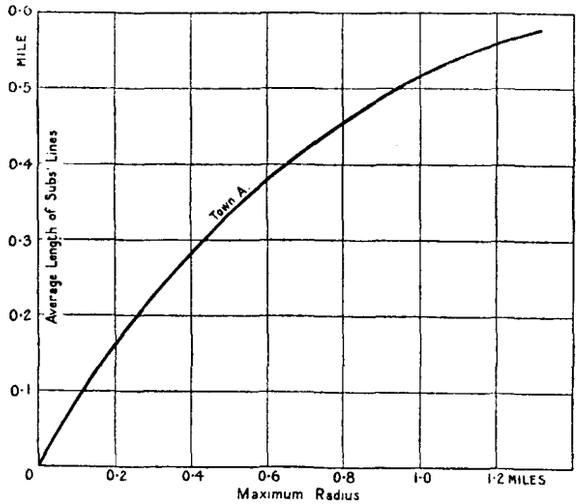


FIG. 4.—Average lengths of subscribers' lines within various radii.

Fig. 4. shows as an example the curve for an area similar to town A of the previous figure. From such curves and the cable cost per mile, the average cost per subscriber's line is ascertained.

The number of junctions required depends upon the traffic, which can be estimated from records of the traffic under existing conditions, and upon the number and methods of connecting the outlets from selector switches used in the switching system adopted. In estimating the cost of these junctions due allowance must be made for the various gauges of conductor necessary to give the required transmission efficiency, and for loading where this proves more economical than the provision of heavy conductors; the limits of resistance imposed by switching and signalling requirements have also to be taken into account. Detailed capital costs have been estimated for each of the types of cable necessary and the annual costs per mile of circuit have been arrived at as described previously. In this manner a curve showing cost of junctions against size of exchanges for any particular area can be prepared.

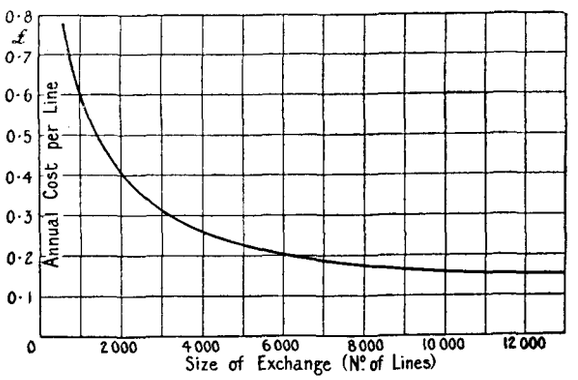


FIG. 5.—Annual cost of automatic exchange buildings.

Fig. 5 shows combined building and power plant costs based on statistics of a large number of existing exchange buildings. It has been necessary to ascertain capital costs of sites and of buildings specially designed for automatic exchanges, with all incidental accommodation. On this the interest and depreciation are calculated, and the charges for maintenance, cleaning, heating, &c., are added.

The annual charges for the power plant are arrived at in a similar way. For automatic exchanges over about 3,000 lines the cost of power plant, maintenance, &c., is practically the same per line; but as the size of exchange decreases, this cost increases, as already mentioned. Hence the 3,000-line exchange is taken as a datum point and only the excess cost for exchanges of smaller capacity is brought into the graph. The curve shows that the accommodation cost for exchanges of 1,000 lines is about 12*s.* per line per annum, reducing to about 4*s.* per line in the case of the largest exchanges.

The first step preparatory to dealing with the layout of an exchange area is to have a detailed development study made of the whole area to ascertain the number of subscribers likely to be obtained in the future, and their distribution. The Post Office practice is to have these forecasts plotted on plans to show the number of subscribers anticipated in each small portion of the area, say in sixteenths of a square mile, at 5, 10, 15 and 20 years ahead. In the case of an ordinary provincial town an inspection of this plan shows that there is always a fairly definite business centre where the telephonic density is high, falling off rapidly towards the suburbs. This condition calls for a large exchange in the centre, the best position for which is generally more or less obvious, and this may be surrounded by one or more rings of small exchanges. The most economical position of the central and adjacent exchanges is then determined by inspection and a comparison of the costs of two or three alternatives.

Although the process is necessarily laborious, involving a large mass of calculations, an engineer experienced in this class of work can, within a reasonable time with the aid of these curves, work out the most economical layout for all but the largest towns.

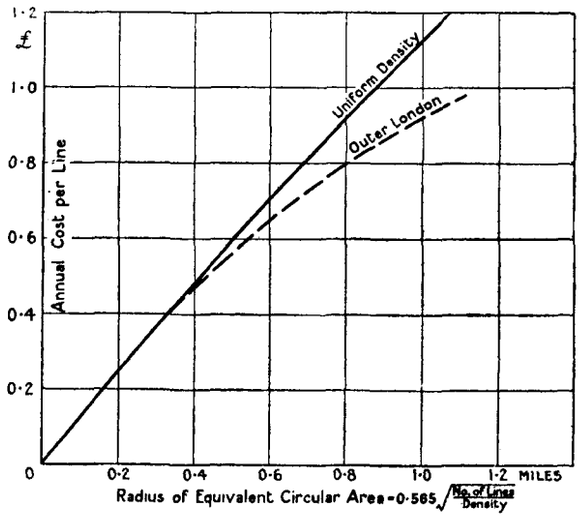


FIG. 6.—Annual cost of lines in various areas.

In dealing with the larger towns, however, especially London, such a method would be unwieldy, and therefore the problem has to be attacked in a more indirect manner. It is assumed that the density, or number of subscribers per square mile, will be fairly uniform over the small portions of the area to be studied in separate detail, which in the central part of the area is reasonably accurate. In order to relate the average length of a subscriber's line, and therefore the cost, to density and size of exchange, the graph shown in Fig. 6 has been prepared, based on Fig. 3 and the average cable costs.

It will be noticed that the base of the graph is the radius of an equivalent circular area, not the size of exchange as in other graphs. This is found convenient for purposes of calculation because it combines the two independent variables, size of exchange and density. Numerically, the density is the number of subscribers per square mile.

In practice, of course, the exchange area is never circular but, provided it is not very irregular and the exchange is properly placed at the telephone centre (that point which makes the total mileage of wire a minimum), the assumption introduces no serious error.

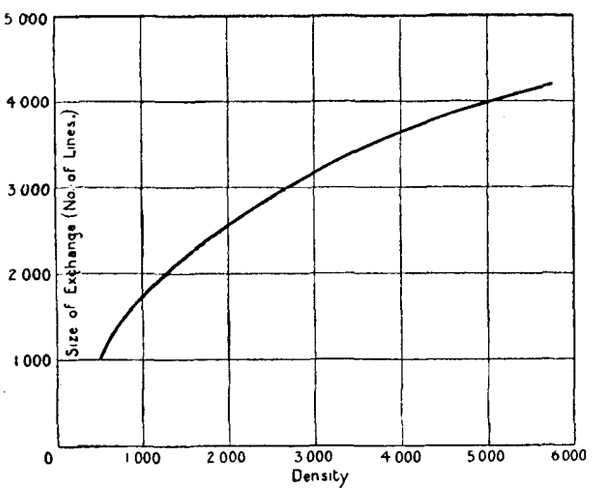


FIG. 7.—Economical sizes of exchanges for various densities.

By means of this curve and the curves for junction and building costs already referred to, the economical size of exchange to serve an area of uniform density is arrived at, and a further curve Fig. 7 can then be prepared giving the economical size of exchange for each density. Having this curve and the map showing the densities, the areas and location of the exchanges can then be set out, corrections being made for non-uniformity of density and other special conditions.

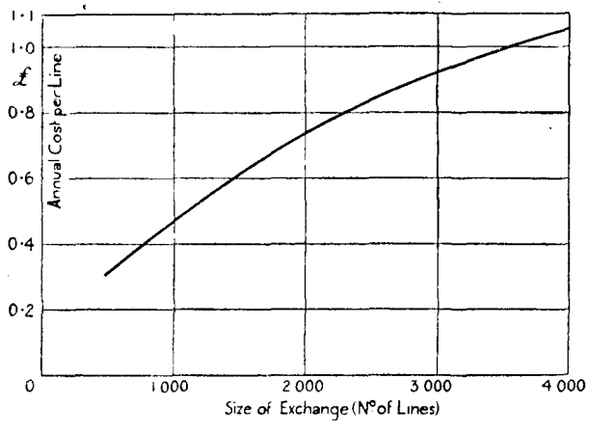


FIG. 8.—Subscribers' line costs for density = 1,500.

The application of the method may be illustrated by taking a typical area having a density of 1,500 subscribers per square mile. Fig. 8 shows the costs of subscribers' lines varying with the size of exchange, obtained from the curves already prepared. Fig. 9 shows similarly the cost of junction lines. The curve of total costs, Fig. 10, shows that for a density of 1,500 the economical size of exchange is about 2,000 lines.

It will no doubt be appreciated that this process represents only the first step in a case where an automatic system has to be grafted into an existing manual system. Allowance must be made for such factors as the layout of existing plant and the necessity for replacing each portion of the manual system only when it is economical to do so. This involves many considerations which it is unnecessary to detail here, but which all add to the complication of the problem confronting the engineer responsible for the layout of an exchange area and the economical introduction of the automatic system.

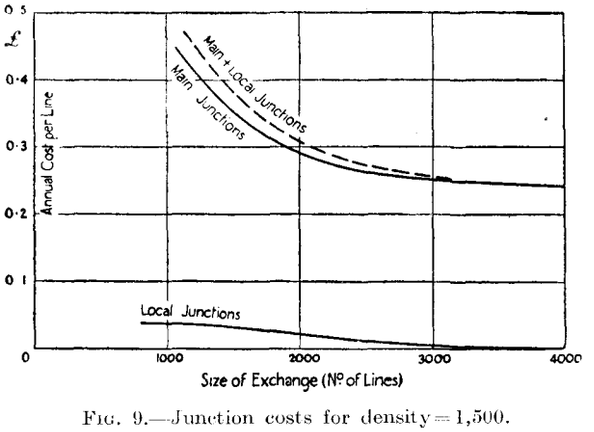


FIG. 9.—Junction costs for density = 1,500.

(5) CALCULATION AND LAYOUT OF INTERNAL PLANT AND WIRING.

After the position and capacity of a required automatic exchange have been settled, and a particular system has been chosen for adoption, there still remains many intricate problems to be studied and solved before the details of exchange design and specification can be matured. Subscribers' lines have only a small amount of apparatus allotted to the individual service of each. The great bulk of the exchange switching equipment consists of apparatus provided for the common use of all subscribers; its quantity depends upon the volume of traffic to be carried, and not upon the number of lines. There are many alternative ways in which the enormous number of selectable outlets involved may be grouped, and very careful calculation and planning are needed in order to arrive at the best economic layout and to ensure that the amount of switching plant at all points in the system shall be adequate to the requirements of the traffic without wasteful over-provision anywhere. It is necessary to prepare data of anticipated traffic for all classes of calls, and the average probable duration of the calls, known as the "holding time," has also to be determined. The amount of switching plant which will be simultaneously held in occupation during the busiest hour of the day depends on the product of "busy hour calls" and "holding time." This is expressed in what is known as "traffic units"—a term now standardized by the British Engineering Standards Association—in which holding time is reckoned in hours. Thus if each subscriber in a group of 100 makes, on the average, two calls during the busy hour, with an average duration of 3 minutes, the traffic originated will be $(100 \times 2 \times 3)/60 = 10$ traffic units. In other words a traffic unit represents the equivalent of one hour's occupation of a switching channel. In most cases the switches engaged in providing a connexion are engaged during its whole duration, and the calculated holding time for those switches includes the time to set up and to clear the connexion in addition to the period of conversation. Several recent systems involve the use of auxiliary sets of switches which are temporarily employed as steering switches to control the setting up of a through connexion, and are then released. The holding time in the case of these switches averages only a few seconds and a small number of sets can therefore handle a great many calls.

Another essential factor entering into the determination of the best economic layout is that known as "grade of service." Telephone traffic varies widely at different times of the day, and even the traffic of the "busy hour" shows considerable fluctuation from minute to minute. The provision of telephone plant in general is subject to the unfortunate economic condition that so far as the bulk of it is concerned, its periods of idleness must greatly exceed its periods of employment. An endeavour to furnish an automatic exchange with switching facilities sufficient to ensure that exchange channels will be available for all calls at the peak of the busy-hour load in the busy season, would involve hopelessly uneconomic provision of expensive mechanism and would increase the cost of the service out of all proportion to the increase in its quality.

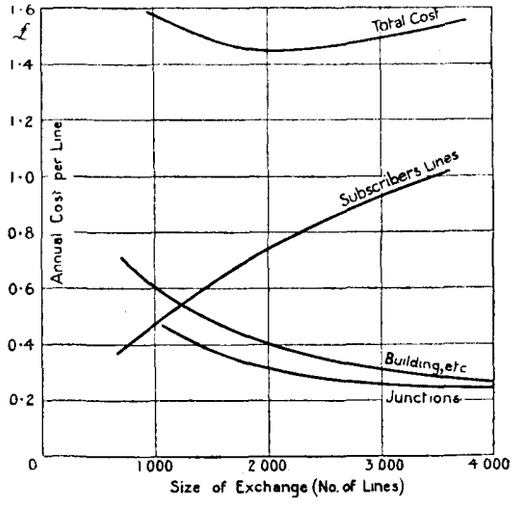


FIG. 10. Economical sizes of exchanges for density = 1,500.

It is therefore necessary to fix a limit for the number of calls which may fail to get through on account of insufficiency of switching plant. This number must be so small that, to the subscriber, it is inappreciable. The proportion of calls that may be allowed to fail in this way in the busy hour represents the "grade of service" or "standard of service," and the Post Office has standardized a proportion of lost calls of 1 in 500 for each switching, with the proviso that if the traffic should increase temporarily by 10% the grade of service shall not fall below 1 in 100. There are also certain modifications to cover special circumstances. Experience and observation have shown that the actual availability of switches, in groups carrying a given amount of traffic per hour, is closely in accord with the results obtained from a mathematical calculation of the probabilities, and, as is well known, the theory of probabilities is used, as far as it can usefully be applied, in the determination of the numbers of switches required.

For example, if a group of subscribers originating a given amount of traffic can be given access to a group of selectors, in such a way that each subscriber can reach any of the selectors, the application of the theory in order to determine the resulting standard of service is trustworthy and comparatively simple.

Most of the problems encountered in large areas are, however, too complicated to be readily solved by theoretical means. In the case quoted above each subscriber will, in practice, obtain access to the first rank of selectors by means of a pre-selector or line switch having a limited number of outlets, say 24. The number of first selectors required in the exchange

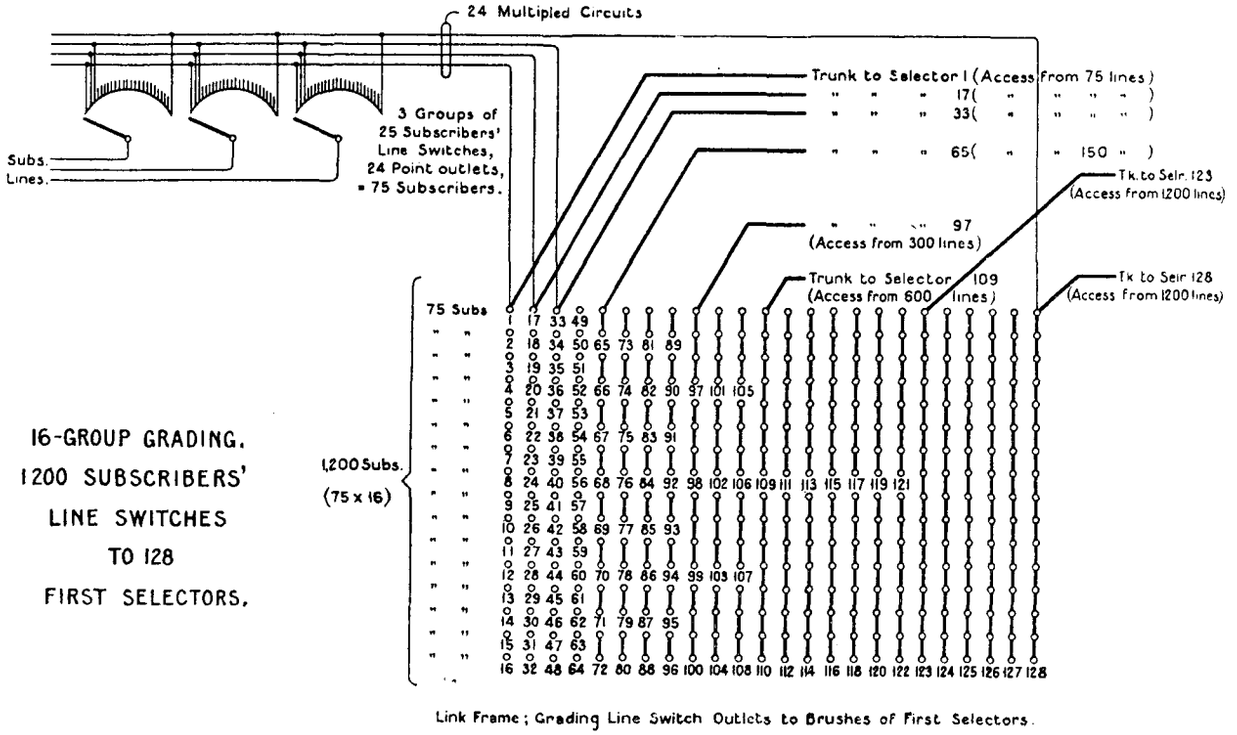


FIG. 11.—Diagram of group grading.

may, however, be 1,000 or more, and the problem will be to arrange the inter-trunking of line switches and selectors in such a way that, while each line can only reach 24 selectors, the traffic of the exchange will be carried, at the specified standard of service, by a minimum total number of selectors. According to early automatic trunking practice the selectors would have been divided into independent groups of 24 and each group would have been multipled to as many line switches as it would suffice to serve during the busy hour. It has been found, however, that the average availability of selectors may be much increased by dealing with them in much larger groups, and by "grading" the multipled connexions on the line switches in such a way that the 24 selectors to which each of them has access will be distributed throughout the larger group.

Fig. 11 illustrates the principle of grading applied to a group of 1,200 subscribers who require 128 first selectors to carry their originated traffic. Each subscriber is connected to a line switch having 24 outlets, and the outlets of 25 line switches are multipled together and terminated on a connecting rack. Any multiple of 25 subscribers may therefore be given access to one or more "individual" selectors, i.e. selectors to which that multiple, and no other, has access. In the figure, 1,200 subscribers' line switches are connected to 128 first selectors. The grading has 16 groups, each group comprising 75 subscribers with access to 24 outlets. There is thus a total of 384 outlets to be graded down to 128 selectors, and the way in which this may be done is shown in the figure.

It will be seen that each group of 75 lines has individual access to 4 selectors via exchange trunks, that it shares 4 further selectors with one other group, 3 with 3 other groups and 7 with 7 other groups, while the remaining 6 selectors are at the common service of all the 16 groups into which the 1,200 subscribers have been divided.

Each 75 lines has therefore access, complete or partial, to 24 selector trunks, although its aggregate access necessarily remains equivalent to 8 trunks as below :—

Complete access to	4 trunks	=	4
Half access to	4 trunks	=	2
One-fourth access to	3 trunks	=	0.75
One-eighth access to	7 trunks	=	0.875
One-sixteenth access to	6 trunks	=	0.375
Mixed access to	24 ; aggregate access to		8

It should be mentioned that, as the selector trunks which represent the first choice of the line switches are naturally kept more fully occupied than those later in the series, and as the selectors themselves are arranged in groups of 10 having a common multiple, it is necessary to calculate the probable traffic in each and to connect them to the grading tags in such an order that each group of 10 will carry the same amount of traffic.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

SOMETHING in the nature of a glimpse over the shoulder at the paper on "Two Rival Systems" with its sub-title "The struggle between the Multiplex and the Harmonic Telegraph" by Donald Murray, M.I.E.E., and which our esteemed friend of telegraphy read before the Post Office Telegraph and Telephone Society of London on the 20th ult., gave the writer the opportunity which, had such been possible, he would wish to have shared with each one of Mr. Murray's audience.

Mr. Murray's delivery always commands attention. He is never dull, and he has a happy knack of putting fundamentals in a nutshell, and in an attractive one at that. The analogy of a weight and a spring as mechanical representations of inductance and capacity, are not unknown similes to electrical students, but Mr. Murray corrects this view. He says: "A condenser and a steel spring differ only in shape and material, but otherwise, they are both springs. They both share that wonderful property—the elasticity of the Universe."

Then, in referring to one of the diagrams, that of the six *filters*, who but a Murray, or maybe a Slingo, would have given the happy mnemonic in which eye and ear give mutual aid to the correct association of the two bed-rock principles with their respective pieces of apparatus, thus: "The condensers that *look* like *weights* are the *springs*, and the *coils* that *look* like *springs* are the *weights*."

Had Mr. Murray done nothing more than cover the ground taken to deal with the history and principles of Tone-frequency Telegraphy, especially in the understanding and attractive manner followed in his lecture, he would have rendered invaluable service to the Telegraphs, but not content with this one feat, the second part of his paper was a tonic to the careful listener, and a healthy challenge to the student and the communication engineer of the future.

In a recent article in the *Radio Times* by P. P. Eckersley, M.I.E.E., replying to a critic who asked why the B.B.C. did not erect a relay station in Norwich, using a 30 metres wave length, and why Britain should be behind in the march of progress in this respect—made one or two very interesting and apposite remarks :—

"Short waves, it has long been known, have the advantage that the radiators or aerials employed for their use need be extremely small for efficiency. In general, it may be said that the dimensions of any aerial, to be efficient, should be near the dimensions of the wave-length used. It must be obvious that the question of building aerials for waves of tens of thousands of metres is a costly matter, and in capital charge alone may absorb much of their potential earning power.

"It may be wondered, indeed, why long waves should ever have been used. Unfortunately, there is 'always a bug somewhere.' Short waves, with their mincing, sprinting steps, tire easily—get tired, that is, long before they reach far. In the days when the crystal or other similar form of rectifier was alone available for receiving, the extreme feebleness of the received impulse weighed strongly in the balance against the use of short waves.

"The advent of the thermionic valve for receiving, which had the great quality of being able to pick up ever so feeble an impulse and make it louder, gave the short wave new life. Short waves, too, are less interfered with by atmospherics. These facts led to new researches in short waves, and now the tendency is to use their remarkable qualities to an increasing degree.

. . . . . .

"The trouble with short waves is that they are so fickle. One day nothing can be more splendid than the signals; another time——! It is true that with greater powers and saner methods of reception a station like K.D.K.A. is quite reliable as a noise. It is, of course, well-known that certain short wave-lengths are more reliable by night than by day; in fact, Senatore Marconi showed that, in certain experiments he conducted, the strength of signal bore a relationship to the elevation of the sun."

After emphasizing the fact that the reception from K.D.K.A. was best described as a noise, *that the quality leaves much to be desired*, and that we suffer from *night distortion* of signals, he goes on to say that so far as Europe is concerned he (Captain Eckersley) looks to the land line as the technical link to tie this country and European States together. He adds:—

"We have our land lines, and surely it is absurd to use 50 K.W. where a 1-50,000th of that power will suffice to link broadcastly John o' Groats with Land's End, London with Paris, or Budapest with Birmingham!"

That this proportion of power required should show so tremendously wide a difference may possibly surprise those who have never given much thought to these matters. Such, and other readers too, may some day, not very far distant, be surprised to find that by means of new developments in high-speed long-distance telegraphy currents very much weaker than those at present in use may be utilised to link the metropolis with some at least of the European Capitals.

The following letter from the *Correspondence* column of The *Westminster Gazette* is reproduced in the hope that some of our many readers may be able to help in the search for the fullest information in the cause of scientific history:—

"Sir,—I think I have discovered the origin of broadcasting—though broadcasting very different from the process we know to-day. Since this question is constantly cropping up, your readers may be interested to know that as far back as 1854 an invention was patented in this country, by means of which it was possible to telegraph without using wires. The inventor of this apparatus was a Scotsman, whose achievements merit more recognition than they have ever received.

"His name was James Bowman Lindsay, and he was born in Carmyllie, a little village not far from the "Thrums" of J. M. Barrie. As early as 1835 he maintained that it was possible to establish telegraphic communication without using wires. In 1854 he patented his invention, and four years later he conducted experiments, successfully telegraphing without wire across the River Tay at Glencarse, where the river is about half a mile wide. It was not until 1858 that his work became known to the world, when, on the recommendation of the Earl of Derby, who was then Prime Minister, the Queen granted him a pension of £100. Four years later he died, and on his tombstone, in a little cemetery in Dundee, is inscribed in his own words his belief in electricity and wireless, and his conviction that one day they would come into universal use.

"The Burndept Research Department, I believe, are attempting to get particulars of his apparatus, which is certain to be of great interest. I wonder if your readers know of any earlier record of those pioneers who blazed the wireless trail.—Yours, &c.,

BLAIR BECKFORD,
38, Cheyne Walk, Chelsea, London, S.W."

Our old friend M. Montoriol, now Inspector of Studies and Research work in the French Post Office, has recently taken part in some wireless experiments between Ajaccio and Nice by means of Baudot telegraph apparatus.

The experiments were, it is understood, very successful, and were made in the presence of Commandant Lagorio, director of a Parisian wireless organisation.

The claim is made that by means of a very rigid system of synchronisation the tapping of telegrams has been effectually rendered impossible, and also that parasitic currents have been reduced to a minimum. As regards the latter *Rundfunk* and *Radioélectricité* add to this information some further particulars as to the special anti-parasitic device used during these trials. This particular protection against atmospherics is based upon the repetition of signals. For example, the combination of signals representing any particular letter is automatically repeated three times before it actuates the mechanical combiner of the *traducteur* and prints the desired letter upon the paper band. For example, if a parasitic disturbance arrived during the time of transmission, it might act on the first, and distort the second, but the third set of signals arriving intact would suffice to permit of the correct reception of the letter actually transmitted.

As regards the claim for secrecy it is not known whether as much as this is altogether claimed by M. Charles Verdan for the invention, but if this is actually the case no doubt we shall hear more of the matter before long.

Engineers who have studied the claims of five unit systems such as the Baudot, Murray, Western Electric, &c., while admitting the immense difficulties attending the *tapping* of such a system, will not generally admit the impossibility of the task, given time and the necessary facilities.

A system of which mention was recently made by the *Westminster Gazette* would appear to promise a nearer approach to absolute enemy-proof efficiency. It is described as "An invention for transmitting by the help of wireless photography cyphers which to the uninitiated appear merely a meaningless jumble of irregular lines suggests that the really secret code has at last been found. There is, of course, a key—a number of squares filled with letters linked up at random by the lines to form words and sentences when the photograph is super-imposed—but even with the key an enemy agent would be powerless without an absolutely accurate picture. The frequency of the letter 'e' gives no clue, as in other cyphers."

On the 8th ult. the Postmaster-General, Sir W. Mitchell-Thomson, replying to a question in the House of Commons, made the following detailed statement regarding the British Empire wireless situation:—"The high-power wireless station which is in course of erection at Rugby is expected to be completed about November. Sites for the beam stations for communication with Canada and South Africa have been placed at the disposal of the Marconi Company and the stations are due to be completed early in October. Sites for the beam stations for communication with India and Australia have been submitted to the company for approval, and those stations should be completed within nine months of the actual provision of the sites. The corresponding beam stations in the Dominions are in various stages of progress The latest reports indicate that the South African and Canadian stations will be completed about the same time as the corresponding stations here. The stations in India and Australia will probably not be ready before the end of this year or the early part of next year. The Dominions have been invited to nominate representatives to a permanent committee under the chairmanship of the Assistant Postmaster-General to consider practical details of working the services, including such matters as message routes and tariffs."

The Western Union Telegraph Company's system comprised on Dec. 31 last 214,431 miles of pole lines, 1,562,499 miles of wire, 2,962 miles of land line cables, 25,459 nautical miles of ocean cables, and 24,478 telegraph offices; and the number of its employees was 56,676.

One or two curious phonetic errors have dropped into my hands lately in connexion with telegrams. One of these unfortunately caused no little distress until the mistake was corrected. Thus, during the Passover period a family in the near East received the words "Have deceased" instead of the seasonal greeting of "Happy feast," while a firm celebrated for heavy iron-work received the perfectly inappropriate request "send gingerbeer immediately" instead of "send engineer immediately."

It was *not*, however, due to a telegraph or even telephone mistake, although the story is told of a telegraph engineer who, plagued with a rather bumptious junior, sent the latter to the Stores for one air-bubble to fit No. 2 spirit-level!

To Mr. J. H. Shinner, of the I.B. Secretary's Office, congratulations upon having reached his 60th birthday on the 29th ult., and upon being able to retire from his really arduous and trying duties with health at so good a standard and prospects so fair for a happy long-looked for voyage to the Antipodes. Those who know "John" best, know also that behind the stern exterior has always been that human and humane touch which makes a MAN. Since writing it is reported that Mr. Shinner was duly feted at a *tea-party* given by a group of office friends on April 29, the actual date of his retirement We repeat TEA-party!

Sir Alexander Roger, as Chairman of the Automatic Telephone Manufacturing Company, paid a very generous tribute to the British Post Office in his speech to the shareholders at the Annual General Meeting, held in Liverpool, for which all thinking men and women of the Post Office will render him due thanks. Said he: "The magnitude of the task involved in adequately telephoning this country is not generally appreciated. If conversion from manual to automatic throughout the country was the only work to be done it alone would be a severe strain, but in addition there is the normal growth to be taken care of besides the accumulated arrears of development arising out of the war and other circumstances. That this great work is being carried on with so little inconvenience to the public is a tribute to the efficiency of the organisation which has been built up by the Telephone Department of the Post Office. While we could hardly have been expected, for obvious reasons, to welcome it, we believe the Post Office did a wise thing for the British public when they insisted that we make our patents available to them so that they could arrange for certain other contractors to undertake the manufacture of the essential equipment, and it has led to a certain amount of collaboration between the manufacturers.

My view is that these collaborations should go further, so that the resources of the industry in manufacturing, engineering, and research be collated and so made available to the Post Office in a manner calculated to forward the work and not delay it.

We, as manufacturers, of course, have a further reason for expressing this view. We are vitally interested in any practical method of reducing costs and accelerating output because of the fierce competition we have to face abroad. . . .

It is an interesting fact that as soon as the British Post Office put their seal on any particular system of telephones or telegraphs their example is followed by other administrations and public authorities throughout the world, and this has happened as a result of the Strowger system being adopted for London."

AUSTRALIA.—We have it upon the authority of the *Daily Telegraph* that the Queensland Government, which has decided to control broadcasting, has given an order to the Amalgamated Wireless Co. for the erection of a 5-kW station at Brisbane. It will be similar to those already installed by the company at Sydney, Melbourne, and Perth. The whole transmitting apparatus will be manufactured at the company's works in Sydney, where two "wireless and telegraph" stations for use in the Northern Territory are also being constructed.

Another definite step forward has been taken by the selection of sites in Australia for stations for the proposed direct service between Australia,

England, and Canada. Two beam-transmitting stations will be erected six miles south of Ballan, on the main road between Melbourne and Ballarat, one for communicating with England in two directions, the other with Montreal. Two beam-receiving stations will be erected about 15 miles from Melbourne between the towns of Keilor and Sydenham. In both cases the stations will be operated by distant control from Melbourne. Feeder stations will be erected in the other capital cities. The work of erecting masts and buildings, connecting lines, and plant generally has commenced, and is expected to be concluded by the end of the year. The selection of sites was made with a view to the subsequent erection of additional stations for communicating with other countries.

CALCUTTA.—The Indian public has long been waiting for some definite pronouncement in connexion with broadcasting, but the Government is still silent. Meanwhile it is learnt that the Calcutta Radio Club has decided to install its own transmitting set.

COLOMBO.—From an interview published in the *Times of Ceylon* with Mr. Wardrop, the representative of the Western Electric Co., it is understood that Colombo will have a high-power broadcasting station of about 2 kW, which will cover the whole of Ceylon. It has been decided to install the push-pull type of special microphone for transmission.

CHINA.—It is authoritatively stated by Reuter's Agency, Tokio, that the Government has instructed Mr. Yoshida, Japanese Charge d'Affairs in Washington, to propose to the United States State Department that the present chaos in China with regard to radio-telegraphy should be solved by the joint efforts of the Governments concerned. It is suggested that wireless in China should be placed under the control of America, Japan, and China.

GREENLAND.—Our best thanks are due to that pioneer journal of Esperanto *La Interligilo* for the following details regarding the extension of wireless in Greenland. After the outline of this information was published in these columns the *Direktoren for Styrelsen of Kolonierne i Groenland*, Kopenhagen, kindly furnished the editor of our contemporary with the complete story.

In order to establish rapid communications between Denmark and Greenland the Danish Government decided to build four wireless stations in their North American colony. Of these three are situated on the west coast near Julianehaab, Godthaab and Godhavn, the fourth is on the eastern side near Angmagssalik.

Julianehaab, the principal station, will have sufficient power to communicate with Europe, and a station of the same type will work from the Faroe Islands, but in the meantime the traffic will be assured by means of the station at Reykjavik, Iceland.

Godthaab and Godhavn will communicate between them direct, or indirectly, by means of the station at Julianehaab. The system in use at Julianehaab is a Poulsen arc with 5 kW's. in the antenna, the power being furnished by two groups of oil-driven dynamos. Normal working is effected by a single group, and if needed by two. In this case the power in the antenna is raised to 7 kW's.

The antenna of Julianehaab is of the umbrella type, supported by a central wire-work pylon 82 metres high, and six exterior masts of 18 metres. The pylons and masts are entirely of metal. The range of wave-lengths will be between 1,400 to 6,000 metres, the shorter waves being used for local traffic, and the longer, which will be in the neighbourhood of 3,000 metres, with Europe.

The principal station will be erected on a rock in front of Julianehaab at an altitude of 70 metres. The rocky nature of the ground has rendered necessary the establishing of an electric counterpoise of considerable dimensions. The entire work will apparently be finished by the autumn. The stations of Godthaab and Godhavn are of an identical type. Both are furnished with valves giving ½ kW. in the antenna. The antenna in both cases is supported by a metal pylon of 52 metres and three masts also of metal and 18 metres in height. An electric counterpoise has been provided in these two stations also. These stations, it is hoped, will be also ready in the autumn.

Angmagssalik has been established upon a different plan. In view of the extreme isolation of this station a greater working security has been attempted. It is a station of modulated waves giving 1-1½ kW. in the antenna. The latter is stretched between two masts 41 metres in height and the station, situated on a rocky plateau, 100 metres above sea level, is provided with an electric counterpoise. It already works with Reykjavik, thanks to a provisional antenna, therefore only the two large masts are lacking to make it complete.

JAPAN.—The Japanese firm, the Kurukawa Mining Company, have secured the contract to lay a submarine cable from Shanghai to Chefoo, the length being five hundred miles.

The price is nearly one million sterling, and work will begin forthwith.

JUGO-SLAVIA.—*The Electrical Review* states that radio is developing in Jugo-Slavia, three stations of fair size being already in operation. They are situated at Belgrade, Serajevo, and Rakovitza. The installation (20 kW) in the capital is used for international service, mainly with Paris, Lyons, Cracow, Prague and Rome, as also is that at Sarajevo, which is only of 10 kW capacity. Every evening the former broadcasts political and trade news to all European stations and, in addition, there are two small stations at Kotor and Skoplje, but there is a demand for further facilities generally; consequently, plant for six new stations has been ordered from Germany on reparation account and will be erected at Ljubljana, Zagreb, Split, Pedgoritza, Novi Sad, and Skoplje.

LATVIA.—*The Telegraph and Telephone Age* reports that the resolution of the Post and Telegraph Main Administration to entrust the erection of the new broadcasting station at Riga to the French Radio-Electric Co. (Société Française Radio-éléctrique) has been approved by the Minister of Communications of the Latvian Republic.

PHILLIPINES.—According to the *Financial Times*, the Radio Corporation of America has completed negotiations with the United States Government for the erection of a high-power wireless installation at Manila at an estimated cost of $4,000,000. The transmitting station will be on the Mariveles Peninsula, while the receiving station is to be situated three miles distant, with an underground cable connecting the two. Both will be controlled from the centre of the business community in Manila.

PORTUGAL.—Reuter's Lisbon correspondent announces that the Minister of Commerce has introduced a Bill to modify the contract of 1922 with Marconi's Wireless Telegraph Co. requiring the company to have a capital of £300,000 in Lisbon and to keep two-thirds of its reserve capital as well as its offices in Portugal. Radio stations will be erected in Lisbon, Angola, Mozambique, Cape Verde, Madeira, and the Azores. The Lisbon station will be sufficiently powerful to communicate directly with Mozambique, South America, and with European capitals. Also that the Finance Commission of the Chamber has approved the alterations which the Government intends to make in the contract with the Marconi Wireless Telegraph Co. requiring the company to incorporate a subsidiary company in Lisbon with a capital of £300,000.

SAHARA.—*The Electrical Review* recently published a very interesting account of a wireless feat carried out in the Sahara desert, illustrated by what must prove to be a unique photograph of the listening audience which was composed of the two wireless engineers, three camels, and three Arab drivers. The photograph was taken in the Sahara desert about 250 miles south of Algiers, and shows the party listening to Radio-Paris on a set of "Radio Brix" specially assembled with the addition of a small "Dragon-fly" loud-speaker. The circuit is of a special "all-wave" form embodying a detector valve and one dual valve; the h.f. stage is tuned anode, but of a special form coupled through a condenser to the anode of the valve, the h.p. of which is supplied through a choke coil having an inductance of about 80,000 microhenries so that practically all the radio-frequency impulses, even at long wave-lengths, pass through the adjacent tuned circuit and this, in turn, passes them on to the grid of the detector valve. The aerial used was a single wire strung to a 40-ft. date palm in the oasis, with counterpoise earth consisting of a single wire stretched along the sand directly beneath the aerial.

SOUTH AFRICA.—Reuter, Capetown, states that the British Postmaster-General's recent statement in the House of Commons in connexion with the sites for the stations of the Empire "wireless chain" is attracting widespread attention in South Africa. The South African Wireless Telegraph Co. emphasizes that there has been no delay on the part of the Union Government. The company has been able to enter into a definite contract with the Union Government that the "beam" system in South Africa will be ready by Sept. 1.

SUMATRA.—*Commerce Reports* says that radio stations have been opened at Medan and Bengkalis, in northern Sumatra, operated by the Post and Telegraph Service of the Netherlands East Indies Government, and are being used for communication with ships and with each other. Previously there was only one radio station, at Sabang, on the island of Wo, but, says *Reports*, it is contemplated to add others to complete the interior system.

TURKEY.—According to a Constantinople correspondent of the *Chicago Tribune*, the Turkish Government has decided to build at Angora "the most powerful radio sending station in the world." The plans have been prepared by Capt. Edward Walker, who is stated to be acting on behalf of the Radio Corporation of America. British, French, and German companies are also said to have representatives in Constantinople in connexion with the scheme. The Government has approved an outlay of £T2,500,000 on the project.

UNITED STATES.—*The Electrical Review* hears from New York that the idea of re-allocating the wave-lengths of American broadcasting stations as recommended by the U.S. Secretary of Commerce at the recent national radio conference has been abandoned by the U.S. Department of Commerce. The plan which had been formulated has been rendered obsolete by the increasing number of broadcasting stations throughout the United States, and it is understood that no attempt will be made to revise the present allocation until the situation becomes more stable.

The recent passing of two of "ours" from the C.T.O., one from the Inland, and one from the Foreign, has left gaps which cannot be adequately filled. The deeply regretted Sidney Justin in the first case; talented to his finger tips, an artist in half a dozen directions yet modest and good natured to the core, struck down after a few days' illness. In the second case it was friend Emblem, who fell on sleep after weeks of weariness and pain. His was one of those lovable characters who seem to pass through life without making a single enemy, men who have behind them the sweet incense of an unselfish spirit, while sacrificing none of the essential elements of all that is best in the term—manhood. To his bereaved and much respected partner (also one of ours, *nee* Jennings) we proffer our tender, heartfelt sympathy.

"Then they praised him soft and low,
Called him worthy to be loved."

Long Life.—And perhaps the best way to attain long life is to be less careful how *long* one lives than how *well* one lives—with what dignity and with what usefulness.—*Evening Standard.*

J. J. T.

The
Telegraph and Telephone Journal.

PUBLISHED MONTHLY IN THE INTERESTS OF THE TELEGRAPH AND TELEPHONE SERVICE, UNDER THE PATRONAGE OF THE POSTMASTER-GENERAL.

Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.1. The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

VOL. XI. MAY, 1925. No. 122.

THE AFTERMATH.

IT will be somewhat of a change in this place to have an article which is not in the strict sense of the word a leading article. The illness of the responsible writer of these leading articles makes it necessary for his place to be taken, and I propose to take that place in a somewhat unconventional way. That, of course, is bad journalism, as everybody knows. Nevertheless, there is something to be said for it on this occasion, for I propose to take the liberty of telling my colleagues something about what I would call the Aftermath of Broadcasting. I read in one of the American Journals that one of the broadcasting companies in New York receives sixty thousand letters each morning. They are letters of encouragement, and in some cases, I am afraid, of a less complimentary nature. It fell to my lot to broadcast some remarks about the British Telegraph Service. They were very simple remarks; they were based upon my own actual day by day experiences. Naturally they were something of the nature of a challenge, and the challenge was accepted in rather more than 200 cases. That is to say, over 200 persons were kind enough to write to me on the subject on which I had addressed them. The letters came to me from all parts, from the North of Scotland, one from the West of Ireland from a lady who assured me that she suffered from deafness in the ordinary way, but that she heard perfectly "on the broadcasting." Now it is a curious psychological aspect, so to speak, that this modern means of communication should encourage people to adopt the older means. It must be some gratification to our postal brethren to realise that when we have done our utmost with the use of the electric current and etheric waves, we are encouraged to fall back on the papyrus and the postage stamp. I do not say this in any sense in any lack of appreciation of these many communications. On the contrary, they were very touching, and especially, if I may say so in this place, those from members of the Telegraph Service who felt impelled to write a recognition of an attempt to state our attitude of service to the public.

They were not all complimentary letters. I did not expect that they would be. One of them was a complaint. It was from an eminent firm of motor manufacturers. They began in a somewhat seductive way, by telling me that they had enjoyed the "talk" very much, and they went on to say that in the Central Telegraph Office we had concentrated our attention so much on other people's telegrams, that we had entirely forgotten a telegram which this eminent motor firm had handed in by telephone at 1.30 p.m., but which had not reached the historic town of Deal until 4.37 p.m. We got out the message and found that it had been handed in by telephone at 4.20 p.m., and further inquiry elicited the fact that one of the officials of the firm in question had forgotten the message until after tea-time, although it had been handed out for despatch at lunch-time. Thus, the one complaint disposed of itself. Of the other letters which I received, there were many curiosities. A gentleman in Scotland, who is by profession an architect, gave me the early history of the telephone, and told me how he was associated with the first establishment of a telephone from the ground floor to the attic of one of those tall Edinburgh houses which strike the visitor as possessing an overwhelming number of staircases. He added that something like 50 years ago, on a telephone in an Edinburgh house, people assembled on each floor and listened to Professor Graham Bell, himself an elocutionist of no mean order, whilst he spoke to them in a broadcasted way from the basement, and that Mrs. Bell took the position in the attic so that she might receive at the most distant point. I am not able to vouch for the accuracy of this story. It was told to me in one of the letters aforesaid, but assuming that it is true it is a curious instance, if my broadcasting friends will permit me to say so, of an anticipation of a public facility which to-day makes ravaging inroads on our leisure. And there was another curious letter. It was from a professor of phonetics in one of the older universities. His interest in my remarks seems to have been, so far as I can understand, rather consonantal. He appears to have gathered his students together with the view to estimating the number of marks I should get for labials, liquids, and the various other classes of consonants. Vowels apparently had little interest for this class. The marks have not been revealed to me and I presume the secrecy is deliberate and not unkindly, for the letter breathed the spirit of kindliness.

Another letter was received from a really eminent literary person, and I put this letter last. He said that he noticed that I had thrown overboard the tradition of speaking slowly and with great deliberation. He thought on the whole this was wise. He believed himself that the philosophic disadvantage of the spoken voice over the printed word was that when you read print you could skip, but when you heard speech you could not skip in the sense of picking out a word here and there and gathering the general tenor. I confess this was an entirely new conception to me, and I leave it to psychologists to worry about. Previously I had thought, from what I have gathered in the comic papers, that there are those who can sleep, even through sermons. However, space happily now is filled, and all I have to say as a last word is to thank very warmly those members of our fellowship who wrote to me on this occasion, and to say that perhaps this newest development of human intercommunication did give us a little chance of saying to the vastest of all audiences what we try to do in the public interest.

J. L.

WHERE TO STAY.

The attention of our Readers is directed to the following list of Boarding and Apartment Houses.

TWO RIVAL TELEGRAPH SYSTEMS.*

THE STRUGGLE BETWEEN THE MULTIPLEX AND THE HARMONIC TELEGRAPH.

BY DONALD MURRAY, M.I.E.E.

A CONTEST between two rival methods of telegraphy, that was fought to a finish 50 years ago, has broken out again during the past few years, and I have taken that contest as the subject of this paper to-night. Fundamentally it is like a battle between a big weight with a big spring and a number of little weights with little springs. It is a contest of great practical importance to communication engineers, and I shall try to present some facts and arguments which may help you to back the winner.

All telegraph and telephone men in these days have heard about carrier current telephony and telegraphy. We have broadcasting with carrier wave telephony, and there is wired wireless and composite and superposed circuits, and modulating waves and carrier waves, and side-bands and filters, and oscillators and modulators, and demodulators and no end of other horrible complexities. Students who want to tune up their intellects on this awful stuff cannot do better than read Colpitt's and Blackwell's classic paper on "Carrier Current Telephony and Telegraphy." I also recommend a wonderfully clear pamphlet by F. Lüschen on "Tonfrequenzwechselstromtelegraphe," published by Siemens & Halske of Berlin. With one exception, I am indebted to these two papers for my very slight acquaintance with this complicated subject. The one exception is the foundation, with which I, like everybody else, can claim to be familiar, and that is a weight and a spring. These are the two simplest things in the universe. Indeed, the whole universe known to us is composed of weights and springs. Under these circumstances I feel reluctant to waste your time on such obvious and elementary matters; but it is a curious fact that no one has ever been able to make a mechanical model that would explain a spring. Lord Kelvin tried, and argued that a gyroscope had all the attributes of a spring; but it dawned on him that the gyroscope itself depended on the elasticities of the material composing it. In other words he was trying to explain elasticity by elasticity, so he gave it up as a bad job. It is also impossible to explain or make any mechanical model of a weight. We know that a weight is an aggregation of energy, but that explains nothing. The Einstein theory is an attempt to explain the weight and the spring. It is a theory of elasticity. Authorities say it is a good theory, but as an explanation it is no better than Lord Kelvin's, because it explains the mystery of elasticity by the still greater mystery of a closed universe. The man who succeeds in explaining a weight and a spring, that is to say, mass and stress, will have solved the problem of the universe. It seems to be a physical and mental impossibility for us to form any conception of the nature of a weight or a spring. We can only know how they act, and their actions are very curious, and, as I have already said, of great practical importance to communication engineers.

If we make our weights and springs, that is to say, our capacities and inductances extremely small, we can tune in for enormous rates of vibration, millions per second. As the result, we get wireless telegraphy and telephony with various wave lengths and tuning and all the rest of it. At lower frequencies, from 3,000 to about 20,000 cycles per second, we have carrier current telegraphy and telephony on wires, this being beyond telephone audibility. Then we have voice frequency telegraphy using telephone frequencies of, say 200 to 2,000 cycles per second, and ordinary telegraphy with frequencies from zero up to about 129 cycles per second. 200 cycles per second would correspond to 800 words a minute on a 16 channel multiplex distributor running at 50 words a minute per channel. Using the duplex balance, this would give us 800 words a minute simultaneously in each direction on one telegraph line. Reducing this to Wheatstone speed we get 500 words a minute. These speeds, of course, are absurdly high at present for ordinary printing telegraph apparatus. We have thus a rough division of frequencies as follows:—

		Cycles per second.
1.	Wireless telegraphy and telephony ...	20,000 to several million
2.	Carrier current telegraphy and telephony on wires	2,000 to 20,000
3.	Voice frequency telegraphy	200 to 2,000
4.	Ordinary telegraphy	0 to 200

I am concerned in this paper only with the 3rd and 4th methods and frequencies. It is between these two fundamentally different systems, harmonic telegraphy and ordinary telegraphy, that the old contest of 50 years ago has suddenly blazed up again as the result of the perfecting of the electric filter and the vacuum tube.

I shall begin with the original battle fought about 50 years ago between the Baudot multiplex and Elisha Gray's harmonic telegraph. Baudot won,

*Paper read before the Post Office Telephone and Telegraph Society of London. Figures 1 to 8 are reproduced by courtesy of Messrs. Siemens & Halske. Figure 9 is reproduced by courtesy of *The Sphere* newspaper and the Institution of Electrical Engineers.

and the harmonic telegraph was knocked out, and led a precarious existence in experimental laboratories, from which it emerged for occasional trials by telegraph administrations, only to be abandoned once more. The electric filter and the vacuum tube have proved real corpse-revivers for the old harmonic telegraph, which is now giving very fine results.

Under these circumstances a paper read by Major Webber in 1878 before the Institution of Telegraph Engineers on "Multiple and other Telegraphs

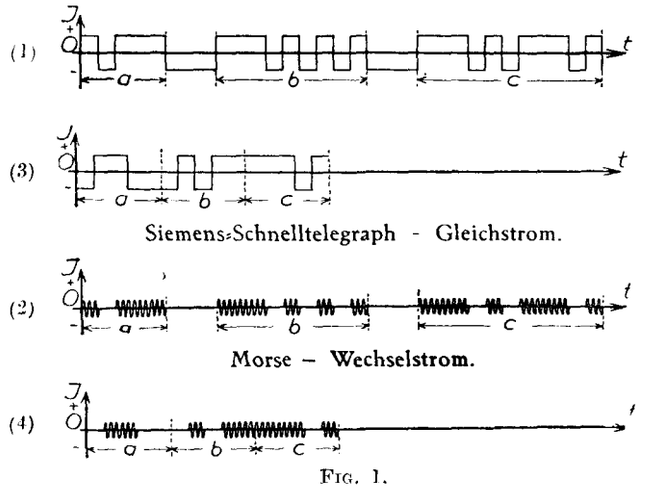


FIG. 1.

at the Paris Exhibition" is of extreme interest and should be read by all students. It will be found in the *Journal* of the Society of Telegraph Engineers for 1878.

In his paper Major Webber says: "The most remarkable of the class of objects exhibited at Paris in 1878 are the acoustic telegraphs (including the telephone) from America, immortalizing the names of Elisha Gray, Bell, and Edison, and the multiple telegraphs of Meyer and others, improved by Baudot of Paris and Otto Schaeffler of Vienna."

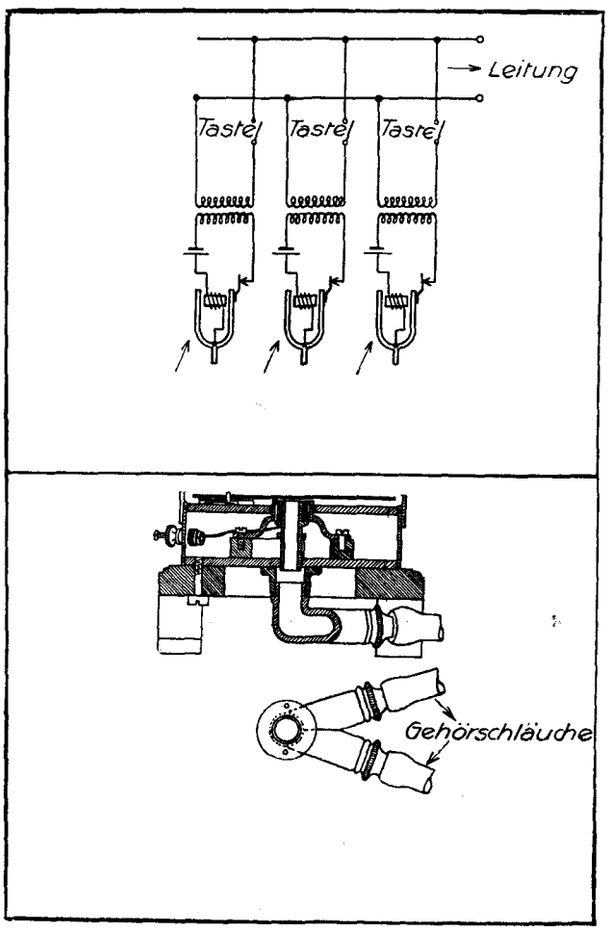


FIG. 2 AND FIG. 3.

The order of importance of the names in those days and "Baudot of Paris" read quaintly now. Major Webber proceeds to describe the Baudot multiplex in its then electrical form, very crude looking stuff to modern eyes, and the paper refers to the "continual objections" which Baudot met with to his electrical combiner, so he introduced his No. 2 machine. In this, instead of a cylinder there was a flat ebonite disc "encrusted with platinum contacts." Baudot only employed one magnet in his No. 2 machine with a mechanical distributor, apparently the first ever made. This remarkable device is illustrated by Major Webber. It seems to be quite practical, and surprisingly similar to some mechanical distributors employed in modern start-stop printers.

In his No. 3 machine at the exhibition, Baudot arrived at 150 to 180 revolutions per minute, or 360 to 500 messages an hour, and Major Webber says: "There seems to be little reason to doubt a very astonishing measure of success."

The paper goes on to describe Elisha Gray's harmonic telegraph with vibrating reeds or sending and receiving tuning forks, and Major Webber says that the harmonic telegraph "opens a startling field for the increase in the capacity of existing wires, which will infallibly revolutionize the means of communication in all countries," and he says the Paris Exhibition of 1878 marks the commencement of "a new era in telegraphic communication, which will, some day, oblige the telegraph administrations everywhere to reconsider

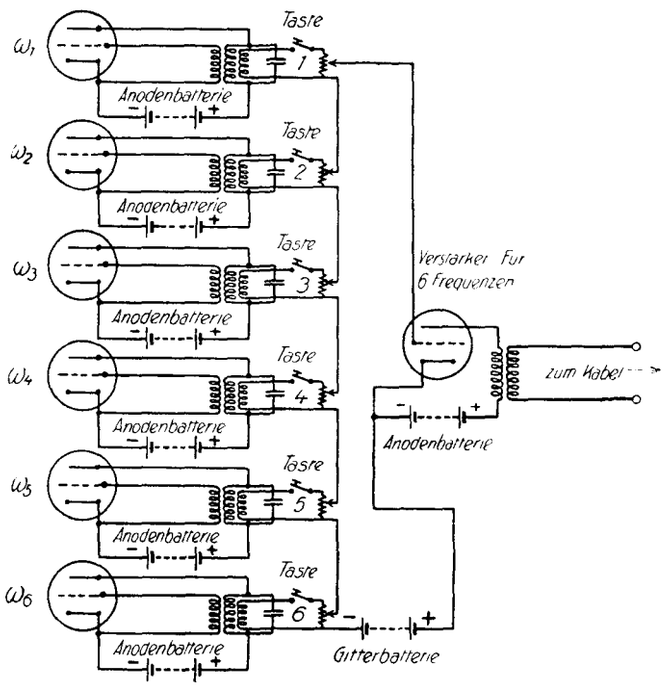


FIG. 4.

their tariffs, the form of their apparatus, and the status of their employees." He goes on to say that the "octoplex harmonic telegraph means that on one wire four double lines of communication can be established; it further means that the eight stations may be situated where you please on the line."

Major Webber points out that a good deal of this was brought out in England as long ago as 1870 by Mr. Cromwell Varley, who seems to have been the first to get hold of the fundamental idea of harmonic telegraphy, of sending into the telegraph line a number of different frequencies of signalling current at the same time and sorting them out at other stations.

Major Webber concludes by saying that "the era of really cheap communication for public and private purposes is not far distant." Major Webber's failure as a prophet sends a cold shiver down my spine, because I, too, have been prophesying lately to much the same effect. I hope I shall prove a truer prophet.

Gray's harmonic telegraph failed, amongst other reasons, because tuning forks for receiving as well as sending were not practicable. Mercadier made a considerable step forward by substituting what he called his monotelephone for receiving, each telephone receiver being tuned to a different note, and his system was tried by the French and other administrations about the year 1890. In this case, the receiving reeds were reduced to telephonic dimensions, with greatly improved results. In other words, for receiving purposes the weights and springs were greatly reduced in size. The Mercadier system, however, was abandoned because it was not sufficiently reliable, and also because it created serious inductive interference in neighbouring telephone lines.

The third, and apparently the final and perfect development, has at last been reached during the past year or two through the introduction of the vacuum tube. Unlike the tuning fork, the vacuum tube can start and stop

vibrating practically instantaneously. In this case the weights and springs are reduced enormously in size and vastly improved in quality. All the harmonic telegraph men availed themselves of the elasticity of the ether and the weight, or more strictly speaking the mass or inductance concerned in the electric current for transmission on the telegraph line; but it was not until the third stage, the recent development depending on the vacuum tube, that we have been put in possession of means for utilising directly the elasticity of the ether and the weight or mass associated with an electric current for transmitting and receiving. In the fundamentals of harmonic telegraphy we have now reached perfection, and further improvement is impossible except in details. The instruments in which it is embodied by the Western Electric Company and Messrs. Siemens & Halske are excellent, and its one drawback now is its high cost, roughly £1,000 for a six channel installation for one loop circuit of two wires. As each of these channels, however, can be worked with a quadruple multiplex installation, it seems obvious that the price is high only because we are not accustomed to it. Clearly, if we enable one underground telegraph loop circuit of two wires, costing say £2,000, to carry six quadruple multiplex installations instead of one or two, the harmonic or voice frequency apparatus is cheap at £1,000, if there is enough traffic. The question is not price, but does it pay? It certainly pays when the circuit is sufficiently long and there is sufficient traffic, and it will pay by and by for short lines because the apparatus is not inherently expensive. It is the invisible expenditure, the research and development work, that is so heavy in such cases, and when the manufacturers have recouped their invisible expenditure and made a sufficiently encouraging profit, the cost of harmonic telegraphy will be low enough to justify its application to short lines.

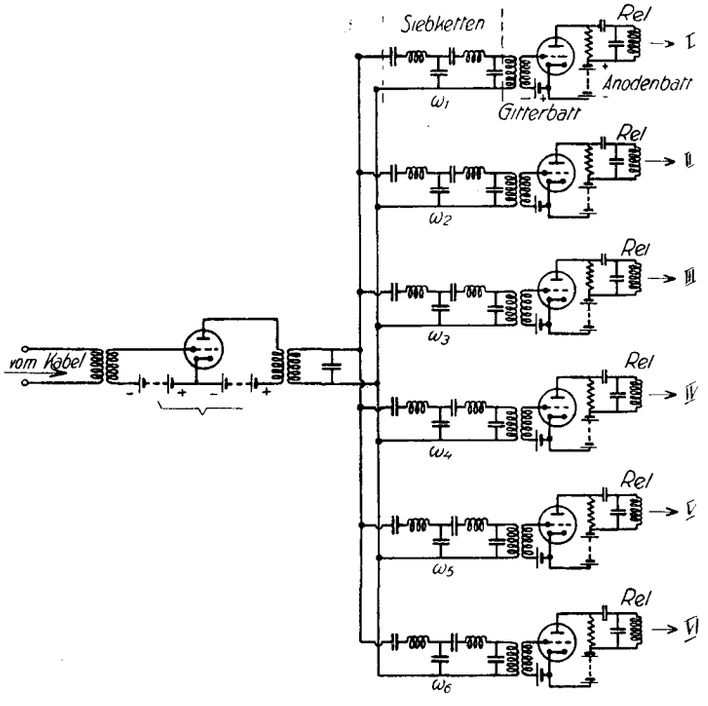


FIG. 5.

I am indebted to Messrs. Siemens & Halske for permission to use remarkably clear and instructive illustrations from their pamphlet by Herr F. Lüschen on "Tonfrequenzwechselstromtelegraphie," or, as we call it, voice frequency alternating current telegraphy. The voice frequencies used range from 400 to 1,700 periods or vibrations per second. I shall take the opportunity at this point of giving Herr Lüschen's views about the subject of my paper. In a letter to me dated Jan. 26, 1925, he says:—

"As for the significance of tone frequency telegraphy, we do not regard it as constituting a new system of telegraphy which will compete as such with multiplex telegraphy. Tone frequency telegraphy has arisen out of the necessity for laying telegraph and telephone wires in the same cable, and it is possible to do this by tone frequency telegraphy without disturbance, as we telegraph with currents which are less than the telephone currents. The economy of the system is therefore due less to its cost that to the saving entailed by the use of standard telephone wires and amplifiers. Of course we agree with you that tone frequency telegraphy can be very advantageous in connexion with start-stop systems."

Starting with Fig. 1, we have in lines 1 and 3 ordinary morse and five unit double current, and in lines 2 and 4 we have the same signals in voice frequency alternating current.

Fig. 2 shows the essential part of the sending arrangement of the Gray and Mercadier systems. Fig. 3 shows the Mercadier receiving monotelephone with the little vibrating reed, each receiving telephone being tuned to a different frequency.

Fig. 4 illustrates the sending end of a six-channel modern voice frequency harmonic telegraph as developed by Siemens & Halske. The vacuum tubes take the place of the tuning forks.

Fig. 5 is the corresponding apparatus for reception. Note the six filters (weights and springs). The condensers that look like weights are the springs, and the coils that look like springs are the weights. The filters are complex, but that does not effect the general principle.

Fig. 6 is very instructive. It is a series of oscillograms of the telegraph impulses: line 1 shows signals at the sending end; line 2 shows two sets of signals of different frequencies superposed on one another; line 3 shows some signals that have passed through one of the filters; line 4 shows these signals after they have been rectified so that they can operate an ordinary relay; line 5 shows the signals in the relay.

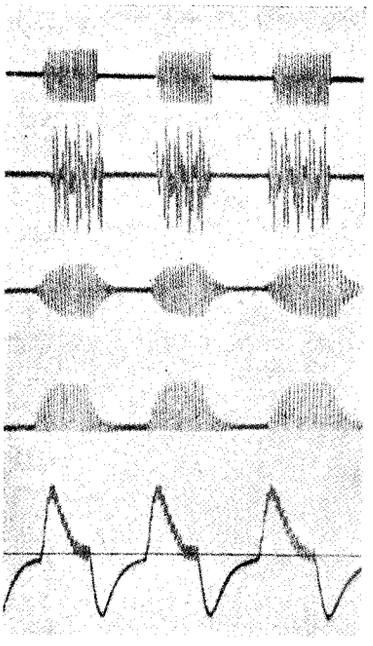


FIG. 6.

Fig. 7 is a six frequency (or channel) sending outfit by Messrs. Siemens & Halske, and Fig. 8 is their six channel receiving outfit. The compactness and convenience of the apparatus is remarkable. Each of these six channels can be worked with automatic or multiplex apparatus up to at least 120 words a minute per channel, giving the great carrying capacity of 720 words a minute on two underground wires.

The essence of the whole matter is that in Germany and also in Great Britain distances are not very great, and underground telephone cables have become a necessity and present no grave technical problems. The argument is that under such circumstances it would be sufficient to allot about 5 per cent. of the telephone cable circuits for telegraph purposes. These telephone loop circuits would be worked by means of the voice frequency harmonic telegraph arrangements already described. There is no interference with the telephone

FIG. 7.

circuits in the same cable, because the astonishingly low pressure of one volt is used for the voice frequency system. That also is a wonderful improvement and gets rid of the gravest objection to the Gray and Mercadier systems, namely inductive interference with neighbouring wires.

In America, the Western Electric and the American Telephone and Telegraph companies have obtained wonderful results on aerial lines by similar means, but long aerial lines, subject to interference by the weather are obviously not so stable as underground circuits. Great Britain, France and Germany, on account of the short distances, are specially favourable for underground work with voice frequency telegraphy, and there is bound to be considerable development. As an illustration of what is being done in America, Mr. A. E. Thompson of the Western Electric Co., at the meeting of the Institution of Electrical Engineers on Dec. 18, 1924, said: "A more direct and no less striking illustration of the economy of the telegraph from the line standpoint is afforded by the Western Electric Co.'s voice frequency telegraph system. Take for instance a four-wire telephone circuit providing one speech channel in each direction. If the telephone is given up, and the same line plant equipped at its terminals with the Western Electric system, then from 10 to 12 independent telegraph channels can be obtained. Each of these may, in turn, be equipped with multiplex quadruplex printing telegraph apparatus, giving a total of 40 to 48 message channels, or a traffic-carrying capacity of approximately 1,200 to 1,400 words per minute. If only two wires are available, the traffic-carrying capacity is, of course, reduced to 600 or 700 words per minute; but this is still considerably more than the telephone can handle."

I now come to the central point of my paper, namely, which is best—the modern perfected harmonic telegraph or the multiplex with distributors. Is the modern harmonic telegraph the old will-o'-the-wisp, the *ignis fatuus* of telegraphy on which inventors have wasted so much time in the past? Is it the old morass into which Delany and Professor Rowland and others fell, the morass of a wasteful signalling method? Or are there some departments of communication in which it can be used to advantage? My answer is Yes, it is going to be very useful, especially on comparatively short lines, on which voice frequency currents will not reach the limit of the carrying capacity of the line, and will not interfere with neighbouring wires, and also in a modified form with very low voice frequencies and few channels on long lines in combination with the multiplex. For pure harmonic telegraphy with a lot of channels, each worked by start-stop printers at, say 50 words a minute, the lines will be fairly short loops, preferably underground—the length I do not know—perhaps 100 miles. On the other hand, directly the line is sufficiently long and the traffic sufficiently heavy to make it worth while to use the line in the most economical way, then, subject to certain important qualifications, the multiplex will beat the harmonic telegraph with ease. The harmonic telegraph is extremely attractive from the points of view of (1) simplicity of apparatus, with no moving parts, and perfect synchronism; (2) the ideal conditions it offers for forked and series working; and (3) the ease with which it can be used with start-stop printers like the teletype and with teletype exchanges on the lines described in my paper before the Institution of Electrical Engineers in Dec., 1924, on "Speeding up the Telegraphs." It is these advantages of harmonic telegraphy that leap to the eye and have attracted the attention of telegraph men in all countries. For instance, I have a copy of a report by the Soviet telegraph authorities in Russia, in which a distinct leaning is shown towards harmonic telegraphy with start-stop printers, even though the great Russian distances and the existence of iron instead of copper wires are grave obstacles in the way of harmonic telegraphy. The essential part of the paper is worth quoting as follows:—

"QUESTIONS BEARING ON THE SCIENTIFIC ORGANISATION OF LABOUR IN THE TELEGRAPH SERVICE."

"The technical section has under consideration the report by N. O. Roginsky on 'Ways and means for developing telegraph service from the point of view of the National Organisation of Labour.'

"Summarising the particulars as to the exploitation of the telegraph systems employed in our country, the reporter arrives at the following table:—

Type of apparatus.	Number of operators needed.	Output total. Words per hour.	Per one operator.	Cost in Gold Roubles.
1. Morse	2	500	250	290
2. Sounder	2	900	400	50
3. Hughes	3	1,200	400	1,600
4. Wheatstone	10	3,500	350	4,900 (with 4 perforators)
5. Baudot quadruple	12	5,000	420	9,600
6. Siemens at 1,000 revolutions per minute	7	7,200	1,030	15,000 (with 3 perforators)
7. Pendel telegraph	2	2,000	1,000	3,000
8. Teletype	2	2,400	1,200	1,200

[NOTE: The comparatively low figures for Morse and Sounder working are due to the Russian practice of repeating a considerable part of each telegram an such circuits.]

"Considering this table, the reporter comes to the conclusion that from the point of view of the utilisation of labour, the most rational are the Siemens and Teletype installations at loads fairly near to the maximum capacity of these instruments.

"At reduced loads requirements will be met by sounder apparatus (to which for purposes of convenience a typewriter may be added to print direct the telegrams received, as is usually done in the U.S.A.). It would appear from the above table, that in the matter of efficiency one Siemens is equal to three teletypes.

"If it were possible to have the multiple work of three Teletype machines on one line such a plant would prove more economical than a Siemens plant, both from the point of view of the number of men and of the output per man and costs.

"A further advantage of the exploitation of such a system is that the Teletype does not require a preliminary printing of the message on a perforated tape. Here transmission is effected by the keyboard which is similar to the keyboard of a typewriter, and the printing is in letters.

"Thus, argues the reporter, the chief aim of the present time is to develop the methods of multiple telegraphy by the so-called high-frequency currents and by currents of tonal frequency. Abroad, on bronze wire lines, considerable success has been secured in this direction.

"In so far as the working of our telegraphs proceeds exclusively on iron wire lines, the difficulties in the way of employing multiple telegraph systems increase. A solution of these problems would, in the opinion of the reporter, render it possible to change from the high-powered apparatus to the simpler Teletype machines, on lines with heavy loads, and to Morse and sounders on lines with small loads. Such, in the main, are the conclusions of the reporter.

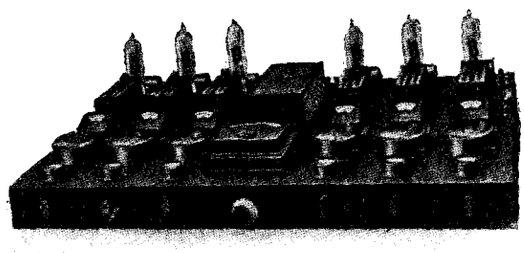


FIG. 8.

"It would be highly desirable that the greatest number of our workers should take a share in the discussion of the problem raised, which is most certainly one of far-reaching importance. We request our colleagues to forward all their opinions and observations on the question raised to Sviazplan, and also to take part in the discussion of this question in the columns of our journal."

It may be explained that the Russian Telegraph Administration has an installation of the Siemens Automatic system working between Leningrad and Moscow, about 500 miles, and several sets of Morkrum Teletypes and Siemens Pendeltelegraphs are in use on various lines. The "multiple" telegraphy referred to in the report is not multiplex but voice frequency harmonic telegraphy. Unfortunately the Russian lines are long iron wires and the load of traffic is light. It is an ideal land for wireless, and for start-stop printers such as the teletype, and for the modern multiplex in the form of double duplex and in a few cases quadruple duplex. The traffic would not pay for the great cost of voice frequency installations applied to long lines. Certainly in Russia, except within narrow limits, harmonic telegraphy is a will-o'-the-wisp.

(To be continued.)

CHESTER.

ON the occasion of her resignation to be married, Miss Gillett, Clerical Officer, District Office, Chester, was presented with a set of stainless cutlery, contributed by the District Manager and Members of the Staff. The presentation was made by the District Manager, Mr. Ramsay Lamb.

Miss Gillett was very popular with all Members of the Staff, who unite in wishing her every happiness in her new sphere.

THE COST—AND THE VALUE—OF AN INLAND TELEGRAM.

By W. H. F. WEBB.

THE first more or less lucky visitors to this earth from another planet could belong to only 4 classes—from an earthly point of view. They should comprise in their party an inventor, a financier, and an empire builder (with a stowaway representing the "largest circulation"). The inventor would have devised the method, the financier would have provided the means, and the empire builder would be carrying gaudy cotton goods, and a few of his "national" flags to plant in the new soil! We need not speculate on their chances in many parts of the earth, but the two latter in their survey of the new territories would certainly feel sympathetically indignant to find that for about half a century the "civilized" portion of the earth had suffered loss on Inland Telegrams, (practically all countries show a deficit on this line of business). The visitors would marvel, on meeting here their terratypes, who, so to speak, run "the greatest shows on earth," that financial loss could persist under a ceaseless fire of criticism maintained for more than 40 years—and they might, or might not, advise the setting up of a Committee of Inquiry as to the beneficiaries from such a heart-breaking business. We may leave its findings to intelligent speculation.

To become quite serious, the Acct.-General's lecture on the above topic may be truly described as an historical event telegraphically, for it provided in highly concentrated form, and authoritatively, the reply to all the long years of so-called "national" moaning which our modern tender-hearted Press informs us daily has gone on ineffectively, like prayers to Mammon, for the stated half century.

Exigencies of time and space no doubt prevented some necessary elaboration by Sir H. BUNBURY of his subject, but both he and the readers of the *T. and T. Journal* may perhaps pardon the present writer his desire to be allowed to extend the analysis to a certain extent.

The "Cost of an Inland Telegram" considered "commercially" *may* involve an accumulative "commercial" deficit, but I would venture, with due respect, to suggest that State enterprise, in the minds of both friends and enemies, differs radically from private enterprise—State enterprise and private enterprise can never be supposed to travel towards the same ideal. The "business" man, stupid as he undoubtedly is (Sir E. Mackay Edgar, one of their greatest, has said it) nevertheless knows the essential difference between State and private enterprise. His hatred and vilification of the former are born of sheer fear!

It is because the "cost" of an article cannot be fairly dissociated from other factors that I desire to call attention to the second most important—its "value" to the buyer. We know that these expressions "cost" and "value" are disputable, but ideas which become customary acquire certain authority. "Value" and "Cost" are interchangeable, even if unequal, terms; therefore, in stating the "cost" of an inland telegram to a business world suffering from acute economania should we not be permitted to set out also the "value" received?

Let us duly recall that the telegraphs were taken over by the State after years of clamour from the industrialists, the Press, and the platform. The price paid was £6,400,000.

At the date of transfer in 1870 there were about 3,000 telegraph offices "run" by several telegraph companies.

By 1872 the State had spent a further £4,000,000 in improvements and additions, supplying another 2,000 offices for telegraph work.

Without specifying every item, more than £15,000,000 has been expended since upon the development and upkeep of the system, and to-day we have about 13,000 offices.

CAPITAL.

	£
1870 Purchase	6,400,000
1872 Extensions	4,000,000
1873 to 1924 Extensions	15,000,000
Total ...	25,400,000

Among those 13,000 telegraph offices there are, in Sir H. Bunbury's words, "over a thousand at which the business done is so small" as to be "unremunerative to a special degree." Arguing analogously (by comparison with "commercial" telegraph companies) such offices would never have been created or, if created, maintained, but he would be a bold citizen who denied the very real *value* to the State of this 1,000 odd of "unremunerative" telegraph offices.

Shortly before transfer to the State the following were a few representative charges:—

TELEGRAPH TARIFF.

	Miles.	Per 20 words. s. d.
Birmingham	112	6 6
Cheltenham...	100	7 6
Glasgow	420	10 0
Hull	200	9 6

and on the S.E. Railway, for instance, 5*s*. 0*d*. per 20 words *between any two stations*! (and the telegrams were known to "beat" the trains—occasionally!)

Government, among the conditions of the take-over, had agreed to reduce the tariff to 1*s*. 0*d*. per 12 words any distance, and the traffic responded vigorously during the next few years—even bringing a small profit to the Exchequer. Private enterprise, however, was not satisfied, but demanded a sixpenny telegram—a move which, from its commencement, has involved the "taxpayer" in a persistent (ledger) "loss." "Sixpenny telegrams" should have increased by about 130% in order to make even the small profit made by "shilling telegrams" but at no time has the "sixpenny" traffic ever exceeded the "shilling" traffic by more than 65%. Every proposal to put the telegraphs on a "paying" basis was fiercely resented until the War, and the "profitless" condition of the telegraphs to-day is due, not to any refusal to use business-like methods, but to the fact that the "nation" declines absolutely to allow its telegraph system to be run on "commercial" lines.

We may now justly try to estimate the "cost of an inland telegram" to the aggrieved "taxpayers" had the telegraphs remained under private or "commercial" enterprise. The various telegraph companies in existence prior to 1870 were making a combined nett profit of about £350,000 per annum. Had their traffic increased at only *half* the rate of the increase under State control, i.e. to say 5-*fold*, they must have made a profit, in the same elapsed period, of over £30,000,000—an average rate of about 3% on the capital which they should have invested. There is every reason to conclude, *by extant analogy*, that the profits would have been much higher. A near calculation of the *total nett* "deficit" from the beginning on the telegraphs in State ownership gives

us the figure of about £17,000,000—a figure which on the spread-over is tantamount to a subsidy of £320,000 per annum. Arranging these deductions "commercially" they may be set out thus :—

I.

TELEGRAPHS UNDER PRIVATE ENTERPRISE.

	£
1870 Valuation	6,400,000
1870 to 1924 Developments (say only)	16,000,000
1870 to 1924 Dividends (average 3%) ...	36,288,000
1870 to 1924 Public expenditure on telegrams	216,000,000
1924 Public Assets	*Nil*

II.

TELEGRAPHS UNDER STATE ENTERPRISE.

	£
1870 Valuation	6,400,000
1870 to 1924 Developments	21,000,000
1870 to 1924 (spreadover loss)	17,000,000
1870 to 1924 Public expenditure on telegrams	216,000,000
1924 Public Assets	30,000,000

Since 1870 the "taxpayer," i.e. the nation, has spent a round figure of £216,000,000 on telegrams, and about £45,000,000 additional for purchase, extension, and upkeep of the telegraph system—say in round figures £260,000,000. Under private enterprise, minus many of the existing amenities, the "taxpayer" must have paid at least £252,000,000—and would be the whole amount "out of pocket." But in fact the "taxpayer" owns a business to-day worth £30,000,000 for a turnover of 55,000,000 telegrams and over £5,000,000 per annum is an asset not to be ignored. The *Financial Times* a short time ago did not propose that a syndicate of business men should take over the telegraphs and work them in the expectation of living on an annual loss !

On balance, therefore, the "taxpayer" is clearly the gainer by State-owned Telegraphs—in spite of a "loss" which under the name of a "subsidy" would smell much sweeter to a business man. A big contribution or profit from State Telegraphs to the Exchequer would be resented by the business community as much as they now resent the postal profit—in fact the business man appears to look upon the other man's possible profit as *his* loss ! A year-to-year balancing of the national telegraph budget is positively beyond the wit of the cleverest financier born or unborn.

It appears to be publicly understood that a sum of £20,000,000 is to be expended on telephone development within the next few years, but the stunt Press, aware of this, has so far (and of course rightly) not raised the least objection to the proposed outlay. Yet it would be extremely interesting to know the views of that same Press as to the ledger part of the business—its conception of the basis upon which the telephone tariff should be estimated. We know the process of estimation in ordinary commercialism—is it agreed that the State Telephones shall be placed upon a "paying" basis ?

To conclude, it may be permitted me to refer questioningly to one of the chief items in the "Cost of an Inland Telegram"—that of staff costs, or "pay." An inquiry into the average pay of a large number of Post Office classes evolves the fact that the percentage of staff drawing maximum pay or even approximating maximum pay, is comparatively low—from 20% to 33%. It is difficult indeed to criticize a statement by the Acct.-General, but it should nevertheless be stated that we cannot, on figures available, agree that an increasing factor in the expenditure is to be found in "the progressive approximation of the pay of the staff to the maximum."

TELEPHONE NOTES.

"More Telephone Troubles."

Under this heading, the *Evening Standard* recently discussed some of the reasons which give rise to bad service. It says : "Bad service is, also, very often due to the subscriber. There is one irri'a'ing and foolish gentleman who, about once a week, finds himself talking to me, when he wants someone else. It is annoying to him and to me ; but he pronounces the number he wants in such a manner that I am always at first deceived myself and cannot blame the operator for the mistake. Ten hours of him in one day would strain the stoutest nerves." *Telephony* reprints a letter, sent to a Kansas paper by A. M. Benedict, Manager Owner of a Telephone Company, and first Vice-President of the Missouri Telephone Association, in answer to some "old stuff, quips gotten off by the paragraphers" in its columns. The immediate cause of the letter was "that little quip—Why are wrong numbers never busy ?" Analysing the causes of 50 cases of wrong numbers which had come under his notice "in the last 6 weeks," he says : "Some 60% of the wrong numbers were transposed ; the balance were caused by the subscribers guessing at the number, without consulting the directory, looking for a number in the directory without putting on glasses, looking for a number in a dark room, glancing at the wrong number after seeing the name in the directory, poor articulation, mouth full of food, mouthful of candy, many cases of 'cigar in mouth,' and several other causes." While one is apt to envy the American telephone man's untrammelled access to the public forum, it must be admitted that it is better for the well-merited rebuke to come from him who is, after all, the victim in the case.

A Standard Telephone Directory.

"There are, in this State, 358 different directories published, nearly all—outside of those of the two large companies—different in size, different in type faces and sizes, different in space for advertising and location of ad." Thus *Telephony* reports W. T. Leyden's paper, read before the Minnesota Convention recently. Proceeding to advocate the setting up of a standard directory, he urged all member companies to use directories of an agreed uniform size, adopt the same style of "set up on covers," and establish a uniform set of rules and regulations, to be carried in the front part of the directory. In short, one might imagine that the speaker advocated a standard directory on the lines of our own, as well as the adoption of our own printing and publishing arrangements. So, after all, it seems, the State-operated British Post Office Telephone Service is not quite as unprogressive as, at least, some of the hundreds of privately-operated American companies. "A standardized directory will make possible systematic telephone advertising, through the opportunity to use directory space that is not sold to advertisers," Mr. Leyden continues, and makes a few suggestions for filling that space. "Likewise, may not good-will, and fair dealing, be induced in your subscriber, if he is made acquainted with the facts regarding operation ; with your balance sheet as a guide, may he not see that you are deserving of more consideration ?"

Tokio's Telephone System.

The casualties of the earthquake in Japan in Sept., 1923, have been given as, approximately, 68,000 dead, 42,000 injured, and 39,000 missing, while the havoc wrought to property cannot be even so nearly assessed. That the Japanese would accept the inevitable with philosophic calm, and set about the restoration of the stricken areas, was generally expected. It is a little startling, however, to read that so far as the telephone system of Tokio is concerned, this restoration is anticipated to coincide with the financial years 1925 and 1926. By the end of that period, 9 automatic exchanges, accommodating some 36,000 lines, and manual exchanges with another 46,000, are expected to be completed. An interesting feature is, that the automatic equipment is to be adapted for the ultimate introduction of the "Director System." The automatic equipment is to be manufactured, and installed, by the Automatic Telephone Manufacturing Company, Liverpool, and the associated manual equipment by the Western Electric Company, London. Apparently, then, Japan is furnishing another concrete proof of the statement that "other telephone administrations repeatedly order telephone equipment in Great Britain, to Post Office specifications, being satisfied with a product that has the approval of the British Post Office," made by the *Electrical Review* recently. It is with not a little pride that we further read that a law, passed by the British Parliament after the great fire of London, in 1666, has been translated into Japanese, for the benefit of the municipal authorities of Tokio ; an Act which, it is stated, created a court of five judges, whose duty it was to make adjustments in all cases of controversy arising out of the fire.

Widening the Telephone Field.

"In Oct., 1922, the number of subscribers' telephone stations in Great Britain reached one million," says the *Electrical Review*, in a leader on the

"Post Office and Automatic Telephones," "and new stations were being added to the system at the rate of about 5,000 per month. The number has now increased to 1¼ million stations, and new subscribers are being connected at a rate representing a net increase of about 10,000 stations per month. In other words, the system has increased 25% in 2½ years, and the rate of increase has, itself, doubled in that period. There is no sign of diminution in the rate of growth, and the recent formation of the Telephone Development Association to undertake publicity will tend, of course, to hasten it." Recently, this Association issued invitations to a private view of a short film, of the cartoon type, which is to be shown under its auspices, at every performance for one week at one of the smaller cinemas in 52 of our industrial towns. Before the picture was shown, an explanation of the purpose of the film was given. This indicated that the object aimed at was to reach "the lower middle class, shall we say, the artisans," as the proprietors are of opinion that the greater part of the future development, must be looked for in the residential telephones of that class. The speaker also said that, he understood, some 5,000 "Hoovers" has been sold in one week, as a result of a house-to-house canvass, and expressed the conviction that, with a slogan of "a telephone for less than 2*s*. 6*d*. a week," selling telephones was as good a business proposition as selling carpet sweepers at 1*s*. 1½*d*. a week.

The Film.

As already stated, the film is quite a short one, consisting of four incidents, which occupied four minutes only to run through the cinematograph. Starting with a simple bell set with hammer at rest, the bell is rung twice, and then a "candlestick" telephone appears. The first incident shows a man sitting at breakfast, despairing of catching his train, and obviously none too nice about it to the lady sitting opposite to him. While interestedly witnessing this "homely" scene, one becomes conscious of a movement on the wall, as of a fly. This becomes more pronounced, the object increases in size and finally, like a faithful if moody Ariel, there comes hopping on to the table—a telephone. After a moment's hesitation, the "artisan" lifts the receiver, and passes a call. A shifting of the scene shows the outside of a taxi office. An order clerk next appears at the door, shouting the address of the subscriber, and then the first of a rank of taxis moves off. The words, "You need never be late for business," appear at the top of the screen during this incident. The second headed, "or go out in bad weather," reminds the audience how an errand to the butcher's in bad weather can be avoided; while the third humorously depicts a domestic tragedy, which ends "as well as can be expected," when the telephone is used for calling a doctor quickly. After a lighting display of the cartographers' art, and making the announcement that "the telephone in this district costs less than 2*s*. 6*d*. a week," the film invites persons desirous of obtaining full information about residential, business, or rural telephones, to apply at the nearest post office. In business, the telephone was first a luxury, next a convenience, and then a necessity. Is its evolution as a social necessity destined to pass through similar stages? It almost looks as if the T.D.A. think it is. If so, one could perhaps have suggested, to the cartoonist, a number of situations in which the telephone would have appeared as a greater convenience to an English artisan and his wife. A less typically American setting might also have been used with advantage.

Shorter Notes and Comments.

The Station (Rugby) is fittingly termed "the Radio" in preference to "the Wireless." If the lengths of copper phosphor-bronze and steel wire used in its construction were totalled together, the sum would be sufficient to build a single line to the Antipodes."—*P.O.E.E.J.*

One of the owners of a telephone line running from the switchboard at Jonesville, complained that his service had been cut off because he refused to pay $6, his share towards paying for a building to house the telephone exchange. The commission held that a subscriber cannot be disconnected for a debt other than service . . .—*Telephony*.

The Munroe Telephone Coys.' Albion exchange, it is said, has so grown and developed as to make necessary, additional switchboard facilities. The Company deems it advisable in providing these, to arrange for the furnishing of common battery service as well as a magneto service. Those subscribers who prefer magneto service, will be privileged to continue such service at present rates. Those desiring the improved (C.B.) service, will pay the increased rates now authorised by the Nebraska State Railway Commission . . .—*Telephony*.

A Joint Stock Company, "Zug-telephonie, Aktiengesellschaft, Berlin," is under contract with the German Railways, to fit telephone apparatus on trains of all railways in Germany. When this work has been completed, it will be possible to speak from any train which is in motion, with any subscriber in any part of Germany. This telephone service is expected to be initiated during the coming summer.—*Financial Times*.

A short article on the Automatic Telephone, recently appeared in the feuilleton of the *Daily Mail*. It is claimed that the matter printed there, is paid for at a higher rate than similar matter printed in any other paper. Col. T. F. Purves said recently, "It is not difficult to interest people in automatic telephones." The statement appears to have thus been "rigorously" proved.

TWO TELEPHONE EXCHANGE TRANSFERS POSSESSING UNIQUE FEATURES.

BY J. O. COOPER, *Assistant Engineer, Liverpool Internal Section.*

IN the January issue of the *Journal* there appears an article under the title of "A Retrospect," which shows in detail the work which has been carried out during recent years in the Liverpool area. The majority of these developments represent engineering work of an ordinary nature, and call for no special comment, but there are two cases, Royal Exchange and Birkenhead Exchange transfers, which presented special engineering difficulties, and it is thought that a brief account of these works may prove of interest.

ROYAL EXCHANGE. LIVERPOOL.

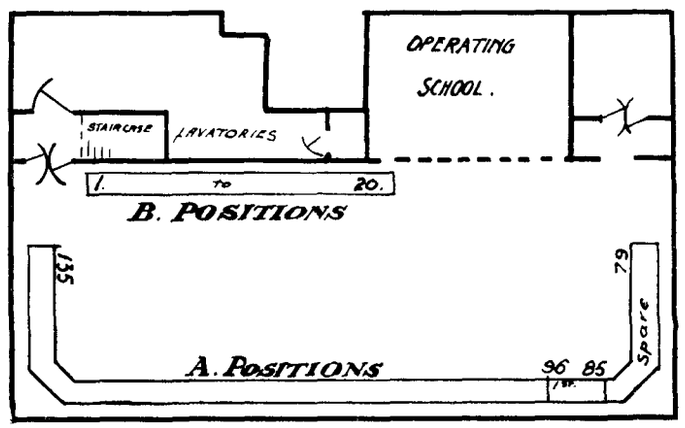


FIG. 1.

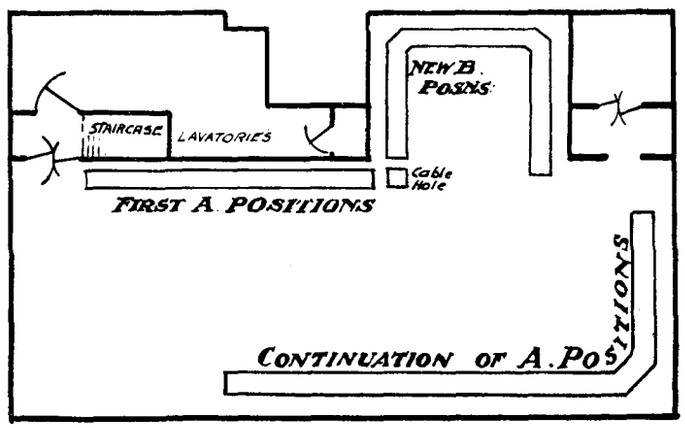


FIG. 2.

Royal Exchange.—The old equipment was of magneto type, with lamp call and clear, and was erected by the late National Telephone Company in 1892, in a building specially adapted for the purpose. During the life of the old equipment, the ground floor was used for engineering stores, the first floor as test room, and the second floor carried the switchroom. The building as a whole was good, though the new apparatus room located on the ground floor is not quite all that could be desired in the matter

of lighting. The switchroom compared favourably with others erected within recent years, and it was decided to erect the new C.B. equipment in the existing switchroom.

A floor plan of the switchroom showing the old equipment is given in Fig. 1., from which it will be seen that by doing away with the operating school, and removing the partition, a fair amount of space was made available for new plant, though it was insufficient to accommodate the whole of the equipment required.

The method adopted, therefore, was as follows :—

New B. sections were erected in space occupied by the old operating school as shown in (2). Before this could be done, however, it was necessary to remove the last section from the old B. positions, in order to provide space for the cables to come up from the new apparatus room below to the new sections. In doing this a rather novel method was adopted in regard to the multiple cables. To have unsoldered these on a 5,500 multiple would have been a tedious and expensive matter, and instead of so doing the cables were simply cut through at the desired point, a sharp chisel being used and each cable cut with a single blow. After the whole of the cables had been severed, the bare ends were given a couple of coats of shellac varnish. This method of cutting working cables is one which can be recommended, not a single fault having been traced to this cause, although the operation was repeated several times during progress of the work.

Upon completion of the new B. positions, the incoming junctions were transferred, the old B. positions were recovered, and space was then available for a portion of the new A. positions. These were erected, and upon completion subscribers from position Nos. 85 to 96 on the old sections were transferred. At this stage it will be seen that a portion of the subscribers on the exchange were working C.B., whilst the remainder were still on the magneto system. In order that all subscribers and outgoing junctions would be available from both the C.B. and magneto switchboards the new and old multiples were teed together.

As all the subscribers' apparatus was condensered, no difficulty arose so far as local and incoming junction working was concerned, but auxiliary apparatus had to be fitted in the outgoing junctions in order that they would function correctly, when used by subscribers working upon either the C.B. positions or the old magneto positions.

The next step was to remove the old A. sections, positions 79 to 96, and erect more C.B. equipment in the space made available. This space was still insufficient to accommodate all the subscribers remaining on magneto equipment, and the process had to be repeated three times before all the subscribers could be accommodated on the new plant.

The external work in connexion with the transfer consisted of teeing on to existing cables where they entered the building, and extending them to the new M.D.F. on the ground floor. The number of cables teed on in this way was 35, consisting of 300, 600, and 800-pr. cables, containing approximately 10,000 pairs.

In addition to the cable work referred to above, extensive alterations were necessary in the streets. New cables of larger capacity had to be laid, and a large re-arrangement of circuits in existing cables and transfer of circuits to new cables, &c., was rendered necessary by the transfer, and the development of the area. In jointing and teeing in the cables great care had to be exercised, as it was necessary to keep the subscribers' lines working in both old and new cables.

During the period covered by the various operations of the transfer, the maintenance conditions were very trying, as in addition to the extra work brought about by the abnormal exchange conditions, a large amount of additional work was necessary in connexion with external development schemes and re-arrangements necessary to bring the plant up to date for efficient C.B. working. In the *Telegraph and Telephone Journal* of December, 1924, these changes and others are referred to as having been effected with scarcely a ripple upon the surface, and this tribute, it is thought, reflects great credit upon the staff employed upon the work of this somewhat exceptional transfer.

Birkenhead Exchange.—The exchange which has just been superseded was erected by the National Telephone Company's local staff in 1901, a year or so prior to the Liverpool Royal Exchange, at a period when the Company was very doubtful whether C.B. was the system to adopt or not, and Birkenhead Exchange was more or less an experiment. It consisted of lamp calling by generator and single automatic clear, with magneto apparatus at the subscribers' premises. The centre point of the subscribers' bell coils were earth connected through the switchhooks, this being necessary to operate the clear upon completion of a call. The earth centred bell coils were also necessary in connexion with machine ringing, which was in operation on the A. as well as the B. positions.

The system might be said to possess all the costly engineering features of C.B. without the corresponding savings, while from a traffic point of view, although some advantage was gained due to the lamp call and machine ringing, supervision was not efficient owing to the single clear.

In connexion with the transfer the outstanding difficulty arose from the earth-centred bell coils, as it was not practicable to condenser the subscribers' instruments so as to make them suitable for C.B. working. Consequently, it was necessary to fit the new C.B. instruments at the subscribers' premises prior to the transfer, and to provide two-way switches to enable the subscribers to bring their C.B. apparatus into use at the time of transfer. Failure to operate the switches meant lamp glows on the new exchange, and it will therefore be seen, that the success of the transfer to a very large extent lay in the subscribers' hands.

Every effort was made to get the subscribers to co-operate, and in addition to each subscriber being written to, the Liverpool station of the B.B. Company kindly broadcasted a message urging the subscribers to throw their switches at the time specified, or earlier, in the event of their leaving the premises before the time of transfer. This message drew attention to the amount of work which would be thrown upon the engineers in event of failure on the part of any large number of subscribers to operate their switches, and pointed out that their lines might, in consequence, be out of service for some considerable time.

Another feature of the transfer was the small percentage of circuits which, owing to the relative location of the old and new exchange, were teed into the new exchange. Some 1,900 subscribers' lines, and 300 out of a total of 350 junctions, were through transfer jacks, therefore the testing, especially that of the junction circuits, was very slow. On a large number of circuits, as many as 11 operations had to be performed at old and new exchange, in order to make one test.

A brief explanation of the use of transfer jacks, which were fitted at both the old and new exchanges, and the method of connecting them in circuit, may perhaps be given. Lines which passed the new exchange en route to the old (Group A.), were taken through the transfer jacks at the former, and the connexions were arranged so that the insertion of pegs into the jacks at time of transfer, disconnected the portion of the lines going to the old exchange, and left the circuits connected to the new exchange. The transfer jacks at the old exchange were connected to the lines which did not pass the new exchange (Group B.). The connexions in this case were arranged so that the removal of the pegs from the jacks at time of transfer connected these circuits through to the new exchange on the conductors of Group A. circuits, thrown spare by the pegging out of the transfer jacks at the new exchange.

If this arrangement had not been adopted, it would have been necessary to provide special cables between the new and old exchanges, approximately 1½ miles apart, in order to extend Group B. subscribers to the new exchange. The use of these transfer

jacks involved complicated temporary wiring and testing arrangements, but this was more than counter-balanced by the very great saving in connexion with the underground cables.

The external work was of considerable magnitude, and included the laying of approximately 9 miles of underground cable, the erection of 57 new distribution poles, extensive overhaul of old distribution poles, and the provision of new leading in cable at many of the subscribers' premises.

As regards the transfer itself, all things being considered, it was more successful than anticipated. Approximately 30% of subscribers failed to operate their switches, whereas arrangements were made to cope with 50%. The method adopted, in cases where the subscribers had failed to operate their switches, was to remove the heat coils from the B. lines, and connect the circuits to 000 tone on temporary units fitted on spare positions adjacent to the T.O. positions. The restoration of these circuits was a somewhat slow process, but by keeping testing staff on over the week-end, following the transfer on Saturday, the majority were given service by the Monday morning.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE total number of telephones working at the end of February was 1,262,217, an increase of 10,365 over the January total. The gross number of new stations added was 19,058, and the number recovered 8,693.

The increase in the number of circuits rented at the special rate for private householders continues very marked. At the end of February these circuits numbered 218,485, or 30% of the total exchange installations in the Kingdom. In July, 1922, when the specially reduced residence rates were first introduced, there were 138,453 private house circuits representing a proportion of 25%.

The growth in rural party line circuits is slowing down somewhat, as a result of the opening of a large number of exchanges under the Rural Development Scheme of 1922, providing exclusive service at specially favourable terms in outlying districts.

Public street kiosks are gaining ground rapidly. In the Provinces, where apparently a better choice of site is possible than in London, these kiosks are proving more remunerative than other public call boxes.

The growth for the month under the various aspects of the service is analysed as follows :—

	London.	Provinces.
Total Stations at 28 February	445,575	816,642
Net Increase for month	3,580	6,785
Residence Rate Installations :—		
Total	80,999	137,486
Net Increase	1,311	1,958
Exchanges :—		
Total	104	3,672
Net Increase	—	17
Call Office Stations :—		
Total	4,169	14,582
Net Increase	16	59
Street Kiosks :—		
Total	54	937
Net Increase	1	26
Rural Party Line Stations :—		
Total	—	9,260
Net Increase	—	7
Rural Exchanges opened under 1922 Development Scheme :—		
Total	—	650
Net Increase	—	18

With regard to long distance communication, 6,625,627 inland trunk calls were dealt with during the month of December, compared with 5,620,050 in December, 1923—an advance of more than a million calls. The number of calls made to the Continent was 17,023. In December, 1923, the number was 11,289.

LIVERPOOL TRAFFIC SECTION.

ON Monday, Feb. 2, 1925, Mr. A. E. Coombs, Traffic Superintendent, Liverpool, took up duty at Glasgow on being promoted to the position of District Manager there.

Prior to his departure from Liverpool he was the recipient of a number of presentations, as a mark of the esteem in which he was held, and as some slight appreciation of the very able and courteous manner in which he has dealt with the staff under his control.

His relations not only with the staff, but also with the officers in other branches, had always been most friendly, and nothing could have been more gratifying than the spontaneous manner in which all sections combined to make his departure the occasion one on which to express in some degree this feeling.

To enumerate all the presentations which have been made would unduly take up space, but the following will indicate how all branches have combined in the matter.

On various dates Mr. Coombs received presentations from the Traffic Officers, Traffic Clerical Staff, District Manager, Engineers and Contract Manager, Telephone Supervising Staff, Day Telephonists, the Night Telephonists, and lastly, from the Provincial Traffic Staff, on his vacating a position on the Executive.

The presentations from the Supervising Staff and from the Telephonists were made before a large gathering at the Central Exchange. Miss E. Jackson, Asst. Supervisor, made the presentation on behalf of the Supervisors, and Miss R. J. O'Malley that on behalf of the Telephonists.

The presentation from the Traffic Officers was made by Mr. E. J. Hidden, District Manager, during a social function at the St. George's Restaurant. Among those present were Mr. W. M. Simpson (Postmaster-Surveyor), Mr. J. Walker (Asst. Postmaster), Mr. H. Ashton (Chief Superintendent, Postal Branch), Mr. O. G. Lee, (Contract Manager), Mr. J. Cooper, Mr. F. Beer, and other members of the local engineering staff, Mr. J. F. Brown, Traffic Superintendent, Chester, and his staff, and Messrs. N. W. Battersby, F. W. Clutterbuck, and G. Johnson of the Manchester Traffic Staff.

Although we are glad that Mr. Coombs has received a well-earned promotion, we must express regret that he has left us, because the loss to Liverpool is great. As a Chief his broad-minded outlook on all matters has been an outstanding factor, and this, together with his encouragement and tact, has rendered possible the progress which has been made in the Liverpool District.

Glasgow is to be congratulated on having in its District a Chief whose aims and ideals are high.

PRESENTATION TO MR. L. G. ALLEN, ASSISTANT TRAFFIC SUPERINTENDENT, BLACKBURN.

MR. L. G. ALLEN, who has been promoted to the position of Traffic Superintendent, Cl. II., at Birmingham, was presented on Friday, April 3, with a handsome Westminster Chiming Clock, by the District Manager's staff of the North Western Telephone District.

Mr. A. L. Barclay, Traffic Superintendent, presided over a representative gathering of the various staffs, and in asking the District Manager, J. T. Whitelaw, Esq., to make the presentation, said how exceedingly sorry he was to lose Mr. Allen.

Mr. Whitelaw spoke in eulogistic terms of Mr. Allen's abilities, and heartily congratulated him on a well-deserved promotion. Mr. Entwistle (Chief Clerk), Mr. Fairhead (Higher Clerical Officer), Mr. Morgan (Traffic Superintendent, Cl. II.), and Mr. J. A. W. Gregory (Asst. Traffic Superintendent), all spoke feelingly of Mr. Allen's good qualities.

In responding, Mr. Allen referred to his happy relationship with the staffs of all branches of the service and expressed his sincere thanks.

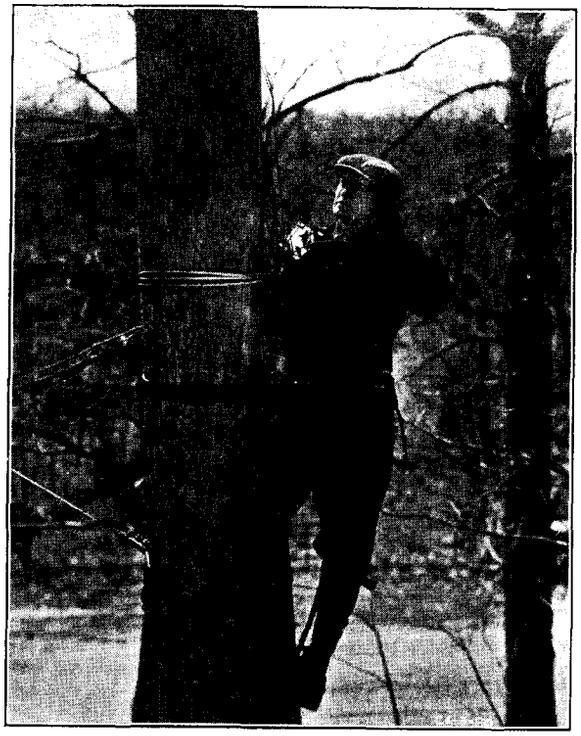
"DAUGHTERS OF THE NIGHT."

WE reproduce on this page some pictures sent to us by the Fox Film Company illustrating "Daughters of the Night," a film dealing with incidents in the life of a telephone girl. The film, which was released at the end of April, and is being exhibited in various towns throughout the country, will be of special interest to many of our readers. Without "giving away" the plot, we may mention that the film is full of thrilling incidents, for the

Interior of Los Angeles Telephone Exchange which figures in the film.

town in which the heroine works engages the attention of crooks, cracksmen, and bobbed-hair bandits. The wires are cut, the bank is set on fire, and the flames spread to the adjoining exchange building, where the heroine is faithful—almost unto death, but of course her linesman-lover arrives in time to rescue her. The complicated relationships of the linesman's brother with the crooks, and of both the brothers with wealthy, but disowning parents, add to the mysteries of the plot.

Alyce Mills as Betty Blair, the telephone girl, who sticks to her duty and faces death by fire.



Orville Caldwell, as Billy Roberts, about to repair lines cut by the villains of the piece.

REVIEW.

"*Mechanical Design of Overhead Transmission Lines.*" *Painton. Chapman & Hall.* 21*s. nett.*

This is an excellent book on up-to-date practice which should prove useful to those interested in the construction of overhead lines, not only for power transmission, but also for communication purposes.

The author has set out all the new data on the subject in a concise readable manner, and the treatment of the chapters on conductors, sag and stress problems, supports and constructional details, is exhaustive and authoritative. The volume is quite free from description of obsolete methods.

Recent developments such as steel cord aluminium conductors and the new designs of foundations for large supports are fully explained.

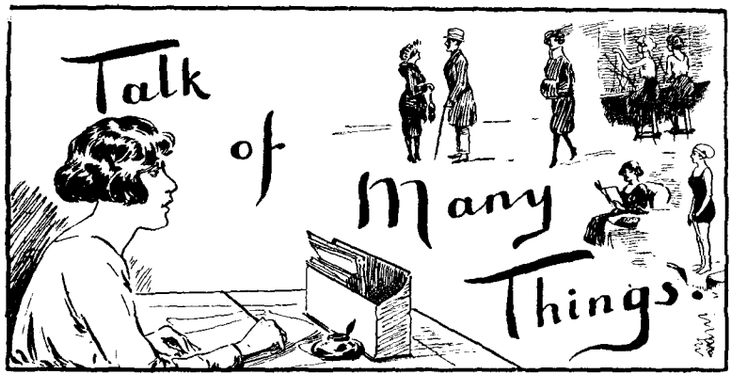
The mathematical work is not complicated, and the various rules and formulae are given in such a way as to be readily grasped. The book is a worthy companion to that on the *Electrical Design of Transmission Lines* by Messrs. Taylor & Neale, recently published by Messrs. Chapman & Hall.

GOLF.

THE Secretary's Office Golfing Society held a successful "Spring Meeting" under perfect conditions on the Maidenhead Golf Club's Course on April 7. Prizes were offered for the best "Medal" and "Bogey" scores, which were both won by Mr. C. L. K. Peel (5) with 75 net and "all square" respectively. As only one prize could be awarded to any competitor, however, Mr. Peel elected to take the "Bogey" prize, the prize for the "Medal" round being shared by Messrs. Birchall, Gavey, and Roadknight, with 79 net each. The runner-up in the Bogey competition was Mr. Roadknight (12) at 1 down.

The Bogey Foursome Competition in the afternoon was won by Messrs. Twinn and Prout; the runners-up being Messrs. Peel and Wakely and Savage and Kilby.

WE TELEPHONISTS



Sages in Cages.

FLEET STREET has a lure and a charm of its own, not only for the Londoner, and it has aptly been called the street of adventure and the street of ink. As a street it is a changing medley of new and old, of creation and destruction, characteristic, some may think, of its daily and nightly occupation. It is compounded of a startling modernity and a calm mediævalism. Its machines eat paper by the hundreds of tons, and its buildings carry one back hundreds of years. It is contradictory and whimsical, and its romance is not in it, but behind it. Fleet Street itself is but the face, its heart pulsates in its obscure courts and alleys. The historical and the hysterical are revealed only to the seeker.

Thus, when ambling recently through its secret places I encountered a policeman and a thrush, and, since each was looking at the other, neither noticed me. Hitherto blameless in the matter of the law I can still admire a policeman, and who could not admire a thrush if only for singing in a dingy city alley? It was typical of Fleet Street inversion that the thrush was caged and that the policeman—emblem of bolts and bars—was not. Actually he appeared very concerned that a thrush should be imprisoned at all, and particularly amid such unnatural surroundings. Said he: "You ought to be free to fly in fields and woods and to add your notes to those of your fellows. We're too busy to stop to listen to you here."

Probably the bird had forgotten that there were such places. He certainly appeared to think he was the only thrush and he sang as though to make up the deficiency and to cheer the hearts of men. Had he remembered, and been able to reason he might have wondered why, since men like fields and woods and birds, the policeman who was the law—had not forbidden the destruction and banishment entailed by the erection of hideous piles of bricks. Or he might have wondered why men congregate in such sterile deserts, and why they pay more attention to factory whistles and motor horns than the song of birds.

But, of course, the thrush was caged and stupid, whereas men are free and wondrous wise. PERCY FLAGE.

Spring is Coming!

"After the dark, the dawning,
After the sour, the sweet."

How true! You can't have one without the other. A short time ago I was planting some seeds in my garden, and as I made the little dark holes in which to drop the seeds, the thought flashed through my mind, how wonderful it was that these tiny atoms could work their way up through the darkness of the earth into the light, and air and sunshine, there to shed their fragrance in the form of a beautiful flower.

Who did not appreciate the sweetness of the Easter sunshine, after the dull monotonous days that preceded it? But we had to have the dullness first for "Only the toilers know the sweetness of rest and calm." Those words came into my mind several times during the Easter vacation, and I realised that it was only *because* I was one of the workers that I was able to appreciate and enjoy it to its fullest extent. L. R.

Clerkenwell School.

The teaching staff held a very enjoyable social in the Clerkenwell Dining Room on Saturday March 21.

Miss Cox—the Superintendent, F.E.S., and Mr. and Mrs. Beaumont were amongst the guests present.

The refreshments provided by the teachers under the direction of Miss Priggen were excellent—the tables were very tastefully arranged and looked beautiful.

A very good musical programme was arranged and altogether a most enjoyable evening was spent.

Those visitors who had not previously seen the School were very much interested in all its details and the teachers spent a busy time showing them round, and appeared to enjoy it too. "One who was there."

We give below a further selection of limericks submitted in connexion with the recent competition:—

If storm faults are due to the rain,
Then isn't it perfectly plain,
We shall get them again,
And again and again,
And again and again and again!

Now this story may sound somewhat strange,
But it happened at Gerrard Exchange,
A caller most willing
Inserted a shilling—
Expecting to get tenpence change!

Said a fetching young flapper named Flo,
"I find operating too slow!
And complaints make me tired—
So before I am 'fired'—
I think on the films I shall go!"

Sneered a haughty "Hello" girl, named Hilary,
"My indolent ways you may pillory—
But pray don't forget
That *I* never fret
When you grab *my* Subs. from the ancillary!"

Sighed a 'phone girl whose front name was Dahlia,
"This 'timing of calls' is a fahlia!
Checking each call's duration
Requires cogitation—
Or else special paraphernalia!"

Park Exchange.

The staff at Park Exchange recently entertained 210 poor children of the district.

The children were invited for 4 o'clock, and, needless to say, arrived quite an hour before time.

After removing their out-door clothes (those lucky enough to possess any!) they were presented with a handkerchief and shown to their seats in the Tea-room.

Their eager eyes showed signs of wonderment at all the good things displayed before them, and as soon as the signal was given to commence each one vied with the other as to who could put away the most in the shortest possible time.

Cakes and mince pies disappeared like magic, some inside—and some in bags.

After doing full justice to this glorious spread, the children were taken into the Concert Hall to see one of their favourite Pantomimes, "Dick Whittington," played by the Telephonists.

They thoroughly enjoyed every moment, especially when they could join in the "Choruses," and give full vent to their merry mood.

Each child on leaving was given a toy, and a bag containing sweets, an apple and an orange.

As the youngsters gradually dispersed we were glad to think that they had had such a happy time, as indeed, we all had.

London Wall.

Two very enjoyable dances have been held by the members of the Nautilus Swimming Club.

The first was held at the Irish Club, and the able services of Mr. Gerrard, who acted as M.C., were very much appreciated.

The dance was made the occasion for presenting prizes to successful members of the Club. Miss Johnstone made the presentation, and was afterwards given a bouquet and a hearty vote of thanks for the inspiring enthusiasm which she shows for the Club.

The second dance was held at the Shaftesbury Hotel. This time, Mr. Beck was the M.C. He was accompanied by Mrs. Beck, and their presence did much to make the evening a very enjoyable one.

Home Thoughts!

Oh, to be in England,
Now that April's there,
And whoever wakes in England
Sees some morning, unaware,
That some weather has broken loose again,
There's a frost and a fog and a blinding rain,
And the birds are frozen on twig and bough,
In England—now!

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North) London, E.C.

LONDON ENGINEERING DISTRICT NOTES.

London Phonograms.

IN the Phonogram Room, on the third floor of the C.T.O., an ancillary section has been installed. The equipment consists of 6 phono boards No. 1, each board being equipped with 3-10 way answering jacks, and 3-10 way lamp jacks. The jacks are wired to their full capacity and can accommodate 30 junctions from the various exchanges.

The boards are wired in multiple, each board having 3 operators' positions equipped, thus allowing any one of the 18 operators access to any of the 30 junctions.

The junctions are led through break-jacks (fitted in the main switchboard) which enables either or all of the 30 junctions to be transferred to the ancillary boards at will. The whole installation is very compact, all cables (with the exception of the main power and line cable) the operators' speaking sets, keys, &c., being installed in T.6.B. casing, and the phono boards fixed to the cover of the casing. The whole installation is raised 4 inches above the table, to allow the operator to put received messages through slots in the table, thence to be conveyed by a band carrier fitted underneath. When an exchange calls, the signal is received on a lamp which glows in the usual manner; the relays for this purpose are fitted on a small rack at the north end of the table, which also accommodates the fuse board and miscellaneous relays. Each line circuit has 3 relays, the lamps being fed through a pilot relay.

Cross connecting facilities are provided for distribution purposes, and the wiring is arranged so that, with slight modifications, the system could be split up into separate units.

Central Telegraph Office: Building Operations.

Some interest has been evoked in connexion with the engineering work which has to precede the building operations now in progress at the C.T.O.

The shifting of machine telegraphs, although of considerable magnitude, does not involve much work of an unusual character; the difficult problem relates to the tubes, but the work is progressing satisfactorily although somewhat slowly.

Threadneedle Street New Post Office.

The comparative comfort enjoyed by the operating staff during the rebuilding of Threadneedle Street Telegraph Office has not been enjoyed by the engineering staff.

Originally the whole of the secondary cells, some 900 in number, were crowded into one small underground room, and the late Mr. Connell, so well known at T.S., prided himself on the achievement; but, of course, it was anticipated that the arrangement would be of a very temporary character. Unfortunately the War broke out and the cells were left in that temporary position from 1914 to 1918. Then it was decided to reconstruct the building in two, instead of three, stages and this involved another temporary shift, many of the cells actually being housed in underground vaults.

This was made possible partly by means of a ventilating system, provided by the power engineers, and partly by "oiling the cells." This last expression might appear to sound like a joke; but it is a fact that the modern method of placing oil on top of the electrolyte of secondary cells, not only reduces evaporation, but also the emanation of fumes. Fortunately, before the whole of the rear portion of the building was completed the new battery-room was made available and the cells were placed in their permanent positions.

The apparatus was removed during week-ends, accommodation being found in the adjoining premises, doors being provided on the upper floors to lead from the Post Office to the rented premises. The second stage of the rebuilding has so far progressed that the apparatus has now been re-transferred and is housed on the second floor of what promises to be a very handsome building.

The number of sets of apparatus transferred at one week-end was 40, and the opportunity was taken to arrange the wiring so as to permit of Morse apparatus being substituted, at an early date, by "Start and Stop" machines. When this is done the new Telegraph Office may be regarded as the most modern and complete in London, although, of course, dwarfed, as regards size, by the great office in St. Martin's-le-Grand.

CORRESPONDENCE.

THE FUTURE OF THE TELEGRAPHS.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

SIR,—These notes on the "Phonetic Typewriter" are extracts from *The Clerk*. It is the invention of Mr. Martin Bandle of Davos, Switzerland. The Inventor claims that either letters or figures can be recorded as desired, that the apparatus can be used for all the principal European languages, and that it can write by the use of the voice only at a speed of 90 to 100 words a minute. The microphone is a feature in its construction.

Quoting from Mr. Murray's paper: "Many messages now going by telephone would go by telegraph, and also a good many letters that now go by mail would go by wire." Here is the answer, that not only the present Telegraph System but also considerable sections of the Postal system of Communications must needs be scrapped.

"The Business Man will have to pay for it." Also in addition to the wire rental he will have to pay the cost of the multiplex channels and of their maintenance in running order.

Why does Mr. Murray object to the word "Suggestion"? Through his paper recur the two refrains: "We must teletype as well as teletalk." "No operator required." The comparison of the telephone girls with the telegraph operators is false. The teletype is no more automatic in its action than the linotype. It needs to be operated. It is improbable that the labour world will acquiesce in the replacing of telegraph operators by typists on telegraph wires. Still more visionary is the idea of everyone a telegraph operator.

Yet without this novel form of economics the whole scheme fails. The Business Man will hardly pay a telegraph operator to teletype at infrequent intervals. The extension of telegraph instruments to underground stations, call offices, and kiosks for public use would necessitate an increased number of operators. At the same time operators would still be necessary at Post Offices and Cable Stations to deal with telegrams handed in there.

It would be idle for me to attempt any criticism such as that of Colonel Purves. Some difficulties that occur to the ordinary man are submitted.

Undoubtedly the Inland Telegraph Service could be made remunerative by charges "according to time and distance" or for services rendered. It is hampered in several respects not the least of which is the equal message rate, but the remedy is unlikely to be found in the methods of Dr. Coue.—

Yours faithfully,
March 23, 1925. J. J. BOYLE.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

DEAR SIR,—I notice in your review of Mr. Baldwin's "History of the Telephone in the United Kingdom" that you say that he adduces evidence to show that Glasgow had the first telephone exchange in this country, viz. about March, 1879.

It appears from his book that Mr. Baldwin accords the credit to Glasgow on the basis of a statement by Mr. David Graham, who certainly would appear to be qualified to speak, as Messrs. D. & G. Graham were the pioneers of the telephone in this city until the National Telephone Co. acquired their business.

Without, however, in the least degree, doubting the good faith in which Mr. Graham made his statement it would seem that some confirmatory evidence shall be forthcoming before his recollection of the date of so long distant an event can be unreservedly accepted.

On the other hand I venture to submit certain reasons why I still believe that the London exchange, established in August, 1879, at 36, Coleman Street, E.C., was the first in the British Isles, as I endeavoured to uphold in my letter to the JOURNAL (Dec. 1917).

(1) As the Bell patent was owned in this country by the Telephone Company, Limited, the policy of which was to establish telephone exchanges in London, and grant licences to companies or persons to do similarly in the provinces, it would seem extremely unlikely that any of the licensees began working exchanges before the parent Company—in other words, that Glasgow should precede London by 5 or 6 months.

(2) Shortly after my letter appeared in the JOURNAL, an old colleague, Mr. R. C. Bennett, who will be remembered as District Manager of Sheffield, called to see me at G.P.O. North. He told me that he had been visiting his brother, Mr. A. R. Bennett, that they had been much interested in my letter, and that the latter expressed himself as being in agreement with my view as to London having the first exchange. I was naturally glad to learn that my contention received support from one identified so prominently with telephone matters.

Incidentally I may point out that it is recorded in the Biographical Section of the Electrical Trades Directory that Mr. A. R. Bennett went to Glasgow in January, 1881, as engineer to Messrs. D. & G. Graham. If that firm was the first to establish a telephone exchange in these Islands, so interesting a fact could hardly have escaped the notice of so close a student of, and authority on, telephone development as Mr. Bennett, in which event presumably he would have remembered it and I should not have been informed that he inclined to my view.

(3) To the best of my knowledge and belief only three telephone exchanges existed in the United Kingdom (viz. London, Manchester, and Liverpool) when I joined the service in Nov. 1879. My chiefs were assiduous in collecting all the information possible from the parent company, its licensees, and all available sources, as to the progress of the enterprise in London and the provinces, which was useful for purposes of propaganda. I had the fullest access to all this and I certainly do not remember hearing of a Glasgow exchange existing at that time, nor in any of the intervening years have I ever heard, until now, any suggestion as to Glasgow having the first exchange.—

Arden Bank, 34, Manor Way, Beckenham, Kent.
April, 1925.

Yours faithfully,
ARTHUR E. COTTERELL.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

Mr. Maycock's term of office as President of the London Telephonists' Society was brought to a successful conclusion by a very enjoyable Whist Drive, which was held at Caxton House Restaurant (Cabins Ltd.), Tothill Street, S.W., on Friday, March 27. This was quite a new departure from the usual activities of the Society and was in response to a number of requests from members who prefer a game of cards—with the possibility of an acceptable present at the end of it—to the pleasures of dancing. As usual the Committee were well supported by 175 members and friends in their endeavour to organise a social evening where they could enjoy themselves with each other, and the occasion brought together a number of old friends from offices and exchanges in different parts of London. In consideration of the fact that most people had come straight from their offices a more substantial supper than the usual light refreshments had been provided, and was much appreciated. There were ten prizes which had been carefully selected and they presented quite a goodly array when they were set out for inspection. The only disappointing feature was the shortage of men which necessitated many ladies playing as gentlemen and thereby preventing them from competing for the particular ladies' prize they had set their heart on winning. At the termination of a very happy evening, Mrs. Beck very kindly presented the prizes to the lucky winners and, before leaving, a very hearty vote of thanks was accorded her.

* * * *

The Survivor.

The transfer of Palmers Green Exchange from magneto to central battery equipment on April 18, leaves Bank Exchange as the surviving example of magneto working within the 10-mile radius from Oxford Circus. It seems very fitting that the oldest inhabitant should still exist. The mention of magneto-working recalls many pleasant recollections in the minds of those who have spent 20 years or more in telephones. The names of Gerrard, Avenue, London Wall, Paddington and many more, conjure up memories of places and people that do not somehow seem to be associated with the more modern central battery exchanges. Still less, one supposes, will automatic exchanges be associated with personalities.

Bank Exchange, although only a shadow of its former self (it now gives service to only 300 odd subscribers) has to be seen to be believed. Comparing the appearance of the switchboard with the latest designs, one is reminded of the difference between the old-world harpsichord and modern upright grand. There is a striking difference between the old switchboard made on the spot and the modern machine and factory-made switchboards. You could not imagine the Bank switchboard being anywhere but at Bank; it has personality impressed on it, but modern switchboard sections are just Robots. So we advance.

* * * *

Culled from the Exchanges.

Gerrard.—Saturday, April 4, was a red letter day for the patients at the Queen's Hospital, Sidcup, and for the members of the Gerrard staff and their friends who spent a happy afternoon and evening there.

After a very unpromising morning the sun came out to celebrate the occasion, and the old house and beautiful grounds looked very spring-like as the many helpers busied themselves making preparations for the entertainment.

There are still about 600 men at the Hospital. The face and head surgical cases are now very few, only the slowest and longest cases being still under treatment, but as they are discharged their places are filled by shell shock and nerve cases who now form the majority of the patients.

By 4 p.m. the tables in the big dining hall were ready, and proceedings began with a procession of trolleys to the wards, laden with special dainties for the invalids who were unable to leave their beds. Then the dining hall was thrown open and in a few minutes the tables were all surrounded by a very cheerful crowd ready to do justice to all the good things provided. Girls in gay frocks hurried to and fro with tea pots so heavy that two hands could hardly lift them. Cream pastries seemed in special demand, and the caterer, with his usual foresight, had provided a goodly supply. A packet of cigarettes each made a fitting finish to the meal, which, one might almost say, ended in a cloud of smoke.

After tea little parties of visitors wandered round the wards and were able to see and purchase some of the work of the men, while some got up little impromptu concerts, and others found partners and danced to a gramophone. At 6.30 everyone made tracks for the recreation hall where the orchestra was already tuning up, and half an hour's dance music gave an excuse for turning a very wide gangway into an impromptu dance floor. The concert then commenced and was provided by members of the Gerrard staff assisted by several professionals, and was followed by more music from the orchestra. Ices and other good things appeared in the interval.

Judging from the cheerful smiles of the patients all thoroughly enjoyed themselves, and certainly the visitors did. Everyone worked with a will, and as usual the caterer's staff did wonders and seemed to enjoy their hard work. We missed some old friends among the patients and hospital staff; "Peter," one of the hospital's miracles, whose cheery presence has helped things go with a swing on many previous occasions, and who has now been appointed to the new hospital at Richmond in charge of the patients' recreations. Good luck to him!

It costs over £60 to give one of these entertainments, but the Gerrard staff have subscribed this amount in the seven months since the last event—a very big achievement. Since the Gerrard staff started these entertainments about 8 years ago £570 has been subscribed and collected. Subscriptions from anyone interested are always welcome and will speed on the day of the next visit to which patients and visitors are already looking forward. The writer, an outsider privileged to take part in these events, can promise that anyone taking an interest for the first time will soon be numbered among the enthusiasts.

PERSONALIA.

LONDON TRAFFIC STAFF.

Resignations on account of marriage:—

Miss D. G. LEVERETT, Telephonist, of the Victoria Exchange.
Miss K. E. M. E. WISEMAN, Telephonist, of the Victoria Exchange.
Miss D. B. BUCKLAND, Telephonist, of the Mountview Exchange.
Miss A. A. SMITH, Telephonist, of the Trunk Exchange.
Miss E. C. PIDWELL, Telephonist, of the Trunk Exchange.
Miss L. R. HOWLETT, Telephonist, of Regent Exchange.
Miss E. H. BARNES, Telephonist, of Central Exchange.
Miss E. E. HALL, Telephonist, of Paddington Exchange.
Miss E. E. BROOKE, Telephonist, of Central Exchange.
Miss D. G. PUDDY, Telephonist, of Central Exchange.
Miss D. A. CLIFTON, Telephonist, of Victoria Exchange.
Miss A. D. FOOTMAN, Telephonist, of Victoria Exchange.

Promotions to Asst. Supervisor, Class I:—

Miss A. L. PIERCE, Speedwell Exchange.
Miss M. H. BAILEY, Chancery Exchange.
Miss C. K. POOLE, Battersea Exchange.
Miss N. SMITH, Ravensbourne Exchange.

Promotions to Asst. Supervisor, Class II.:—

Miss A. E. WHITEFIELD, Central Exchange.
Miss A. E. PENNICOTT, City Exchange.
Miss DAISY A. JONES, Clerkenwell Exchange.
Miss D. COLLINS, Hampstead Exchange.
Miss F. M. REYNOLDS, School.
Miss A. R. CHILD, Ealing Exchange.
Miss L. B. WICKEN, Hop Exchange.
Miss C. E. FURNESS, East Exchange.
Miss A. L. MEALING, Chiswick Exchange.
Miss L. M. DAVIES, Gerrard Exchange.
Miss E. C. LLOYD, Royal Exchange.
Miss D. V. TILBROOK, Avenue Exchange.
Miss E. TANNER, New Cross Exchange.

Promotion:—

Controller's Office. Mr. P. G. LIVERMORE, to Executive Officer.

THE

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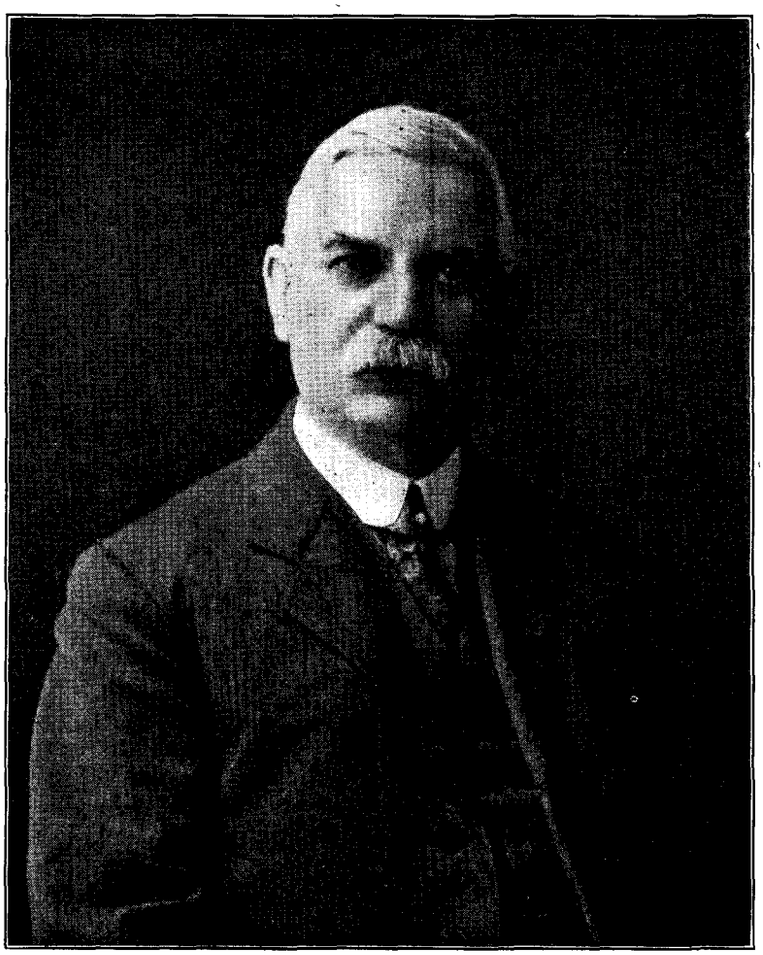
TELEGRAPH AND TELEPHONE MEN.

XVII.—MR. J. ALSOP.

THE subject of our sketch this month, Mr. J. Alsop, Chief Superintendent Telegraphs, Birmingham, was born in January, 1866, a month remarkable from the fact that it saw the birth of three of the Chief Superintendents of the four Class 1 towns.

He entered the employment of the Post Office at Birmingham in August, 1881, and, in the course of his long service at that office, he has performed every branch of telegraph duty and passed through every grade, before reaching the highest telegraph post in September, 1923.



Mr. Alsop is one of the fast diminishing band of men who carried through the transfer of the National Telephone Company's trunk lines to the Post Office in 1895. For many years he was intimately concerned with the Birmingham Trunk Exchange, and was Exchange manager from November, 1908, until February, 1912.

He has been a member of the Awards Committee since 1916, and last year became its Vice-Chairman.

Mr. Alsop is a fine example of the men to whose organising ability and sound judgment the efficiency of the telegraph service is largely due.

NOTES ON TELEGRAPH PRACTICE.

By G. T. ARCHIBALD.

VI.—*Concerning the Disposition of Apparatus &c., in Telegraph Instrument Rooms.*

THE telegraph instrument room must be described before the further treatment of telegrams is discussed. Here it is that the telegraphist spends an average of eight hours a day for the greater portion of his official life. He does not come into close contact with the public as does his brother officer on the telegraph counter and, although he is not a dull unimaginative fellow, he usually regards the instrument room as the home of monotony; indifferent to the romance of telegraphy and displaying only a bored kind of interest in the telegrams that pass through his hands. He seldom feels inclined to weave a story round Jack's telegram to Elsie apologising for his inability to keep last night's appointment, he exhibits no emotion in signalling a telegram to a bereaved parent, wife or child. Nor does he differentiate between the anxious, sympathetic little lady who wires, "No letter this week; are you ill?" and prepays the reply, and the suspicious dragon who merely wires, "No letter this week, Wire," and does not prepay the reply. If circumstances permitted the telegraphist to take more interest in telegrams, who can say but that he might develop into a first-class story writer. This may seem to be a digression but it is a digression with an object, since it is designed to show that, although telegraph operating may appear to be monotonous, it has all the elements of a very interesting occupation.

The office arrangements must be such as to ensure the disposal of telegrams within the standard transit time of 15 minutes, and in order that this may be done it is necessary to observe certain guiding principles which govern the lay-out of apparatus, &c.

The fundamental requirements of a telegraph instrument room are :—

(*a*) A well-lighted, airy room.
(*b*) The necessary telegraph apparatus, and tables.
(*c*) Circulation facilities.
(*d*) Delivery preparation facilities; and
(*e*) Receptacles for sorting and storing finished work.

We are all entitled to our own opinion on the question of the ideal instrument room, but since many of us would be extravagant in our demands, it may be well to accept the official ideal for our standard. It is not a bad standard, although very few of our instrument rooms conform to it at present, and it is doubtful whether it will ever be possible to arrange the larger offices exactly on the lines laid down in official instructions.

The official ideal telegraph instrument room is square shaped, and a room of such formation should be provided if possible at offices dealing with 1,000 telegraph transactions or more daily, when new buildings are being erected or extensions are contemplated. This will be a tall order if ever it should become necessary to build a new Central Telegraph Office, and it seems a fair assumption that such an office could not be provided within the boundaries of the City of London.

Having secured the most suitable available room, we must proceed to the disposal of the apparatus. The speedy transference of telegrams from circuit to circuit is essential. At the smaller offices where only a few circuits are in use, this work is performed by the girl probationers and messengers who are employed in collecting and distributing telegrams. At the larger offices this form of distribution would result in chaos, and it is therefore necessary to set up a central circulation position to which all telegrams are brought by the collectors and are then sorted into racks for transference to the out-going circuit.

The circulation table has been aptly described as the hub of the office, and, as may be guessed, it is usually located in the centre of the room. Tubes and other mechanical carriers connecting the instrument room with the counter, branch offices, phonogram room, delivery room and subsidiary circulation points (if any) are usually led to the circulation table or to an adjacent table.

The addressing table—at which telegrams are prepared for delivery—is also located at the circulation point at the smaller offices; at offices where a separate addressing table is warranted, the delivery room tube is connected to that point.

In order that the time occupied in internal circulation may be reduced to a minimum, circuits carrying the heaviest loads are placed on the instrument tables nearest to the circulation table, the less heavily loaded circuits, concentrator switches and news circuits being grouped on the more distant tables.

The concentrator switch is usually placed at the end of a table in close proximity to the associated working sets and as near to the circulation table as circumstances permit. Phonogram equipment when located in the telegraph instrument room is installed at the extremity of the room, the working positions being arranged so that the operators face the back of the telegraph sounder screens. A separate room is usually provided for phonogram equipment in cases where eight operators or more are employed on such work during the busy hour.

Single tables of standard pattern are used in all cases, and the apparatus is so arranged that the telegraphists may all face in the same direction. At the larger offices the circuits are so arranged that the operators face the circulation table.

All instrument tables are of the standard width of 2 feet, with the exception of tables for Baudot Multiplex circuits, which are 2 feet 3 inches in width, and for Creed apparatus and repeaters, which are 2 feet 6 inches in width. The length of table required for the principal types of circuit is as follows :—

	Ft.	In.
Morse Simplex	3	0
„ Duplex	5	0
„ Quadruplex	10	0
„ „ Wheatstone on "A" side ...	10	0
„ „ "A" side relayed	11	0
„ „ Split Repeater	15	0
„ Wheatstone Automatic Duplex (excluding punching or writing space) ...	6	0
Each Puncher or Writer	2	4
„ Wheatstone Automatic Simplex (excluding punching or writing space) ...	4	0
Baudot Multiplex (Distributor Table)... ...	4	2
„ „ Arm (Duplex)	5	0
Start-Stop Duplex	5	0
Creed Receiver and Printer	7	0
„ each gummer and checker	2	6
Keyboard Perforators	2	6
Telegraph Concentrator Switch... ...	3	0
Phonogram Position	2	6
„ Ancillary Section (for three operators)	7	6
Repeaters: Ordinary Fast Speed	4	6
„ Quadruplex	6	0

Where local difficulties prevent a rigid adherence to the above standards they may be departed from to the extent of 10% if no inconvenience is caused to the operating staff. The standard measurements are, however, applicable only where apparatus is regularly used to its full extent for more than two hours daily. Where a circuit is not used to its full extent, or where the use is only occasional, a variation up to 15% may be allowed.

Few changes in the construction and lay-out of instrument rooms have been made during the past thirty years. Probably the most considerable improvement effected is in the lighting arrangements, particularly at the larger offices, but greater care is now taken in the spacing of apparatus, largely as the result of the recommendations of the Cramp Committee which sat in 1910-11 under the chairmanship of Sir John N. Barran, Bart., M.P.

There was formerly some difference of opinion on the best arrangement of telegraph circuits. Some supervising officers

preferred a geographical disposition, so that when one circuit was interrupted the work might be sent to an adjacent town providing an alternative route. Other officers preferred an arrangement whereby circuits having a community of interest might be placed together. Under this system the Manchester–Southampton and Manchester–Glasgow circuits were placed on adjacent tables, so that the telegrams from Southampton to Glasgow and vice versa might be passed from one circuit to the other without touching the central circulation table. Theoretically, this system was excellent, but it broke down in practice in very large offices, for the simple reason that the collectors could not be expected to discriminate. As a general rule, as Mr. Lee pointed out in his book, a compromise was effected, the broad geographical arrangement was adopted, the principle being departed from in special cases. This system has been disturbed by the rapid development of printing telegraph working, and more particularly so since the introduction of divided multiplex circuits which join such offices on a single circuit as London, Preston and Edinburgh; Newcastle, Bradford and London; Glasgow, Manchester and Bristol; Edinburgh, Leeds and Belfast; Glasgow, Liverpool and Swansea; and the present policy is to associate the various types of apparatus together, the more important circuits being located on the tables nearest the circulation table. The multiplex system lends itself admirably to team working, and this is an additional advantage gained by the grouping together of all such circuits.

The next point to be considered is that of internal circulation. This is a sufficiently important matter to deserve detailed explanation, and will be dealt with in the next chapter.

(To be continued.)

POST OFFICE (LONDON) GOLFING SOCIETY.

THE Society's Annual Meeting was held at Wanstead Golf Course on Friday May 22. The function was blessed with fine weather, and with the course in excellent condition, together with the admirable arrangements which had been made for the comfort of the members by the Executive of the Wanstead Golf Club, a fine day's sport was assured. Sixty-six members foregathered to take part, and representatives of all the various departments turned out for the contests which embraced a "Singles" Stroke Competition in the morning and foursomes against Bogey in the afternoon. An additional feature on this occasion was a medal round for the Challenge Cup presented by the Captain, Mr. A. W. Edwards, to decide the Society's Championship, the best gross score returned over 18 holes determining the winner. The Wanstead Course is admittedly an excellent though a difficult one, and its many pitfalls were doubtless the cause of the non-return of many of the Competitors' Cards. The unlucky 13th which bears the name of "Profanity," and which is a dog-leg hole over a large lake, was the downfall at a critical period to many of the players, and the lake demanded and certainly obtained its full quota of golf balls. The kind offices of Mr. F. Thomas, the Secretary of the Wanstead Golf Club, who was indefatigable in his efforts for the success of the meeting, were greatly appreciated by the competitors.

RESULTS.

Challenge Cup and Replica :—

Mr. A. B. Cooper. 84 gross.

Singles :—	Gross.	Handicap	Nett.
Mr. W. E. Weston	86	9	77
„ A. G. Tydeman	90	12	78
„ A. Gordon	96	18	78
„ A. B. Cooper	84	6	78

Mr. Weston thus secured the 1st prize presented by the Captain, Messrs. Tydeman, Gordon, and Cooper tying for the 2nd and 3rd prizes presented by the Society.

Foursomes :—

Messrs. W. L. Rathbone and Mr. Larkins	5 down
„ L. V. Manogue and J. R. Steedman	6 „
„ A. E. Johnston and W. D. Topley	6 „
„ C. D. Hinman and W. T. Muir...	6 „

Messrs. Rathbone and Larkins received the prizes presented by the Vice-Captain, Mr. A. G. Tydeman, the 2nd and 3rd prizes presented by the Society being tied for and divided among the members named.

THE POST OFFICE AND AUTOMATIC TELEPHONES.*

BY COLONEL T. F. PURVES, O.B.E., M.I.E.E.

Continued from page 147.

Apart from any method of grading, the best arrangement of the plant—in this ratio of 1,200 subscribers to 128 selectors, which is equal to 8 selectors for 75 lines—would have been obtained by combining the 24 outlets of 225 subscribers' line switches in a common multiple with access to 24 selector trunks. Assuming normal busy-hour traffic, this would have provided a standard of service of 1 lost call in 100.

Grading in 16 groups, as shown, raises the standard of service to 1 in 500 without involving the use of any additional plant. In the absence of grading, this standard could only have been attained by reducing the number of subscribers' lines served by 24 trunks and selectors from 225 to about 190—equal to an increase of 15% in the required number of trunks and selectors. The economy effected by grading is therefore an important one.

Another, and older, method of increasing the traffic capacity of first selectors is to provide access to them via an intermediate set of secondary line switches or "pre-selectors." Many descriptions of this method have appeared in automatic literature, and it is not necessary to describe it here. There is good reason for believing, however, that, considering switching plant as a whole, the grading scheme effects substantially the same economy as the use of secondary line switches, while it has the great advantage of avoiding the circuit complications and the increased fault liability that the latter entails.

Problems similar to those mentioned arise in connexion with the operation of hunting for disengaged trunking circuits between one rank of selectors and another. In this case the economic importance of securing optimum trunking arrangements is greatly increased by the fact that the next rank of selectors may be located in another exchange and the circuits may have to traverse some miles of street cables.

The increased traffic efficiency attending the selection of circuits in large groups has led to the design of selector switches which are capable of searching, or hunting, through much larger banks of trunking circuit contacts than the banks of 10 which are usually associated with the "step-by-step" automatic system. The rotary system of the Western Electric Co. searches over a bank of 22 circuits, while the panel system of the same company is arranged to search a maximum of 90 circuits and could probably, if desired, be arranged to search nearly 500 circuits. The switches of Messrs. Ericsson's machine-driven automatic system could also, if necessary, be arranged to find a disengaged circuit in a group of approximately 500. The direct step-by-step system is somewhat handicapped in this respect by the fact that the whole operation of searching for and finding a disengaged trunking circuit has necessarily to take place in the short interval between two successive pulls of the automatic signalling dial on the subscriber's telephone. In the case of machine-driven systems, such as those of the Western Electric Co. and Messrs. Ericsson, where the trains of signalling impulses are received from the subscriber by means of quick-acting "registers" which subsequently steer the call through the connecting switches, there is no such arbitrary time element to contend with.

It has, however, been possible to devise step-by-step switches which can search directly over a bank of 20 trunking contacts two at a time without exceeding the small time interval available. It is also quite practicable, on this system, to install suites of 10-contact or 25-contact "pre-selectors" between the various ranks of switches, and thus raise the theoretical trunk-hunting capacity to 100 circuits or 250 circuits. Such pre-selectors installed, say, between second selectors and outgoing junction circuits, would have their brushes joined to the selector banks and their multiple banks connected to the junctions. The selector can only find an outlet to the junctions via a pre-selector, the brushes of which are already standing on an idle line. Thus the actual searching movement is confined to the selector itself, and the time required for the operation is not increased by the introduction of the intermediate pre-selectors. Exhaustive study has shown, however, that by utilizing the methods of graded grouping already referred to, the need for large banks of trunk-hunting contacts, or their equivalent, can to a great extent be obviated, and that a satisfactory amount of traffic per switch can generally be carried even with 10 contacts in the bank level. It appears possible that the savings so effected in switch construction, and by the omission of the intermediate pre-selectors, will in most cases balance the cost of the small proportion of additional junction circuits required for the 10-contact system, and selectors having banks of 10 contacts will therefore

* Paper read before the Post Office Telephone & Telegraph Society of London.

be used for ordinary services in the exchanges installed in London and throughout this country, unless and until further detailed study of local conditions indicates that facilities for increased searching range will at some points be economical.

It has been mentioned that the theoretical method of attacking problems of switching layout is often exceedingly difficult and leads to results which are tedious to evaluate. The most obvious alternative is to solve such problems by actual observations on working exchanges. There are two objections to this: first, that it is difficult to control such tests—i.e. it is necessary to work with the traffic actually experienced, whether this traffic is that required to give salient points on traffic curves or not—and secondly, that the available range of "grade of service" is very small, so that it is not possible to find what deterioration is effected in the service by a given increase of traffic or reduction in the number of switches. For these reasons it has been a practice of the Engineering Department to make use of "artificial traffic" for the production of designing curves, and the results obtained are checked by theoretical calculation and by observations at working exchanges, where possible.

Two methods of producing artificial traffic have been used, one employing numbered counters and the other making use of the numbers in a telephone directory. In the first method 100 counters, numbered "01" to "99," are placed in a bag and shaken. Counters are then drawn one by one at random, each counter being replaced after drawing. The number of such drawings is made equal to the number of "busy hour" calls required for the test, and the number drawn represents for that call the interval of 1/100th of an hour at which the call originates. By repeating the process and tabulating the results together, the time at which each supposed call originates may be determined to 1/10,000th of an hour. The times of the calls are arranged in sequence and are then available for the analysis of the effect of any desired grouping of switches. The holding time may be constant or variable, as desired. In the telephone directory method the time at which a call originates (to 1/10,000th of an hour) is obtained by choosing a succession of 4 digits from the numbers in the directory. In general, tens digits only are used, as with the others there would be a tendency for certain digits to occur more often than others.

Each of these methods is, of course, merely an attempt to obtain a sequence of events in time according to the laws of pure chance, and so to represent the entirely fortuitous intervals at which individual calls are made during a short period when the aggregate amount of traffic is fairly constant.

As an illustration of the way in which the fluctuations of traffic are proportionately reduced as the size of a group increases, it may be of interest to consider the case of a number of subscribers each making two calls per busy hour with a holding time of 3 minutes. If these are arranged in a group of 10 having a common outlet, the resulting traffic would be equivalent to 1 traffic unit, and if the calls were made at absolutely uniform intervals they would all be carried by a single switching channel, continuously occupied. Similarly, a group of 250 lines would originate 25 traffic units and require 25 switching channels under the same conditions.

Actually, if this provision were made the following percentages of calls would be lost:—

	Per cent.
For 10 lines (1 traffic unit and 1 switch) the loss would be	50
For 100 lines (10 traffic units and 10 switches) the loss would be	21.5
For 250 lines (25 traffic units and 25 switches) the loss would be	15
For 1,000 lines (100 traffic units and 100 switches) the loss would be	7.6

The matter may be looked at in another way as follows: Assuming that the standard grade of service of 1 in 500 is given, it is found that the average traffic per switch for the numbers of switches quoted above and in two graded cases would be as follows:—

10 Switches will be asked to carry 3.43 traffic units per hour; average traffic units per switch	0.343
25 Switches will be asked to carry 13.76 traffic units per hour; average traffic units per switch	0.55
100 Switches will be asked to carry 76.4 traffic units per hour; average traffic units per switch	0.764
100 Switches (10-contact grading), 43.6 traffic units per hour; average traffic units per switch	0.436
100 Switches (25-contact grading), 64.08 traffic units per hour; average traffic units per switch	0.641

In the first three cases the pre-selectors finding their outlets via these switches are assumed to have a sufficient number of contacts to secure full availability; in the two last (graded) cases the pre-selectors would have only 10 and 25 contacts respectively.

(6) Services Reserved for Manual Operation.

The conversion of an area to automatic working does not involve the complete elimination of the manual operator. Some classes of traffic can at present be handled more conveniently and economically by manual than by automatic means and, in general practice, all calls for which more than the unit fee is charged will be dealt with by an operator who will record each call on a ticket in order that the proper debit may be made to the calling subscriber. In the Post Office system, operators are retained for trunk and toll circuit calls, extra fee junction calls, phonogram (i.e. telegraph message) calls, call-office and coin-box station calls, and for "inquiry" and "information" calls.

Until recently all coin-box and call-office traffic was handled manually, but a new form of coin-collecting box has now been introduced which provides for the deposit of the local unit fee automatically. The attention of an operator will only be required for calls involving the deposit of additional coins in the box. The use of this new coin box in association with automatic systems will, in the first instance, be confined to provincial areas.

For all calls to points outside the unit fee area, the originating automatic subscriber dials a number which will obtain the attention of an operator in his own local exchange, or in the trunk or toll exchange, to whom he gives his demand. The call is then handled and recorded on a ticket in the regular manual fashion throughout.

The method known as "dialling out," which permits the calling subscriber to obtain direct communication with an operator at the distant exchange required, is frequently advocated, but has not been adopted by the Post Office for extra fee traffic, on account of the disadvantage of removing the supervision of such calls from the operator at the home exchange. The distant operator cannot conveniently be placed in a position to check the identity of the calling subscriber against whom the extra charge is to be debited.

The converse procedure of "dialling in" is, however, in common use. A subscriber on a manual exchange who requires a subscriber on an automatic exchange, reached by means of a junction or direct trunk line, makes the demand to his local operator as usual. This operator then completes the call by dialling from her cord circuit over the junction or trunk line directly into the switches at the automatic exchange, and thus sets up the desired connexion without the intervention of an operator at the called exchange. This method of operating is adopted in all cases where line conditions permit, in preference to the alternative method of passing the demand verbally by order wire, or over a signalling junction to a manual operator at the required automatic exchange for completion.

The character of the line has, however, a restrictive effect upon the extent to which "dialling-in" can be employed. The method is practicable on almost any length of unloaded physical line, but the introduction of loading coils and repeaters and the use of phantom circuits give rise to certain difficulties. The transmission constants of a loaded line introduce a marked degree of distortion in the dialled impulses, but in the few cases where this trouble would be sufficient to affect working efficiency it would be possible to remove the difficulty by the use of special methods and apparatus.

Repeaters and phantom circuits are, however, obstacles which have not yet been fully overcome. A solution has been found to the cognate problem of sending calling and supervisory signals over such circuits, and considerable progress has been made with the solution of the dialling problem. A method which promises a satisfactory result involves the use of high-frequency alternating currents, the application of which to the line at the sending end is controlled by the dial impulses. At the receiving end these trains of high-frequency alternations operate on the grid of a valve having in its plate circuit a relay which in turn controls the stepping relay of the selector switch.

In ordinary local areas of medium size an endeavour is always made to change over from manual to automatic working simultaneously at all the exchanges in the area, but this is often impracticable, and in such cases one or more exchanges remain manual whilst the remainder are automatic. Under such conditions the methods of "dialling-in" and "dialling-out" are both adopted for interchange of traffic between the two systems, and each call is dealt with by one operator only.

There is no objection to allowing an automatic subscriber to dial out to the operator at a manual exchange in the case of unit-fee traffic, since the registration of the call is automatic and the operator, who has no extra charges to record, is not concerned with the identity of the calling subscriber.

(7) The Problem of very Large Areas.

Although it has long been recognized that the mechanical switching possibilities of automatic selecting apparatus are theoretically unlimited, there have been difficulties of a very practical kind in applying it to the telephone service of the largest area systems which have grown up in manual exchange practice. Up to a few years ago it was necessary to envisage an automatic intercommunicating area as laid out upon a perfectly uniform and rigid scheme of exchange numbers for the subscribers in all parts of it. The first digit of each number had to choose a line to a particular district, every subscriber in which must have a number commencing with that digit. There might be another digit to choose a particular exchange in the selected district, in which case all the subscribers' numbers on that exchange would have to commence with the same two digits. A further four digits would

suffice to choose any subscriber's line in an exchange of 10,000 lines, or in a group of smaller exchanges of 10,000 lines' aggregate capacity. Such a system would be a straight 6-digit system or its equivalent and, as one or two initial digits have to be reserved for special purposes, it would serve a maximum of about 700,000 subscribers' lines. If it were possible to construct the whole system *en bloc* and to transfer to it all existing subscribers on a given day, on which day a brand-new telephone directory would be brought into use, the fact that every number on the system had been changed might not present too serious a difficulty. In reality, of course, the process of transfer must generally extend over several years. The economic advantage of the automatic system is not usually sufficient to justify the scrapping of adequate and up-to-date manual exchanges, and there is generally a long interim period during which the two systems must exist side by side. So long as a rigid numbering scheme was essential the successive transfers of groups of subscribers, as additional automatic exchanges were opened, occasioned in each case a certain amount of dislocation of the service. The continual change of indefinite groups of numbers in the directory, and the consequent alterations in the methods of initiating and handling the traffic concerned, were exceedingly troublesome to subscribers and operators alike. Another condition necessarily attending the layout of an area under a rigid numbering scheme is that in all parts of it a definite allocation of spare numbers must be made at the outset, in order to provide for future development at each particular point during a period of many years. Similarly the layout of main switching centres, the number, capacity, and approximate positions of all exchanges, the routing of traffic between them, and the capacity of the routes followed by external junction lines, must be settled long in advance of the maturing of full requirements. Telephone development is affected by so many uncertain factors—commercial, social and political—that it is very doubtful whether even the most careful forecasts of ultimate development could be relied upon to avoid the probability of enormous expense and inconvenience in providing for errors and in correcting them. A further possibility of danger arose from the fact that the handling at manual exchanges of calls for automatic subscribers absorbed more of the operators' time than ordinary calls. As the proportion of such transfer calls increased, the traffic capacity of each manual exchange would be correspondingly reduced and additional operators' positions, with in some cases extensions of buildings, would be necessary to serve the existing manual subscribers at unconverted exchanges. There would be many cases in which such extensions could not be made and a very critical position might arise. So serious did these aspects of the matter appear that telephone engineers responsible for providing the means of carrying on uninterrupted service in the large and immensely important areas represented by New York, London, and other great cities, hesitated to embark upon the task of introducing the automatic system in these areas.

As already mentioned, the preliminary installation of a semi-automatic system throughout the area, followed by a final quick change-over to full automatic, presented a solution—although an uneconomical one—of some of the difficulties of the transition period, but it did not provide any way out of those affecting the subsequent development of the area on the basis of a rigid numbering scheme.

A notable attempt to solve the London automatic problem was described in a paper by Messrs. Laidlaw and Grinsted, read before the Institution of Electrical Engineers, in 1919. The authors proposed to divide London into nine regions each expected to serve about 100,000 subscribers, and to mark the names of these nine regions on the subscribers' calling dials, adjacent to digits 1 to 9. The main switching exchange in each region would bear the regional name, and would be reached, by the first pull of the dial, from any subscriber's station in London. Access would be obtained through it to all the other exchanges in the region. Subscribers' numbers would all be changed and would consist of the regional name followed by 5 digits, or possibly by 6 digits. In a 5-digit system, for example, "Wimbledon 1829" might become "South 71829," the digit 7 being used to steer the call into the Wimbledon exchange. ("Wimbledon 19" would become "South 70019.") The initial digit "0" would be used to gain the attention of an operator for all service purposes and for the completion of all calls to points not included in the nine London regions. The proposal was very ably worked out, but it was felt by the Post Office that it failed to provide the traffic and engineering conditions necessary for the satisfactory introduction of automatic working in the London area. It postulated a rigid numbering scheme, with eventual alteration of all existing subscribers' numbers; an inflexible routing scheme which involved, *inter alia*, the provision of direct junction circuits from every main exchange to all the regional centres. Only 10 exchanges in each region of 100,000 lines could be selected by means of the second digit, but the most economical layout of the regions would seldom be secured by 10 exchanges of 10,000 lines each. In some cases the number would approach 20 exchanges of correspondingly reduced capacity. An exchange of 4,000 lines, for example, would therefore have to be reached, through a nominal 10,000-lines' centre, by 4 separate third digits, each representing the selection of a group of 1,000 lines. Junction circuits would have to be provided for each group independently, instead of as a common stock available for the full 4,000 lines. Such conditions tend to involve excessive provision of external plant. The scheme also dictated a certain artificial sequence of exchange transfers—inasmuch as in every case the main regional exchange would have to be made automatic before any other exchange in the region could be dealt with—which would have been liable to involve heavy economic wastage. Some of the interim arrangements proposed for the transition period would also have led to troublesome repercussions in practice. (These remarks are, I think, quite consistent with high appreciation of the value of the contribution made by Messrs. Laidlaw and Grinsted to the general study of the subject.)

(8) THE "PANEL" SYSTEM OF THE AMERICAN BELL COMPANIES.

Such was the London position until in 1919 we began to hear rumours that the long-continued and quite unadvertised efforts of the American Telephone and Telegraph Co. and its associated manufacturing concern, the Western Electric Co., had succeeded in evolving a system which obviated all the well-known difficulties, and that it had actually been decided to commence its installation in New York. The basis and general arrangement of the new system—the "panel" system—had been known in this country for some time, but details of its most recent development were lacking until Mr. McQuarrie of the Western Electric Co. visited this country early in the year. Mr. McQuarrie's description of the new operating features which had been grafted on to the system came to me as a veritable flash of light. It was at once evident that, by the invention and application of the digit translators, numerical call indicators, &c., which he described, most of the old bogies had been disposed of, and that a way had been opened for the direct application of the automatic system to telephone areas of the very largest size. Initial preparation could be made at all exchanges in the area without affecting the service, and thereafter the installation of automatic plant could begin at any points where new exchanges were required. The routing of calls through various switching centres could be arranged in accordance with the actual needs of the traffic and could be modified from time to time as development might dictate. There was no need for any wholesale change of exchange names or of ordinary subscribers' numbers; all that was necessary was to alter a few names which were alphabetically or numerically similar to others, and to level 2-digit and 3-digit subscribers' numbers up to four digits. (Even these comparatively trivial modifications are quite sufficiently troublesome in practice.) The arrangements for interchanging calls between automatic and manual exchanges permitted of rapid operating and tended to raise, rather than to lower, the traffic capacity of existing manual exchanges. Each subscriber, automatic or manual, could make all his calls in a uniform manner and would not require to distinguish in any way between calls for correspondents served by automatic or by manual exchanges. Above all, a directory which would give no trouble to any subscriber could be prepared once for all, in advance of the first exchange transfer, and could be maintained unaltered throughout the whole transition period and into the subsequent full automatic period, apart, of course, from ordinary additions and deletions.

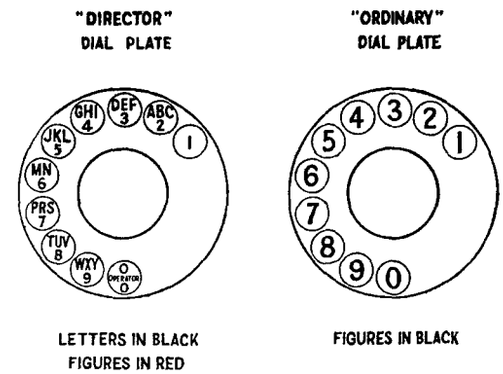


FIG. 12.—Automatic dial plates.

The subscribers' calling dial with a combination of letters and numbers, first introduced in connexion with the panel system, has frequently been described and is becoming fairly well known, and the same applies to the arrangement of the directory pages.

Fig. 12 shows the finger plate of this dial, as well as one of the ordinary type. The subscriber is required to dial the three initial letters of the required exchange, followed by the four digits of the called subscriber's number. The three letters which appear in each of the finger holes of the dial have, of course, the same numerical significance, and produce the same effect upon the switching mechanism as the digits which occupy the same positions; the use of letters is purely a matter of convenience. The three initial letters of each exchange must represent a different combination of digits from those of any other exchange. Obviously, therefore, the two names "HAMmersmith" and "HAMpstead" must not exist together in the same area, and the same would apply to two such names as "Victoria" and "Thames" since the pulls of the dials represented by VIC are identical with those of THA. Fig. 13 shows the arrangement of part of a directory page. The block printing of the first three digits of the exchange names does not at all inconvenience the manual subscriber who passes his calls verbally, and it indicates to the automatic subscriber that these three letters must be dialled in order to reach the exchange in question.

As already indicated, the panel system is so equipped that each subscriber obtains communication with all his correspondents, manual or automatic, in the same manner, and is therefore quite unaffected by the successive conversions of exchanges, other than his own, from one system to the other. So long as his own station remains manual he passes all calls to his exchange operator verbally as usual and, as soon as his own exchange has been converted to the automatic system, he uses his calling dial in exactly the same way for calls to either type of exchange.

This result is achieved by the introduction of "call indicator" equipment of types substantially similar in operating principle to those which have been adopted for the London automatic system, as described later (see Figs. 21 and 22).

A detailed description of the panel switching system and its modes of operation—which represent a remarkable aggregate of invention and design—would occupy several volumes, and only a brief reference to it can be made here. Its evolution was only undertaken after a thoroughly comprehensive study of all existing automatic systems, and with the specific object of producing a system specially adapted to service in the largest and most densely telephoned areas, which would be capable of furnishing every kind of service that the manual system, with its operators, has ever been called upon to supply. A preliminary description, by Gherardi and Charlesworth, was printed by the Associated Bell Companies in 1920, and a fuller general description was presented in a paper by Craft, Morehouse and Charlesworth, read at a convention of the American Institute of Electrical Engineers in 1923.

Argent Co. 1400 Bway.....GRE eley 5513
Argentina Brazil & Chile Shipping Co
70 Wall..HAN over 0307
Argentine Genl Consulate, 17 Batry pl..REC tor 6946
Argentine Impt & Expt Corp, Prod Ex...BRO ad 1768
Argentine Mercantile Corp, 42 Bway.....BRO ad 5066
Argentine Naval Commission, 2 W 67..COL mbus 5623
Argentine Quebracho Co, 80 Maiden la....JOH n 1652
Argentine Railway Co, 25 Broad.....BRO ad 1383
Argentine Trading Co, 1164 Bway.....MAD Sq 1871
Argeres Bros, Restrnt, 86 6th av.....SPR ing 5337
Argero A, Grocer, 119 9th av.....CHE lsea 6255
Arghis A, Tobacco, 74 Wall.....HAN over 6311
Argirople Theodore, Jwlr, 406 8th av..FAR ragut 9772
Argo Packing Corpn, 705 Greenwich...FAR ragut 4505
Argon Dress Co, 24 E 12.....STU yvsnt 2011
Argonaut Supply Corp, 50 Union sq..STU yvsnt 7476
Argonne Steamship Co, 17 Battery pl...REC tor 2493
Argos Ad-Art Co, 1133 Bway.....FAR ragut 5986
Argosy The (A Pub), 280 Bway.....WOR th 6800

FIG. 13.—Extract from a New York telephone directory.

The installation of the system has been rapidly pushed forward and it has now been equipped in New York and some other large American cities to a capacity of more than 250,000 subscribers' lines.

The system derives its name from the design of the selector switches, the multiple contact banks of which are arranged in large flat panels over which the contact brushes move in vertical lines. Its moving parts are all machine-driven by means of a system of rotating shafts maintained in continuous motion by specially designed motors of practically unvarying speed. Its electrical design differs profoundly from that of step-by-step systems with straightforward selection by decimal stages. In general the movements of the switches are governed by what is known as "revertive control," that is to say they are not actuated by impulses sent into them but, after having been started, the switches themselves send impulses back into the controlling mechanism, which counts the impulses and stops the movement of the switches when the required position has been reached.

The number of circuit outlets among which a panel switch can exercise selection is not limited, as in the step-by-step system, to 100, but has, in fact, been made 500; that is to say the excessive selections do not follow in decimal sequence.

Since the subscriber's calling dial transmits a series of plain decimal impulses, it is necessary to provide means for receiving these impulses and translating them to a non-decimal basis before they are used for controlling the movements of the switches. This function is performed by a combination of apparatus—called a "sender"—situated in the exchange of the calling subscriber. In the sender the decimal impulses sent out from the dial are accepted, stored, translated and finally sent out, in any desired sequence of impulse trains, to route the call through any necessary intermediate switching centres to the required exchange, and, finally, to reach the line of the called subscriber. Complete numbering and trunking flexibility is thus provided.

As already mentioned, the motion of the selector used in the panel system is vertical only; when hunting for a circuit it moves upwards, and when released it returns downwards to its normal position of rest. The movable portion of each selector consists of a long tubular metal rod carrying six triple-contact brushes. One of these brushes fixed at the top of the rod moves over a flat commutator in combination with which it controls the extent of the motion and also extends the three wires of the selector circuit to the other five brushes. These five brushes are spaced equidistantly on the tube and have in front of them the flat panel multiple of 500 circuits. Each brush has access to 100 of the circuits and each selector can therefore make connexion with any one of 500 circuits. Motion either upwards or downwards is imparted to the rod and brushes through the medium of magnetic friction clutches placed at the bottom of the rod in association with the constantly rotating power shafting.

The panel with its five sections of 100 lines each, placed one above the other, is fitted in the centre of an iron framework.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

THE news editor of the London *Daily News* made a wonderful discovery the other day on the back of a news telegram which had been received from the Central Telegraph Office. Let it be put into the news editor's very own words!

> "The News Editor turned over the pile of telegrams of murders, assaults, labour troubles and political news, just as a gleam of golden May sunshine lit up murky Bouverie Street, and on the back of one telegram, written in a girlish hand, read:—
>
> *'Dear One. This is four o'clock! and you departed at three. Oh, I must possess myself in patience until to-morrow, when I shall be off at four—with you. Oh, the things to talk about!'"*

It is all very natural and all circumstantially true to life, yet why should our contemporary be startled by the fact that telegraphists are human, very human? Yet one is glad indeed to know that, "Like a dear faded rose petal, a page of romance" fluttered on to the desk of the grey-haired editor, and that it took him back over the years again and led him to write of the C.T.O. as "that grim office, yet a fairy castle to some lucky man, for Love lingers there!"

DENMARK.—The London *Times* states that the Copenhagen Telephone Co. is negotiating with an American banking firm for a loan of $3,000,000 (£600,000), and the conclusion awaits the final decision of M. Stauning, the Danish Prime Minister. The loan will be used for the extension of the Company's service. The question of establishing a telephone service between Copenhagen and London has been discussed by the Danish Telegraph Authorities and the British General Post Office. The project presents considerable difficulty.

FRANCE.—The juridical section of the International Wireless Congress of the newly-formed International Amateur Radio Union, held in Paris, having dealt at length with the question of composers' and authors' rights as affected by transmission by wireless telephony, voted unanimously the two following resolutions:—

> 1. The right of intellectual property recognised by the International Convention applies to the diffusion of all intellectual works by all means of transmission and execution. It is, therefore, applicable, with all the consequences ensuing from its application, to works transmitted by radio-electricity.
>
> 2. The radio-electric transmission of the execution of an intellectual, literary, or artistic composition cannot be made without the consent of the person interpreting the composition.

The Congress also discussed the confusion caused by similarity of wavelengths, and approved a series of recommendations by which specific wavelengths would be assigned to amateurs in different regions. Mr. Hogg (Great Britain), the reporter of the sub-committee appointed to deal with this aspect, said that the committee considered it was advisable to divide the world into four distinct sections: Europe, Canada and Newfoundland, the United States, and the rest of the world. In principle, only wavelengths exceeding 70 metres had been dealt with, as there was as yet insufficient data with regard to shorter lengths; nevertheless, provisional figures for shorter lengths had been determined in order that experiments should be carried out in an orderly manner. The lengths decided upon were as follows:—

> Europe.—115-95 metres; 75-70; 47-43.
> Canada and Newfoundland.—120-115 and 46-41.5 metres.
> United States.—85-75 and 41.5-37.3 metres.
> The Rest of the World.—96-85 and 37.5-35 metres.

All other wavelengths, apart from those now indicated for amateurs and those already chosen for international traffic, should be set aside for experimental purposes.

GENEVA.—At the conference of representatives of European broadcasting organisations, held in London at the invitation of the British Broadcasting Co., it was decided that an International Broadcasting Bureau should be set up at Geneva. For the oversight of the affairs of this Bureau a committee of nine was appointed, and at a meeting of the Committee at Geneva representatives from the following countries were present: Belgium, Czecho-Slovakia, France, Germany, Great Britain, Holland, Norway, Spain, and Switzerland. The Bureau is to be a clearing house for information, and will also be charged with the responsibility for negotiations in connexion with the interchange of programmes and the settlement of technical and programme difficulties. Mr. A. R. Burrows, who has been connected with the B.B.C. as its director of programmes from the outset, has been appointed Bureau manager, and has accordingly resigned his position with the B.B.C. Many of his duties will be taken over by Mr. C. A. Lewis.

HOLLAND.—Reuter's Amsterdam correspondent states that the special committee appointed to inquire into the State management of the Dutch post, telegraph, and telephone services recently reported to the Minister of Waterstaat on the working of the powerful wireless station recently erected

at Kootwyk. The committee urges that the State management of this station should cease, and that it should be placed in the hands of a private company as a concessionary. This station is intended especially to provide radio communication with the Dutch East Indies.

HONG KONG.—*A report has been issued by the Colonial Office of a* conference on piracy near Hong Kong, which was the outcome of representations made by the organisations of shipmasters, navigating and engineer officers. The conference recommends that the fitting of wireless apparatus and the carrying of trained operators should be obligatory on all ships subject to the piracy regulations, and that the Admiralty should be asked to consider what steps should be taken to render the naval vessels patrolling the danger zone continuously able to receive distress calls from river steamers.

LITHUANIA.—*Commerce Reports* says the construction work on the radio station at Kovno, which is in the hands of a French company, has been suspended owing to lack of capital. The chief of the radio station has requested the Government to appropriate a sufficient sum to complete the station, but it is doubted whether the desired appropriation will be made in the near future.

LONDON.—A debate took place at the British Horological Institute, London, at the end of April, on the subject of wireless time signals, and the most desirable type of transmission code from the point of view of the watch, clock, and chronometer manufacturers in the British Isles. The Swiss Horologists recently considered the same subject, and decided in favour of terminating each minute of the International ONOGO code with the six dot seconds as transmitted by the British Broadcasting Company from Greenwich, which has proved to be desirable.

It is stated that the Swiss Group has already approached the Bureau International de l'Heure, of Paris, with this request, but that organisation is merely an executive body under the International Astronomical Union, which has a special section responsible for the whole of the world's international wireless time signals. Any such changes in transmitting codes can only emanate from the Astronomical Union, because it is an international body, and as a conference is to be held at Cambridge in July this year, it is considered desirable that the question of the most suitable forms of time signals for various purposes should be thoroughly thrashed out so that the Cambridge meeting may have all the evidence before it. The debate will be open to members of the Institute and others interested in this important subject.

PERSIA.—It is reported, says the *Electrical Review*, that a beginning was made on March 24 at Kassra-Kadjar, about four miles from Teheran city, with the erection of a radio station, the first of seven to be constructed by the (Russian) Central Electrical Trust in Persia.

RHODESIA.—*Commerce Reports* informs us that the Government of Southern Rhodesia has definitely decided to go ahead with the scheme for a radio station just outside Salisbury, for which £12,000 has been set aside under the loan estimates to cover the cost. Tenders will be called for in a few months.

UNITED STATES.—The London morning and evening papers report that a new broadcasting scheme to cover all America is announced. Four linked stations, at Chicago, New York, Los Angeles, and a place to be decided upon, will cover the entire country. The scheme is in the hands of Mr. Hearst, who will put his newspaper resources behind it, and Mr. Joseph Schenck, the kinema and entertainment magnate, who will provide the amusement features.

Several schemes to put broadcasting on a proper basis are now being considered by the United States Government. That which finds most favour is the charging of a tax of 8*s*. on each valve and 2*s*. on every crystal set sold. Should the scheme be adopted, it will probably come into operation next October.

The annual report of the Cuba Submarine Telegraph Co., Ltd., is an interesting document. It shows that the receipts amounted to £64,881, and the expenses to £27,170; the balance, after providing for cable repairs, income tax, etc., was £24,062. To this is added a difference of exchange of £4,028 and £7,106 brought forward, making £35,196. The sum of £15,000 has been added to the general reserve; and interim dividends absorbed £7,000. From the balance it is proposed to pay the final preference dividend and a final dividend at the rate of 5%, free of tax, on the ordinary shares (making 5% for the year, tax free). This leaves £6,196 to be carried forward subject to corporation profits tax. The competing Government cable in the West Indies was opened for working in December last, and the subsidies allowed to the West India and Panama Telegraph Co. ceased. To prevent this company from going into liquidation the Cuba Co. acquired the whole of its debentures and shares. The board hopes that this will enable the greater part of the traffic to and from the West Indies, upon which the company is so dependent, to be maintained.

None the less interesting is the annual report of the Indo-European Telegraph Company, which also shows the vitality of the cable world, and the tenacity of the directorate and management of some of these old-established telegraph organisations. The Chairman, Mr. H. L. M. Tritton, in his speech to the shareholders, said that the reconstruction and repair work had been carried on during the year on sound lines so that total interruptions were very rare, and seldom lasted more than 24 hours. The volume of traffic was not unsatisfactory, having regard to the difficulty of regaining the confidence of customers after a long period of enforced inactivity. This confidence was being regained by the high quality of the Company's service, and with the improvement of facilities it should increase. Relations with the concessionary Governments had continued to be most friendly; the German concession up to December, 1954, had been obtained. Their co-operation with the Indo-European Telegraph Department of the India Office had gained for them direct Wheatstone working between the United Kingdom and Karachi, a distance of 5,300 miles. In the accounts £50,000 had been set aside towards the reconstruction of lines in Russia and Poland. The success of the year's working was indicated by the increase in the dividend from 7 to 8½%. Among other allocations was the placing of £10,000 to the dividend-equalisation fund, which was practically exhausted. It was the existence of a considerable sum on this account which had enabled the directors to maintain dividends at a very substantial level during the war.

PICTURES BY WIRE.—A new use for the system of sending pictures long distances "over the telephone wires" has been found. An X-ray photograph of an injured human hand was transmitted from New York to Chicago for a surgeon's diagnosis. The sending of the photograph was completed in seven minutes. Röntgen-ray operators in New York hospitals who have been making experiments with these "telephoned" pictures, state that they are apt to lose about 25% in definition, but are still useful for diagnosis.

The following, excerpted from the *Electrical Review*, is probably one of the latest uses to which radio communication has been adapted. At a recent meeting of the Peterborough Electricity Committee, the manager stated that experiments had been carried out by Mr. Rowland and Mr. Berridge, of his department, with a view to the use of portable wireless apparatus for communicating with gangs of men working at distant places, and that such experiments gave very promising results. Permission had been given by the Postmaster-General for the issue of a licence the cost of which would be £3 for the first year and £2 per annum thereafter, and he asked whether the Committee would consent to pay the licence fees. He gave instances of the value which such apparatus would have when properly developed. It was unanimously resolved that the Council be recommended to pay the licence fees due to the Postmaster-General.

During a recent visit to the Tunbridge Wells Post Office opportunity was taken to obtain a closer view of the singularly beautiful war memorial carved in wood by one of the Tunbridge Wells staff. Readers will recall the reproduction of a photograph of this labour of love and work of art which appeared in *St. Martin's Magazine*. No sketch, or even photograph, could, however, really reproduce the impressiveness of this beautiful specimen of handicraft.

According to the *Daily Telegraph*, contracts have been completed for the duplication of the northern sections of the Pacific cable. The Telegraph Construction and Maintenance Co., the contractor for the Bamfield-Fanning section, 3,450 miles of loaded cable, is to employ the new alloy, "Numetal." Siemens Brothers, the contractors for the Fanning-Suva section, 2,043 miles of loaded cable, are using "Permalloy." The cost of the two sections will be £2,379,000, and completion is due in September, 1926.

It is estimated that the speed of Permalloy cable is 600 letters per minute, and of a Numetal cable 720 letters, both simplex, as compared with the present rate of 135 letters, duplex. It is anticipated that duplex operation will be found possible.

The reserve fund of the Board, which was £2,100,000 in February, will be increased to £2,450,000 by the time duplication is completed. A condition of the contracts is that all the components shall be of British origin, except certain loading material, which cannot be guaranteed British.

In another issue of the same newspaper, and writing on the same subject, their informant says: "The British Government owns two cables across the Atlantic, which are not remunerative in a commercial sense. It is not the present intention of the Post Office authorities to follow the example of the Western Union and the Pacific Cable Board by laying down a new cable for rapid transmission. The cost between England and Canada would be over £1,000,000, but this would be an economic expenditure from a commercial point of view, as the two Post Office cables will suffer heavily from the new competition."

The *Telegraph* adds: "Those engaged in wireless and interested in its development do not anticipate that high-speed cables will arrest the progress of wireless, which will remain a supplementary service, with the enormous advantage that it can reach many regions inaccessible to cable communication. There is also the prospect that the new short-wave and beam system will greatly reduce the cost of wireless, enabling it to carry messages at the same, if not a lower rate, than the high-speed cables."

In this latter connexion the *Industrial Daily News* says: "Further facilities for inter-communication between the Dominions and Great Britain are foreshadowed by the handing over by the Government of various sites in the country to Marconi's Wireless Telegraph Co., Ltd., who have agreed to erect a number of wireless stations. Sites at Dorchester, Bodmin, and Bridgwater are now being cleared preparatory to the erection of the new buildings, which have been planned by the engineering staff of the Marconi Company. The work of erecting the new stations has been entrusted to the Foundation Co., Ltd., of Kingsway, W.C.

(*Continued on page* 173.)

LIST OF BAUDOT AND SIEMENS' APPARATUS USED ON ANGLO-CONTINENTAL CIRCUITS.

DECEMBER, 1924.

STATION.	Distributor how Driven.	Repeater.	Normal Speed per Channel.	Number of Channels Outward.	Number of Channels Inward.	Simplex or Duplex.	Fitted for Autos.	2-Line Simplex.	REMARKS.
Havre	Weight	No	180 R.P.M. 30 W.P.M.	2	2	Baudot Duplex	Yes	Yes	——
Paris Bourse	„	„	„	2	2	Baudot Simplex	„	No	——
„ „	„	„	„	2	2	„	„	„	No leak relay.
Paris—Berne	„	Paris	„	3	3	Baudot Duplex	„	Yes	Key tester fitted on table.
Paris—Geneva—Zurich	„	„	„	3	3	„	„	„	——
Paris—Bale	„	„	„	2	2	„	„		——
Milan—Zurich	„	Paris—Lyons	„	2	2	Baudot Simplex	„	No	——
Turin—Rome	„	Paris—Turin	„	2	2	„	„	„	——
Lyons—Genoa	„	Paris—Lyons	„	2	2	„	„	„	——
Lille—Boulogne	Motor	Boulogne	„	2	2	„	No	„	——
Liverpool—London—Paris	Weight	London, Dieppe or Havre	„	3	3	Baudot Duplex	„	Yes	2 Arms P, 2 Arms LV, 1 Thro.
Marseilles	„	Paris—Lyons	„	2	2	Baudot Simplex	„	No	Underground, London to LV.
Amsterdam	„	Lowestoft	„	3	3	Baudot Duplex	Yes	Yes	Key tester fitted on table.
„	Motor	„	„	3	3	„	„	„	——
„	Weight	„	„	2	2	„	No	„	Wired for practice Arm.
Rotterdam	„	„	„	2	2	„	Yes	„	„ „ „ „
„	„	„	„	2	2	„	„	„	„ „ „ „
Antwerp	„	No	„	3	3	„	No	„	"C" vibrating relay used.
„	„	„	„	2	2	„	Yes	„	——
Brussels	„	„	„	3	3	„	No	„	——
Hague	Motor	Lowestoft	„	2	2	„	„	„	——
Hamburg	Weight	North Walsham	„	2	2	„	„	„	Arms reversed for convenience of Hamburg.
„	„	„ „	„	2	2	„	Yes	„	
„	„	„ „	„	2	2	„	„	„	Do. and wired for practice Arm.
Berlin	„	„ „	„	2	2	„	No	„	——
„	Motor	„ „	90 W.P.M.	1	1	Siemens' Duplex	Yes	„	——
„	„	„ „	„	1	1	„	„	„	——
Emden	Weight	Lowestoft	30 W.P.M.	2	2	Baudot Duplex	No	„	——
Frankfort	„	North Walsham	„	2	2	„	„	„	Key tester fitted on table.
Bordeaux	„	Havre—Toulouse	„	1	1	Baudot Simplex	„	No	No leak relay.

"The Bridgwater and Bodmin stations will be utilised for communicating with Canada and South Africa, whilst it is intended to use the Dorchester station for transmitting messages to and from America."

Reuter's Agency in Chicago summarised the cable position on the 14th ult. as follows: "The Western Electric Company announces that work will be started immediately in four new rapid-transmission trans-oceanic cables. The first will connect New York with Bayroberts, the second Bayroberts with London, the third Victoria (B.C.) with Suva (Fiji), and the fourth will run from Emden to the Azores, where it will connect with Italo-American cables."

The above symposium of cable and wireless information just about expresses the present rivalries of cable and wireless. High-speed submarine cable developments are proceeding rapidly, and bid fair to make the pace for wireless for years to come, and until engineers on the radio side discover a satisfactory counter-irritant to atmospherics.

USE OF SHIPS' WIRELESS IN PORT.—The Chamber of Shipping has been advised by the Postmaster-General that in future merchant ships may use their wireless installations in (*a*) the Naval Harbours of Portsmouth, Plymouth, Chatham, Sheerness, and Rosyth, and (*b*) the Port of London above Cross Ness (the lower extremity of Barking Reach) for the transmission of urgent ships' service messages, when they are unable to communicate with the shore by other means owing to stress of weather or other causes Communication must be exchanged only with the nearest British coast station. The minimum power necessary must be used, and no interference caused to other traffic. Communication must cease at the request of a Government or commercial station.

The propositions of the nations of the world for the forthcoming International Telegraph Conference, to be held in Paris, in the Sarbonne, during the month of September next, are likely to give rise to considerable discussion. There is apparently a consensus of opinion among the majority of the signatories to the Convention of 1908, as also among some of the newer states, that matters have drifted too far as regards the licence permitted to users of code. It is certainly and infallibly true that code language has degenerated into a jumble of unpronounceable letters which have no longer the right to be called by the name of *words*. Regarding the remedies for the abuse of the code word regulations, the administrations do not appear to be so united. Some would appear to advocate an increase in rates for "code" telegrams, others are inclined towards "grouped language" as a deterrent and brake upon the use of code, while others appear to think that the use of *authorised* code books should be rigidly enforced The arguments *pro* and *con* would occupy at least a couple of issues of the *T. & T. Journal*.

Congratulations to Mr. W. Jayne upon his Swanage appointment. He had better look out for one or two London visitors during the holiday season who may wish to inquire the best way to Tilly Whim!

The Electrical Review says, as we know, broadcast reception in Great Britain is by no means confined to the programmes transmitted by stations in this country, and the number of Continental stations which can be received will soon be increased when those stations which are now in course of erection in Sweden and Spain by Marconi's Wireless Telegraph Co. are completed. The new stations are being erected at Stockholm and Madrid respectively, and are standard Marconi 6 kW type "Q" stations, similar to those erected for the British Broadcasting Co.'s main stations. The transmitter consists essentially of four panels, viz.: A rectifier, an independent drive, a main oscillator and a modulator. The use of the independent drive in the Marconi transmitters has been justified by the results achieved; it ensures the invariability of the carrier-wave frequency, and consequently lessens the need for altering the tuning adjustments at the receiver.

In a recent work on Industrial Psychology, one finds the following list of desirable qualities considered necessary in the make-up of a suitable candidate for a salesman, which places the modest official Devolution Forms "A" and "B" altogether in the shade: (1) Good digestion. (2) Tact, (3) Buoyant Health, (4) Love of people, (5) Cheerfulness, (6) Persistence, (7) Optimism, (8) Courage, (9) Pleasing Personality, (10) Resourcefulness, (11)Verbal Expression, (12) Courtesy, (13) Understanding of Human Nature. And the greatest of these is the last!

The London *Times* recently gave some interesting particulars regarding direct wireless to Australia as at present planned by the Amalgamated Wireless (Australia), Ltd., on behalf of the Australian Government.

Two beam stations for high-speed wireless will be erected. One of these stations will communicate direct with England and the other direct with Eastern Canada; the stations will be designed and equipped for maintaining communication 24 hours daily throughout the year and for duplex working with both countries at high speed. (The correspondent does not say for how many hours per day high speed is to be worked.)

The work of erecting the stations will occupy about nine months.

The stations will be erected on sites near Melbourne, in the State of Victoria; they will be in two groups—one group near the town of Ballan, about 50 miles from Melbourne, comprising the two transmitting beams, and another group near Sydenham, about 15 miles from Melbourne, comprising the two receiving stations. Both groups will be connected by direct operating lines with a central office in the city of Melbourne.

It is understood that the British Government will arrange for the Marconi Company to erect corresponding stations in Great Britain, and that the Canadian Marconi Company will erect corresponding stations near Montreal. The English stations will be operated direct from London and the Canadian stations will be operated direct from Montreal; and consequently, for the first time in history, a service will be provided through which a message from one of the principal cities of Australia will be sent direct into the heart of London, and the same circumstances will exist for the service between Australia and Canada, in which case the operator in Melbourne will be in direct communication with an operator in Montreal. "The Commonwealth Government," continues the writer, "has insisted upon the establishment of direct communication in preference to any form of communication depending upon relay stations in other countries."

The following paragraph apparently does not convey exactly what the writer meant to say.

"It was found that the much greater speed and reliability of the beam system rendered it more suitable for Australian requirements, also that *a number of beam stations communicating with an equal number of different countries could be operated simultaneously, while a high power station could only work to one country at a time.*"

Great Ideas.—Great ideas travel slowly, and for a time noiselessly, as the gods whose feet were shod with wool.—*President Garfield.*

J. J. T.

REVIEW.

"Telephone Communication." By C. A. Wright and A. F. Puchstein (Ohio State University).—McGraw-Hill Publishing Company, Ltd.

This book deals with the theory and practice of telephone communication, and is designed primarily for the use of students and teachers of the subject.

Part I, comprising chapters 1 to 4, outlines the problems to be solved, and indicates the manner in which speech sounds are converted to electro-magnetic waves, transmitted over a circuit and re-converted to sound waves again. The theory of sound and telephone transmission is briefly discussed.

Part II, comprising chapters 5 to 10, gives in greater detail the theory of telephone transmitters and receivers, and the fundamental equations for the transmission of electro-magnetic energy along a line are developed, the solutions indicated and the results analysed. Electrical filters are discussed.

Part III, comprising chapters 11 to 15, deals with recent developments in the telephone art with special reference to vacuum tubes and their numerous applications. Telephone repeaters and public address systems, multiplex telephony and telegraphy and radio telephony are included in this section.

Part IV, comprising chapters 16 and 17, discusses the maintenance of telephone circuits and their equipment, and describes various methods of testing for faults and measuring electrical characteristics.

Appendix "A" summarises in convenient form many of the formulae useful to the telephone engineer, and appendix "B" gives a set of laboratory exercises designed for the instruction of students.

In the latter part of the book some of the arrangements shown have already been modified in more recent practice, but the fundamental principles laid down hold good. The book is not unduly mathematical, and, in this respect, has been kept to the limits necessary for a discussion of the subject matter. There is, perhaps, room for fuller mathematical treatment of some portions of the work. The book is well printed and liberally provided with clear diagrams and illustrations, and the sequence of the chapters is well arranged. It is a valuable addition to the literature on the telephone art, and has special interest for the transmission engineer. To students of the subject it will prove a reliable text book and a most helpful guide, and can be confidently recommended to all desirous of acquiring a sound knowledge of the principles on which telephone communication is based.

C. A. T.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

A REVIEW of telephone statistics for the past financial year shows that the total number of stations working at March 31 was 1,273,800, an increase of 115,308, or 10% on last year's total, a gross increase of 216,876 new stations being offset by 101,568 cessations.

Some idea of the extent of the growth of the telephone service in recent years may be gained from the fact that in the 6 years which have elapsed since the end of the war, the number of stations has increased by 444,272 or 54%.

During the year the number of residence rate subscribers increased from 186,684 to 221,952, a growth of 35,268 or 19%, whilst the number of business subscribers increased from 474,539 to 512,087, a growth of 37,548 or 8%. Since July 1 1922, when the residence rate tariff was introduced, the proportion of residence subscribers to the total exchange subscribers has increased from 25.2% to 30.2%.

The number of public call offices working on March 31 last, was 18,830, which represents a net addition during the year of 1,155 or 6.5%. Of the total net increase 426 or 37% serve rural areas, and of the 14,648 call offices now working in the Provinces 5,891 or 40% may be classified as rural. Included in the total of 18,830 are 1,076 call offices installed in street kiosks, the increase over last year's total being 442 or 64%.

As regards rural development, the number of new exchanges provided under the rural exchange development scheme during 1924-25 was 241, making a total of 672 exchanges opened since the inception of the scheme in June 1922. Nearly a hundred additional exchanges are in course of provision.

With the establishment of exchanges in rural areas the development of rural party lines was diminished but, notwithstanding, during the year there was a net addition of 970 rural party line stations bringing the total at the end of March up to 9,374.

Steady progress has been made in linking up railway stations in rural areas with the exchange system. At March 31, 620 of these circuits were working, representing nearly 700 telephones.

With regard to traffic statistics the total number of originated effective calls in 1924-25 is estimated at 929 million, an increase of 97 million or 11.7% over the total for 1923-24. According to the January 1925 operating statistics the average calling rate per line per day—effective and ineffective calls—was 5.4 at the exchanges with 300 or more lines, and 2.8 at exchanges with less than 300 lines, whilst the average for all exchanges was 4.9 calls.

Trunk statistics for the year are not yet complete. The January figures are the latest available, and during that month 6,487,034 inland calls were dealt with, an increase of 128,630 calls or 2% over the January 1924 figure. The increase over the previous year was the smallest for several years, mainly attributable to (1) gale damage, and (2) the inflation of traffic last year during the period of the railway strike. International traffic also was affected by rough weather. The French calls were below the average, but the Dutch traffic was heavy. Altogether 17,398 calls were dealt with.

The appended summary shows the growth for the year under the different classes of service :—

	London.	Provinces.
Total stations at March 31, 1925	449,388	824,412
Net increase for year	38,527	76,781
	9.4%	10.3%
Residence rate installations :—		
Total	82,304	139,648
Net increase	13,499	21,769
Exchanges :—		
Total	104	3,696
Net Increase	3	261
Call Office Stations :—		
Total	4,182	14,648
Net Increase	223	932
Kiosks :—		
Total	97	979
Net Increase	81	361

Further progress was made during the month of April with the development of the local exchange system. New exchanges opened included the following :—

LONDON—Mill Hill, Palmers Green.

And among the more important exchanges extended were :—

LONDON—Edgware, Maryland, Park.

PROVINCES—Coatbridge, Heaton Moor, Horsham, Kilmarnock, Lewes, Pendleton, Plymouth, Rusholme, Rutherglen, Southend-on-Sea, Stockton-on-Tees, Woking.

During the month the following additions to the main underground system were completed and brought into use :—

Cardiff—Caerphilly Cable.
Blackburn—Bolton ,,
Paisley—Kilbarchen } Sections of the
Paisley—Beith } Paisley—Beith—Dalry Cable.
Doncaster—Laithouse (Section of the Doncaster—Goole Cable.)
Manchester—Oldham Cable.
Southampton—Bournemouth—Wareham Cable.
Southport—Ormskirk Cable ;

while 68 new overhead trunk circuits were completed, and 58 additional circuits were provided by means of spare wires in underground cables.

TELEGRAPHS.

Baudot working was established on May 21 between Birmingham, Bradford, and Leeds.

NOTTINGHAM TELEPHONE DISTRICT.

ON Friday, March 13, the Nottingham Telephone District regretfully said good-bye to Mr. E. Brown, Contract Manager, who has been promoted to Brighton. It was made the occasion of a spontaneous demonstration of regard and esteem.

So far as the staff is concerned, Mr. Brown's success as a Departmental Head is second to none, he earned their respect and won their esteem by a sympathetic attention to all matters affecting their official welfare.

We venture to say he has been no less successful from a Departmental standpoint inasmuch as he invariably found a way past all obstacles to Telephone Development.

Concrete expression of the sentiments of all sections found vent in the really splendid presents. From his own staff Mr. Brown received a silver tea and coffee service on an inscribed oak tray, and from the Accounts and Traffic Sections a beautiful cut glass Tantalus, and a pipe in case.

In making the presentation, Mr. Kidd, the District Manager, summed up the feeling of everyone present in the homely phrase that Nottingham's loss was Brighton's gain.

It was refreshing to hear on every side obviously sincere expressions of regret at "Nottingham's loss," and Mr. Brown is to be envied in having evoked them.

Mr. Brown, in a happily chosen reply of thanks, recorded his deep appreciation of the help he had always received from his own personal staff and other sections of the office.

The
Telegraph and Telephone Journal.

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Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.1. The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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WRONG NUMBERS.

AMONGST the ills incident to a humanly-operated telephone service that, we think, which bulks most largely in the public mind is the "wrong number" trouble. Or, perhaps, we should be more correct in saying that it bulks most largely in those self-appointed interpreters of the public mind, the gentlemen who purvey humorous, satirical, sarcastic, pithy, pungent, quizzical, terse and what not criticisms and quips to the lighter columns of the Press and the comic weeklies. To one of these the announcement of the opening of a new exchange with 10,000 lines calls up the vision of a vast storehouse of 10,000 possible wrong numbers; to another, a telephone directory is a thesaurus of unlimited numbers which can be misconnected by a perverse Administration to a long-suffering public; to a third the mere mention of the word "number" calls up but one associated adjective—not "golden," "mournful," or "tuneful," but always "wrong." The experiment of sending French telephonists to London and of British telephonists to Paris for the purpose of improving their knowledge of English and French respectively, and of giving them some insight into the working methods of a foreign exchange, attracted much attention and some encomium from the Press, but even here one writer was moved to say—somewhat ungraciously, we think—that the telephonists would in future be able to give wrong numbers with a charmingly correct accent. Why should the wrong number difficulty be singled out amongst the failings of the service for special reprobation? We cannot tell. Reference to official returns shows that about 2.5% of the telephone calls made in this country are connected with wrong numbers, while 11% are abortive because the called subscriber's line is engaged—surely a much more vexatious happening, although one beyond the control of the Administration. If you get a wrong number you can expostulate and obtain the right one. If you find your correspondent's line engaged, you lose your pains and your time, and there is nothing for it but to call up again; possibly, if your friend is a busy man, you may find his line engaged a second time.

The wrong number trouble arises from two causes: viz., from mishearing of numbers—by far the principal cause, owing to widely varying elocutionary styles of a widely varying mass of subscribers, or from the operator's plugging the wrong jack when she has correctly heard the number given. The former cause is chiefly due to the similarity on the telephone of certain numbers, for which reason subscribers are implored to give an exaggerated and unusual pronunciation to certain numbers; to remove the second cause, the stile-strip method of enouncing numbers has been introduced. The public and the Press did not kindly take at first to the suggested variants in their native tongue, and Sir Harry Brittain does not like "stile-strip"; but there is no doubt that these remedial measures are reducing the evil. After all, 2.5 is not so heavy a percentage as might be expected to exist, judging by the outcry of the humorists; the percentage of "wrong number" jokes in the whole field of telephone humour must be somewhere between 50 and 80.

M. Tristan Bernard, the well-known French author, at a meeting of the *Martyrs du Téléphone* (a gathering of dissatisfied subscribers), complained that in Paris about 25% of his calls were to wrong numbers. This is, of course, a subscriber's (and a humorist's) uncorroborated statement. However, the wrong number trouble apparently, sometimes, has its compensations. M. Bernard relates how a friend of his, connected in error with a very charming lady whom he did not know, maintained a conversation with her "presque galant," and rang off with "Au revoir, madame, until the next wrong number." But these fond considerations are taking us far from our text. We cannot, on this side, find in wrong connexions the germ of a romance, except in the sense that an exaggeration of their incidence contains all the germs of "romance" in the more unfavourable interpretation of the word.

HIC ET UBIQUE.

OFFICIAL returns show that Russia had 106,076 subscribers at the end of 1923. If this figure refers strictly to subscriber's lines, it may well mean that there are about 120,000 to 130,000 telephone stations in Russia. The principal cities possessed: Moscow 25,362 subscribers; Leningrad 13,484, Kiev 3,607, Baku 2,500, Rostov-on-Don 1,753, Tiflis 1,622, Nijni Novogorod 1,439, Kharkov 1,430, and Odessa 1,196.

Mr. Powell Jones, of the Telephone Development Association, has been addressing audiences at Manchester and Liverpool on the subject of telephonic development. Pointing to the backwardness of this country in this respect, compared with the United States, Canada, Denmark and other places, he asserted that the British public had still to be taught the telephone habit. A high development such as obtained in America was not a natural growth; it was an artificial culture. Some of the papers in reporting him seem to desire to deny Great Britain even that which it hath, for it quotes British development as 14 per thousand instead of 26, and says that it barely surpasses that of Czecho-slovakia. As a matter of fact it is nearly 4 times as high. Another case of "wrong number" trouble!

The *Morning Post* reports that two of the three telephone exchanges in Prague have been converted to automatic working, and that the conversion of the third is almost completed. By the end of 1926 it is said that the automatic system will provide for 100,000 lines. Some rapid development must be expected, for at present there are not many more than 100,000 lines in the whole of Czecho-slovakia.

We learn that about £614,000 is to be spent by the Postal Department on the erection and equipment of additional automatic telephone exchanges in Sydney, Melbourne, and Adelaide. The work will be started immediately, and should be finished in two years. In Sydney four exchanges are to be converted into the automatic type. In Melbourne there will be two new automatic exchanges, and in Adelaide there will be seven.

Official figures of the telephone development of Poland at the end of 1923 show that there were 69,211 telephones connected with the State system, and 40,937 connected with that of the Telephone Company of Poland operating in Warsaw, Lodz, Lwow (Lemberg), Lublia, Bialystok, Sosnowiec and Boryslaw;—or 110,148 in all.

According to the *Electrical Review*, by closing five divisional police-stations and adopting a system of police telephone boxes, Sunderland has saved £15,000 in one year. Each constable on a beat has a telephone-box. He rings for a motor-car when he has a prisoner for headquarters, and uses the box to detain his captive until it arrives. During the past year 10,232 calls were made from the boxes, including 574 for arrest by motor vehicle, 122 concerning fires, and 1,036 for doctors.

"Finger prints, they say," says a daily paper, "may now be sent by phone." How wonderful is the progress of science! I understand that the G.P.O. have conceived the idea that it may soon be possible to transmit the sound of the human voice by the same means.

Thus far a newspaper humorist. How wonderful is the progress of the newspaper that can conceive such a mighty thought, such a tidal brain wave!

Extract from an article in an important Northern newspaper which shall be nameless:—

"But the difficulty was to justify the presence of a *heavy side layer*, which seemed to be necessitated in some form or other, by the theories which fitted with the results of the Antrim's cruise." [The italics are ours. Ye Shades!]

Someone must have achieved a great wireless feat lately in collecting wireless waves still circulating round the globe from past ages. In no other way can we account for the re-appearance in a Western paper of the following hoary and forgotten chesnuts:—

Mrs. Murphy had received a cablegram from her son in India saying that he would be home shortly. She showed it to her neighbour, Mrs. Casey.

"Wonderful quick things these telegraphs; ain't they?" said Mrs. Casey.

"Quick ain't the word for it, the gum ain't dry yet what's on the envelope."

* * *

Aunt: "Can you explain wireless telephony to me, Arthur?"

Arthur: "Well, if you had a very long dog, reaching from London to Liverpool, and you trod on its tail in London, it would bark in Liverpool, that's telephony, and wireless is practically the same, only without the dog."

"Direct telephone communication between London and Berlin," (says *Telephony* of Chicago,) "severed in August, 1914, is to be established during the summer, it has been announced by the British authorities."

Public telephone communication has never existed between London and Berlin or anywhere else in Germany; nor have the British authorities announced that it will be established or re-established during the summer—that is, unless, in America erratic newspaper paragraphs are accounted British authorities.

TWO RIVAL TELEGRAPH SYSTEMS.*

THE STRUGGLE BETWEEN THE MULTIPLEX AND THE HARMONIC TELEGRAPH.

BY DONALD MURRAY, M.I.E.E.

(*Continued from page* 154.)

Now for the reasons. In Herr Lüschen's pamphlet already referred to, it is explained that during research work they succeeded with as low as five vibrations per unit signal (one half cycle or morse dot), but that *in practice they have to use eight vibrations or cycles per unit.* That is the whole thing in a nutshell. One cycle is two units. Hence eight cycles is 16 units. In other words, taking the five-unit alphabet, voice frequency harmonic telegraphy requires 80 units per letter compared with five units used in the ordinary multiplex. 16 to 1 is an enormous handicap when the line is long or the load of traffic is heavy, and the line must be worked to its economic maximum as it will have to be worked by and by when start-stop printers and printing telegraph exchanges come into extensive use.

It is the same argument as I used in my I.E.E. paper on "Speeding up the Telegraphs," illustrated in Fig. 9. I am indebted to the *Sphere* for permission to use this very admirable popular rendering of Fig. 1 of my I.E.E. paper.

There is no answer to that argument. *If the conditions are such that you must economize in telegraph lines, then you must economize in signals.* The ordinary multiplex contains the germ of the best method of economizing in

*Paper read before the Post Office Telephone and Telegraph Society of London. Figure 9 is reproduced by courtesy of *The Sphere* newspaper and the Institution of Electrical Engineers.

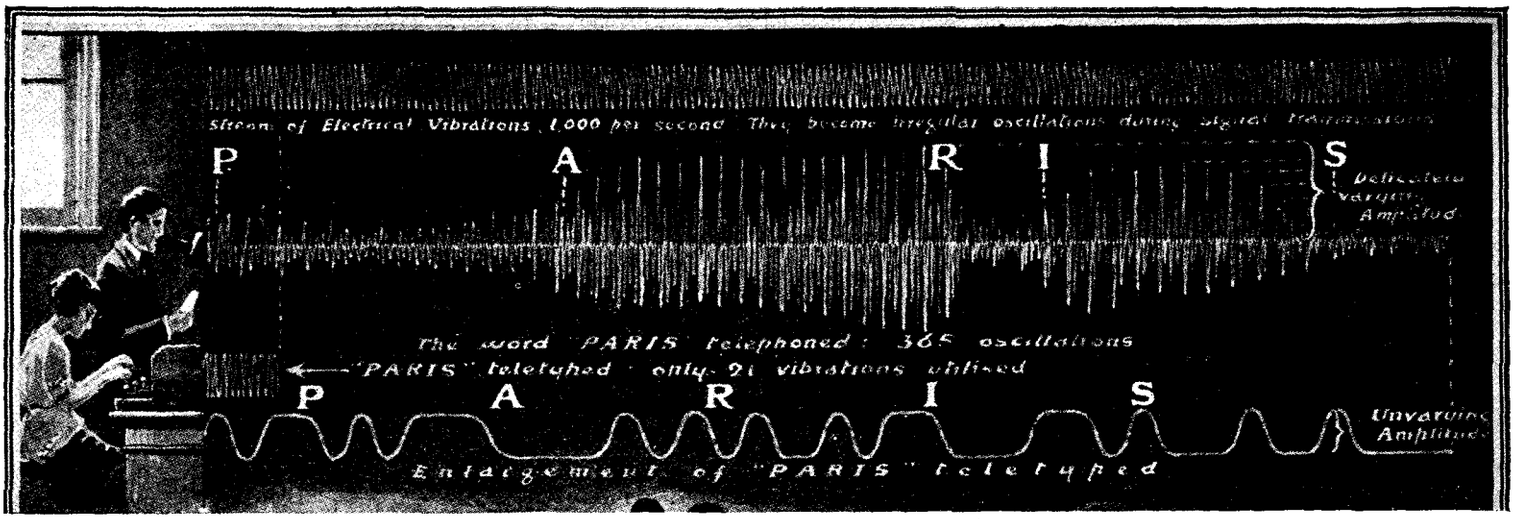


FIG. 9. [*Reproduced by permission of "The Sphere."*

telegraph signals. Up to the present, the best the multiplex has done is the sextuple duplex between London and Birmingham, the credit for which must be given to Colonel A. C. Booth, of the Engineer-in-Chief's office. That, however, is only a beginning, and when the demand arises telegraph engineers will certainly develop the multiplex to the same *ultimate* limit of perfection as the harmonic telegraph has now been brought by the vacuum tube and electric filters and other modern devices. Let us have a look at the possibilities ahead of the multiplex distributor.

It is known that the speeds possible on telegraph lines of average length and size of wire, say 200 or 300 miles, are far beyond the speeds of the telegraph apparatus at present employed to work them. Chemical telegraphs operated successfully at speeds up to 1,000 and even 2,000 words a minute. It is sufficient, however, to consider the results obtained by the telephone. Telephones talk right across the United States, *nearly 3,400 miles*, and good quality commercial speech by telephone entails a speed of not less than 2,000 cycles per second. Let us put it as low as 1,500 cycles per second. Taking the five-unit alphabet we have the following calculation :—

$$\frac{\text{1,500 cycles per second}}{\text{2.5 cycles per letter}} = \text{600 letters per second,}$$

$$= \text{6,000 words a minute.}$$

In other words, it is possible to telegraph 6,000 words a minute over 3,300 miles between New York and San Francisco on two telephone wires, copper, each 870 lb. per mile with telephone repeaters. This is 3,000 words a minute on one wire. It has also to be borne in mind that telegraph signals are far easier to transmit than telephone signals, because there is no varying amplitude of the currents. It would, therefore, be practicable to cut down the diameter of the telephone wire by half for telegraph purposes from 870 lb. per mile to 400, and still retain the 3,000 words a minute per wire. As the line would have to be worked as a loop circuit, provision would have to be made for mechanism to handle 6,000 words a minute. Taking a speed of 50 words a minute per channel on the multiplex, this is 120 multiplex channels on one circuit formed of two wires looped together. In such a case it would obviously be out of the question to trouble about the duplex balance; but we have made it a condition that we are to be free to use modern methods, so we shall work at 6,000 words a minute from New York to San Francisco, and at 5,000 words a minute in the opposite direction on the same circuit, using filters to sort out the two frequencies at each end. Please do not think that I am talking practical politics. I am merely sketching out possibilities, so as to encourage some of my hearers to start prospecting in this very promising goldfield. They will meet a difficulty at once in trying to filter full size unit signals with frequent and abrupt changes of phase and interference between the two frequencies; but overcoming difficulties is what people are paid for, and the bigger the difficulty surmounted the bigger the pay. A good way with a difficulty is to cut it in two, so let us content ourselves with 60 channels on the one circuit. Up to the present, work done with distributors has been mere child's play, and we have regarded six channels each way on one wire as a fine record. Let us examine the position. I pointed out long ago that distributors are clocks or time-dividers. It follows that the proper method of driving them is with electric pendulums (vibrators, which are springs and weights), and electric escapements (phonic motors or impulse motors, chiefly weights); but we are only just beginning to think of precision work in connection with these electric pendulums and escapements. Several administrations are beginning to study the effect of temperature on vibrators or tuning forks (electric pendulums), and the best way of obviating change of speed due to change of temperature. Invar, elinvar, sinevar and other nickel-steel alloys are available to guard against change of length of the vibrating reed with change of temperature, but the chief factor is change of elasticity, due to change of temperature. One plan would be to use reeds made of rock crystal, with a piece of iron attached at the centre of percussion to be operated on by the driving magnet of the vibrator. Fused rock crystal or silica is one of the most wonderful materials in the world. It is almost perfectly elastic and it has an extremely low temperature coefficient. That is to say, the change of length is extremely small for any given change of temperature, so much so that although it looks like glass it can be heated white-hot and plunged into cold water without a sign of cracking. Another plan to guard against temperature change is to enclose the vibrator in a box kept at a uniform temperature by an incandescent lamp and a thermostat. Another plan would be to put big vibrators with heavy reeds (weights and springs combined in one, as already pointed out) in a deep cellar under each telegraph office, 60 feet below the surface of the earth, temperature variation ceasing at this depth. There would be several of these big vibrators with different speeds corresponding to say 30, 40, 50 and 60 words a minute per channel. These speeds would be laid on to the telegraph galleries just as different voltages are now laid on. With proper precautions, well known for years in the case of very accurate clocks, extreme accuracy can be secured with vibrators under the conditions just mentioned. For instance, several years ago a clock made in France with an invar steel pendulum was exhibited in London, which was so accurate that it only gained one-tenth of a second per month. In the case of a distributor, this would be equivalent to running at 180 r.p.m. for about 6 hours without a correction, and during that time the brush arms of the distributor would only have advanced one degree. Hence, a correction of one tenth of a degree every half hour would be sufficient to preserve sychronism at that speed. Phonic motors or impulse motors of far more scientific design than any at present in use can be constructed to give smooth and uniform motion under the control of the impulses from the extremely accurate vibrators just referred to. In passing I may recall that the normal correction on a present-day multiplex distributor is 1½ degrees every half second. Compare this with one tenth of a degree every half hour. This extreme accuracy will be just as easy and reliable as our present clumsy efforts.

There remains the plateau or distributing plate. Let us assume that the narrowest segment that can be used on a plateau is 1/8th inch wide. We would then have a multiplex distributor with 60 channels, each with five segments 1/8th inch wide. The diameter of the plateau will therefore be 12 inches. There is nothing formidable about that, and with vacuum tubes instead of relays to pick up the sudden and short little impulses each lasting only 1/1500 of a second, there would be no difficulty in building up each of these impulses into workable signals. In fact, it is all so easy that it would not be impossible to have a distributor with 120 channels.

I have purposely taken an extreme case so as to make a proposal for a 24 channel multiplex seem extremely modest and reasonable. The possibilities are five times greater than this, so there would appear to be a good working margin for 24 channels. Taking 24 channels with the five-unit alphabet at 50 words a minute per channel, this is only 300 cycles per second. Compared with the telephone that is slow. In this case also it may be possible to use two different speeds of, say 300 cycles and 250 cycles and filter them out at each end, thus avoiding duplex balance troubles. The Gulstad tuned relay shows that the thing is possible, though interference between the two frequencies will be a formidable difficulty.

Coming down to still more practical politics, it will be seen that a six channel multiplex working with the duplex balance, giving 12 simultaneous channels on one telegraph wire at 50 words a minute per channel, should be an easy matter on very long lines.

These possibilities with the multiplex are far beyond anything attainable with voice frequency harmonic telegraphy except on comparatively short

lines, subject always to the condition that ordinary telegraph lines are used, and not extremely expensive telephone circuits. My point is that for the same capital expenditure the multiplex will beat harmonic telegraphs on all but comparatively short lines, and this for the simple reason that the multiplex uses far fewer signals. It is interesting to note, however, that there are possibilities of using harmonic telegraph methods with the multiplex instead of the duplex balance on long telegraph lines without resorting to telephone methods.

Before closing, a few lines must be devoted to the working of start-stop printers such as teletypes in conjunction with multiplex channels. This is necessary, because it is obvious that the ordinary telegraph service has no use for 120 channels on one circuit. There will be use for a large number of such channels when business men send their own telegrams to their correspondents through teletype exchanges. The voice frequency harmonic telegraphs would appear at first sight to have a great advantage over the multiplex for direct operation of start-stop printers. This is specially the case with echelon or series working, as half a dozen towns can have independent communication on one circuit by harmonic telegraphy with extreme ease, using start-stop printers. It is, however, also quite practicable to work start-stop printers into and from multiplex channels. The Western Electric Company has already done considerable work in this direction. This paper, however, is already far too long, and start-stop printer operation in conjunction with multiplex channels has been the subject of patents and will be the subject of more. I shall, therefore, content myself by saying that such operation is practicable.

I have tried to make this paper stimulating and suggestive, and that must be my excuse for having at times shown a tendency to chase after will-o'-the-wisps, like some of the harmonic telegraph men.

MORSE THE PIONEER.

BY J. SKINNER (*Brighton*).

IT would probably be difficult to mention any two names more familiar to telegraphists than Morse and Wheatstone, yet it is surprising to find how few of the present generation know anything of either of the geniuses whose names are inseparably connected with their craft. The familiar Morse code, still the most reliable system by means of which intelligent signals may be transmitted over vast distances, continues in daily use throughout the world, and amateur wireless enthusiasts possessing suitable apparatus, may hear the familiar dots and dashes signalled from ship to shore or across continents at any hour of the day or night.

Sir Charles Wheatstone (1802-1875), to whom the telegraph service owes so much, is perhaps remembered only in connexion with the system which bears his name, and the celebrated "bridge" which, however, it is stated he did not invent but only introduced. It should be noted though that he was a brilliant physicist and a professor of experimental philosophy at King's College, London. His pioneer work with Mr. W. F. Cooke, in 1837, is of absorbing interest to students of the history of telegraphy, and a mere chronicle of his achievements would occupy far more space than is at our disposal. Perhaps at some future date we may be permitted to attempt the story of this eminent man's work in the field of telegraphy, but at the present moment we wish to direct our readers' attention to the other side of the Atlantic.

The Morse code was given considerable publicity in the Press recently when the story was told of a superintendent of telegraphs in far-off Yukon who, after being seriously ill, relapsed into unconsciousness from which every attempt to rouse him had failed. At the suggestion of the patient's daughter a telegraph instrument was placed at his bedside, and the office call was signalled three times. At the third call the sick man stirred, opened his eyes and then recovered consciousness! It appears to be a tall story, but doubtless many telegraphists will believe that the familiar signals made a subtle appeal to the mind in a manner that nothing else could, with beneficial results to the invalid.

"Morse" is a word familiar indeed throughout the telegraphic world, but its origin now appears almost unknown to the average telegraphist. Beyond the fact that Morse was an American, and the inventor of the famous code bearing his name, little is known of this illustrious man who was one of the fathers of the telegraph service.

Samuel Finley Breese Morse was born at Breed's Hill, Charlestown, Massachusetts, on April 27, 1791. He was of English stock, having descended from Anthony Morse who first saw the light at Marlborough, Wiltshire, in 1606, and emigrated to America in 1635. His father was the Rev. Jedediah Morse, D.D., a leading divine and author, whilst his mother, Elizabeth Ann Breese, was the granddaughter of a former distinguished president of Princeton College. Professor Morse, to give him his title received in later years, was educated at Yale University, where it is stated that he first became interested in the subject of electricity. He had, however, considerable talent as an artist, and money being scarce, for his father was but meanly endowed with this world's goods, he commenced painting portraits on ivory at five dollars a head. He graduated in 1810 and resolved to place himself under a first-class artist, his object being to excel as a painter. He was fortunate in securing as his master the eminent Washington Allston, one of America's greatest artists, and in company with this gentleman proceeded to England in 1811.

Morse made many warm friends in this country, and the character of the man can be estimated by the esteem in which he was held by such men as William Wilberforce, Zacharias Macaulay (father of the historian and statesman), and many others. In 1813 he exhibited his first picture, "The death of Hercules," at the Royal Academy, and this work was placed among the nine best paintings in an exhibition of nearly one thousand. His clay model from which he painted the picture won the Society of Arts Annual prize, and also a gold medal. Artists are, however, proverbially needy, and Morse was no exception to the rule, for in 1815 his clothes were threadbare and his shoes out at the toes! He was forced by circumstances to return home and arrived in Boston, where he rented a studio and exhibited another painting, "Jupiter." Business was decidedly bad in the art world, and we find him next, in conjunction with his brother Sidney, turning to invention and bringing out an improved pump! This proved a financial success, and in 1818 Morse, having made about three thousand dollars, married Miss Lucretia P. Walker. He returned to art and received a commission to paint the portrait of no less a personage than James Monroe, President of the United States. After many ups and downs in art and ventures in inventions with his brother, he settled in New York and founded the National Academy of the Arts of Design, of which he was president from 1827 to 1845. He delivered the first course of lectures on the fine arts ever given in America, and was generally acknowledged as a leading authority on the subject. As in the case of many other genius, however, he remained a poor man. The death of his wife in 1825 was a heavy blow, and in 1829 he again visited Europe, spending three years in England, France and Italy.

Morse sailed from Havre to New York on the "Sully" on Oct. 1, 1832, and whilst on the voyage conceived the idea of the recording telegraph and Morse code. A discussion on the subject of electro magnets had arisen, when Morse made the following notable remark: "If the presence of electricity can be made visible in any part of the circuit, I see no reason why intelligence may not be transmitted instantaneously by electricity." Later, whilst pacing the deck of the ship the idea rapidly took form in his mind that, either by the electro-chemical or electro-magnetic effect

of a current, marks might be made at almost any distance so as to render possible the transmission of recognisable signals.

It is stated that the Morse alphabet was practically begun, elaborated and completed on the ship before the inventor reached the United States.

Space does not permit anything but brief mention of other interesting facts relating to the life of the illustrious subject of this short article. In 1835 he was appointed Professor of Literature of the Arts of Designs in the New York University, but continued his work on the electric telegraph. Two years later the professor, together with Messrs. Vail and Gale, commenced active preparations to perfect the invention. The first instrument was made by Mr. Alfred Vail assisted by his father and brother, and experiments were made with three miles of wire around a room. It is interesting to note that, according to William Maver (author of "American Telegraphy"), the first telegraph relay or electro-magnet constructed for Morse weighed over 300 lb.

The professor was subsequently involved in considerable litigation regarding his invention and in 1838 was refused permission to take out a patent in this country. A time of hardship and poverty followed, and in 1841 we find Morse writing to his friend Alfred Vail saying: "I have not a cent in the world."

The efforts of this genius were, however, soon to be crowned with success, for in 1843 Congress voted thirty thousand dollars "to test the expediency of the telegraph projected by Professor Morse," and on May 24 the memorable message, "What hath God wrought?" was signalled over the wires.

Afterwards, the development of the telegraph in the United States was phenomenal, and Morse was honoured by practically every civilised country.

On the afternoon of June 11, 1871, his statue was publicly unveiled in Central Park, New York, in the presence of a vast assembly. In the evening there was another great gathering in the Academy of Music which was packed with telegraph operators from all parts of the country. Professor Morse was present, and a telegraph instrument, connected to wires stretching across the continent, was placed on the table before him. At 9 p.m. a lady telegraphist signalled the following message:—

"Greeting and thanks to the telegraph fraternity throughout the world. Glory to God in the Highest. On Earth Peace, Goodwill to men."

Amid tremendous applause the venerable father of telegraphy himself then took the key and signalled his signature "S. F. B. Morse." Soon afterwards replies were received from all quarters of the globe. Professor Morse then addressed the gathering at length, and it is interesting to note that he paid a generous and striking tribute to the work of other early pioneers whose efforts had contributed to the success of the Electric Telegraph.

Not many months afterwards, on April 2, 1872, this noble-minded man passed peacefully away, being then in his 81st year.

Whether the "Morse" code with its modifications has had its day or not we will not now attempt to discuss, but it will doubtless be admitted that it has served its generation well, and has proved to be one of the greatest boons to mankind made possible by the use of electricity. Perhaps those of us who took an active part in the Great War value the code as much as anyone, for we realise what was accomplished by its agency during those dark days, and what a faithful servant it proved to the Empire generally.

The writer is indebted to James D. Reid's monumental and deeply interesting book, "The Telegraph in America and Morse Memorial," published nearly 40 years ago, for most of the details regarding the life of Professor Morse.

TELEPHONE NOTES.

"Smile, Darn Ye, Smile."

The *Telephone Review* has just issued its long-heralded "Smile Number." "Did you ever sit down to Joe Miller's Joke Book and try reading jokes for three or four hours at a time?" asks the editor. For ourselves, the answer is "No," but we can imagine what condition one's sense of humour is in after reading and judging "over 15,000 contributions" to a "Smile" number. Even a Smile Number cannot escape "the blight of the American craze for tracing everything back to Julius Caesar," as an eminent engineer once put it, and perhaps the best in this section is as follows:—

"In 1876, Don Pedro, Emperor of Brazil, picked up a telephone while visiting an exhibition.

"Emperor: 'My Gawd, it talks.'"

Dial Shyness.

The Colchester District is at the moment passing through a by no means unique experience—making preparation for opening its first automatic exchange. It is something of a unique experience, however, for any District to receive a letter such as this:—

> "Sir,—The days of our old telephone system are numbered, but I should much like to express my thanks for all the courtesy and care of all the officials connected with it. I had a telephone installed for the war, and during all that terrible time I had rarely to call more than once, either day or night, even during air-raids. Nor since then have I ever had any trouble; I have been answered immediately, and have had no wrong number. Now that I shall have to do the work myself, although paying the same for the telephone, I expect endless mistakes, my own and other people's. I am *very* sorry for the coming of the Automatic Telephone."

In kindly sending me a copy of this letter, Mr. Carter, the Traffic Superintendent, says the dear old lady "at first refused to have a dial fitted, but after having been shown how to manipulate it, she remarked, 'Ah well, I suppose I could twiddle the thing round as good as any young 'un.'" From one point of view the letter is disappointing, for it reveals a weakening in that assumed self-confidence which is so charming in some "dear old ladies." We hope this tendency will not progress to the point of developing into an acute form of the general complaint from which everybody suffers, more or less, when first making an automatic call, sometimes referred to as "dial shyness."

Enterprise.

"There are many American telephone managers who are laying themselves open to the charge of operating their plant on inadequate rates," says *Telephony*. That is "real sporty" of them if, as another authority says, "it is, in many instances, merely a case of 'Ask, and it shall be given unto you.'" One of the many instances in which this is *not* so appears to be that of the Ohio Bell Company. The Ohio State Legislature has made an appropriation of $150,000 for the purpose of carrying on a State-wide inquiry into telephone tariffs. Perhaps it should be explained that an American telephone company has its tariffs fixed by the State Commission. The prices which may be charged are fixed at a figure which is calculated to allow a fair return on money invested in the company—usually 6% or thereabouts. An inventory of the property has to be submitted, and the value arrived at in this, after discussion and amendment, is taken as the capital on which the 6% is to be paid. The accuracy of an inventory submitted by the Ohio Bell Company has been challenged, evidently with good reason. The Company's "appraisal engineer" revealed under cross-questioning that "the inventory was not compiled from a recent field examination, but was made up from inventories of various companies" which had been swallowed up. It appears that "the Bell Company, in its acquirement of competing plants, came into possession of a large amount of property which it is not using, and which is now for sale." As Jas. A. Davis, in *Telephone Engineer*, remarks, anent another common method of seeking to obtain increased tariffs, "After subscribers contrast the conjured-up visage of sadness of the service officer imploring the Commission to grant higher tariffs, with his chuckle after receiving the assenting order for same, they feel that they have been hoaxed." And yet the champions of public ownership are still in a minority over there.

Binaural Broadcasting.

Prof. F. M. Doolittle, Yale University, writing in the *Electric World* concerning an experiment recently carried out at W.P.A.J., in New Haven, forecasts rapid development towards perfecting the quality of broadcast music. He analyses sound as a complex of impressions. The three chief impressions when a sound is heard, he says, are (1) as to its character, i.e., simple, complex, rhythmic, etc; (2) as to its loudness; and (3) as to the source of its origin in respect of the listener. In broadcasting, it is impression number (3) which is lacking. There is nothing sent out which suggests to the brain that (say) the drum is behind the violin, that the choir is in front of the organ, nothing to suggest that all the instruments and voices are not all concentrated at one particular point. What is wanted is something to do for the ear what a stereoscope does for the eye. Just as, with the stereoscope, normal vision is simulated by presenting two slightly displaced photographs to the eye, so with "binaural broadcasting," two sound pictures are presented to the ear, the phase of one sound picture being slightly displaced in relation to that of the other. To do this, two microphones are used mounted 7 ins. apart. Two modulators on different wave-lengths are used, and the earpieces of a pair of telephones are fitted one to each of the two necessary receiving sets. During the experiment, wave-lengths of 268 and 227 metres were used. The effect produced is that experienced by a person when sitting with closed eyes in a studio. There seems to be no insuperable reason why the two separate radio channels should not be combined. In short, with "binaural" broadcasting, as with television, little remains to be done from the scientific point of view. As Hertz required only a Marconi, so the discoveries of Baird and Doolittle only require exploiting in the commercial sense.

Thrift.

A statement in the Annual Report of the American Telephone and Telegraph Company, to the effect that one-sixth of the Company's 345,466 shareholders are also Company employees, with an average of 9 shares ($100) each, brought to mind some remarks recently made by one of the "personal work" employees of the New York City Bell Company, in *Telephony*, and an article which appeared some months ago in that Company's *Telephone Review*. Said Miss Coffman, in the former, "Besides providing comfortable lunch and rest rooms for the operators, books, magazines, Victrolas, and even radios are provided." Health talks are given, and there are also talks on thrift. "All eligible employees are given the privilege of buying the Company's shares, paying for them by instalments, and are thus encouraged, in many cases initiated, in the habit of thrift." From the article in the latter it appears that the two slogans of the thrifty are "allocate your money before you get it" and "keep tabs on your expenditure." As an aid to a proper allocation of income, a graph is given showing the percentage of income spent by the "spendthrift," the "thrifty," and the "unduly saving," respectively, on "living expenses," "amusement," "education," and "donations." The remainder is "saved." Those are called thrifty who spend the following percentages under these heads, viz.:—55—45, 15—10, 10, 5. So a thrifty American is the one who saves 15—30% of income. To assist in "keeping tabs on expenditure," budget books are issued to any employees who ask for them. These are ruled for the full year. To encourage the shy and the laggards, "experimental" forms are supplied, and all employees are asked to try the scheme for one day. "My company has adopted the slogan 'The voice with the smile wins every time,' and does everything possible to promote the spirit that goes with the smile," says Miss Coffman.

Shorter Notes and Comments.

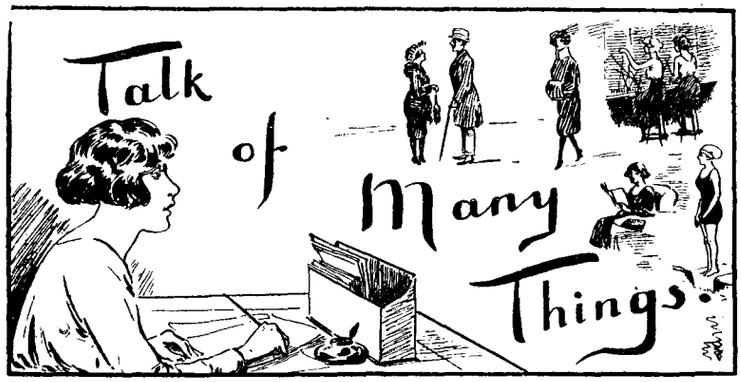
"So much annoyance was caused the executives of the Company, through the calling of wrong numbers, that it was decided" by the Home Office of the Prudential Insurance Company, in Newark, N.J., "to do away with extension numbers, and have the persons calling ask for the person wanted by name," says *Telephony*. Since there are some 6,000 calls each day, to the 5,000 persons using 565 telephones in the office, it is distinctly a relief to learn that the 11 P.B.X. "operators keep well and happy" with such a load of memorising superposed on that of operating.

Most of the final negotiations in a recent big American deal involving 175 million dollars were, it is said, conducted by telephone. The telephone company made this fact the subject of a large advertisement in the New York papers. "Why does the telephone company so emphasize its participation in a financial deal?" asks the *New York Times*. "Its instruments play a rôle in numberless things of far greater importance every day—such as the arrangement of meetings between young men and maidens." The leader writer was surely

> "Sighing like furnace, with a woeful ballad
> Made to his mistress's eyebrows."

The *Aorangi*, a Clyde built motor ship, said to be the highest-powered motor propelled ship afloat, has been fitted with a modern C.B. telephone system. In addition, she carries a broadcasting installation which supplies music, speeches, etc., to all the public rooms on 17 loud speakers. *H.M.S. Dolphin*, a submarine depot ship, has been fitted with an automatic system which, when she is at her moorings, is connected by the junctions to the P.B.X. at Fort Blockhouse.

WE TELEPHONISTS



Boots.

So much of our life seems to be governed by a pendulum which inexplicably but infallibly induces in us a swing as regular as its own. As we allow our thoughts to travel up the years we find that our supposedly stable characteristics have altered, and in noting our alternate revolts and subjections we see the shadow of the swinging pendulum become increasingly distinct. We love where we hated; pray where we scoffed; cheer where we jeered. We become alarmed, and wonder where we are going and whether we are not losing our individuality. We sigh for the natural existence of our childhood, with its freedom from convention and artificialities. Although we may be generally unaware of the present domination, we feel its tyranny in particular cases, and then we rebel—usually without effect. Even in rebellion we are not happy, and fear that we may be succumbing to the sinister humour of the pendulum and swinging still in conformity.

These thoughts have come to me since I made the rash resolve to buy a stout pair of ladies' walking boots—boots, that is, which should be high in the leg, broad in the tread, low in the heel, and waterproof withal. The resolution, as I was to discover, was an act of rebellion and pitiably sensible. Fashion has apparently decreed that in these advanced days ladies shall not wear boots, particularly "sensible" boots. At least, that is how it appears to a mere man. But I was ruthless and heartless; boots I wanted, and I meant to have them. Fashion must go; my wife must be suitably shod to prepare for the normal summer floods, and to bid defiance to marsh and bog. During my search through the length and breadth of Oxford Street I met with pity, scorn, ridicule, contempt, humour, and, at last, success. I felt very sorry for the shop assistant who eventually produced the goods. It was evident that she was labouring under a stress of emotion. She was by turns distraught and attentive; wild and subdued; vivacious and melancholy; tearful and fearful. Was she not betraying her trust to the goddess of Fashion? Was she not being used as a tool to mar the even beat of the pendulum?

I feel ashamed of those boots now—I who have found glory in spurning starched cuffs, creased trousers, and spats. They mock me and accuse me of degrading the soul of a shop assistant before the very altars in a temple of Fashion. Fashion has scored a moral victory, and I am humbled. I am swinging again in unison with her pendulum. Success has turned to ashes, and I have realised once more that it is hard to kick against the pricks—even in boots.

PERCY FLAGE.

The Paper Chase.

Yes; we actually indulge in a paper chase very often in the office; not the frivolous sort of paper chase you are thinking about. It is not a game. It is a very serious part of our daily work, and a part that we dislike very much usually. In fact, it is shunned almost like a plague. The correct name for it is "looking" or "searching" for papers.

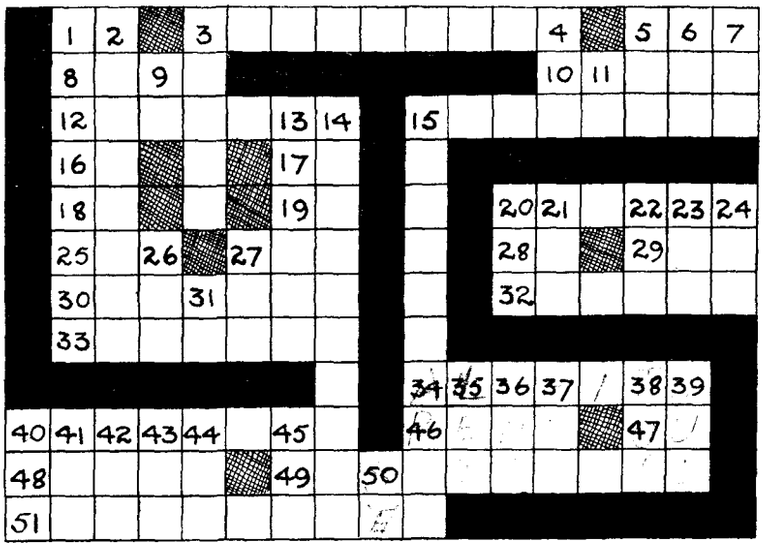
Now, a "look" and a "search" are in no way related to one another, as you will see later. The hunt always has small beginnings. A piece of paper, size usually about 4 in. by 3 in., wends its way to your desk. It is eyed suspiciously by all, but claimed by none for a short time. Suddenly it is picked up by a brave soul, who studies it thoughtfully. The rest of us breathe freely again. The slip reads: "Papers please for Brown about 1860." That date is, of course, a slight exaggeration, but these old papers always give us the impression that they have been in the files since the time of Hengist and Horsa. It is very striking how attached some of our departments become to these ancient files! They hate to think of parting with them. And we verily believe that they only ask for them to convince themselves we haven't destroyed them. Perhaps they like to gaze on them once in a while to know they are still with us. It is a peculiar thing that papers for 1925 never seem to be in demand so much. I suppose that is because they would be too easily found. So reluctantly the look commences.

Half an hour later a W.A. emerges from the filing room with hands and countenance that are in colour with those of the cleaner who brings the coal

round. (Note: Old papers are invariably required when one has a clean blouse on.) No luck! Only enough dust in there almost to enable one to grow cabbages. Now for the *search*. Sherlock Holmes pales in significance before our methods. What on earth did Brown want in 1860? Was it about a call office, or did he put a two-shilling piece in a coin-box on a dark night? Was it about a rural party line out in the wilds of Wigan? Perhaps he was waiting plant for a few years! Still no luck—a complaint? engineering matter? withdrawal? and so on until we come to a full stop. Batch after batch of papers have been returned to us as useless until finally we give in. "No trace," knowing full well that that will not suffice, but at least it will give us a little respite.

Our surmise is correct. The slip returns to tell us that the papers were out only last week. A clue at last! Why can't they say these things at first? (very irritable now). Here they are all the time in the "Pending Enquiries" box at my elbow. Curtain!

E. A.



We congratulate the inventor of the L.T.S. cross-word puzzle given below on the ingenuity displayed.

A year's *Journals* (July 1925—June 1926) will be given to the sender of the first correct solution opened. Solutions should be in the hands of the Editress on or before Thursday, June 18.

CLUES.

Across.

1. He (or she) engraved it.
3. Satirical letter or picture.
5. To be in debt.
8. You.
10. Regal.
12. R.A.
15. One of the benches.
16. Preposition.
17. Postal district.
18. Privy Councillor.
19. Note of the scale in solmization.
20. Large rake.
25. Edge of a garment.
27. Enclosure.
28. Three-toed sloth.
29. Amateur Athletic Association.
30. Constructed.
32. Proboscides.
33. Fainting.
34. Dismounts.
40. Range of hills in Madras.
46. Quaker who founded an American State.
47. Where (Fr.).
48. Covers nearly two-thirds of the Globe.
49. Concealed.
51. Dividing membranes.

Down.

1. Introductory stanzas in Greek drama.
2. Division of the High Court of Justice.
3. Place of trial.
4. Historical period.
5. You in disorder.
6. Hostile operations.
7. Cathedral city.
9. Two-fifths of eight.
11. Bone.
13. In a state of sleep.
14. Winding.
15. Wires.
20. When passed round, dispels meetings.
21. Mien.
22. Length of twine.
23. Tree.
24. Part of the verb "to be."
26. Chess pieces.
27. Please turn over.
31. Account current.
35. A London railway.
36. Behead a king.
37. South African antelope.
38. Part of the foot.
39. Half sudden.
40. To be drowsy.
41. Here (Fr.).
42. Fallow land.
43. Chasm.
44. Hendon, Holborn.
45. River in Shropshire.
50. Streatham.

Extract from "Morning Post."

Your Stockholm Call.

("The result was fairly easy with the Exchange at Stockholm, but poor when the Exchange switched on to a subscriber.")

When I talk to Stockholm (Sweden),
Which they call the telephonists' Eden,
I shall hear with the greatest ease
The Voice that says "Number, please."
And—when for an hour I've raged
Like a tiger newly caged—
"The number is still engaged."
But as soon as my call is through,
And I start to say, "How d'ye do?"
The answer, unless I err,
Will be "Bzzzzzzzz! Ping! Cluck! Cluck! Grrrr!"
And thoughts will come into my head
That had better be left unsaid,
Since they will not reach the ears
Of the Post Office Engineers,
Or stem the accustomed flow
Of the Propaganda Bureau.

Something is rotten in the state of Sweden.

And *this* is London!

In London, I'm pleased to say,
It is quite the *other* way.
You hear, with the greatest ease,
The telephonist's "Number, please."
And after a second or two,
You find your call is through,
And are saying, "How do you do?"
And the answer (unless I blether)
Is "Splendid—except the weather."
And after a friendly chat
On this and these and that,
The thoughts that you leave unsaid
Would turn a telephonist's head!
And you yearn to thank the staff
For striving on your behalf;
And you long to give "Three cheers"
For the Post Office Engineers;
And deep gratitude to show
To the Propaganda Bureau!

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

PRESENTATION TO MR. G. F. STAITE.

AT a large representative gathering of the staff on the 4th May, at the District Offices at Peru Street, on the occasion of his leaving Manchester District to take up his Traffic appointment at Liverpool, Mr. Staite was the recipient of a handsome testimonial from the Manchester District staff, and the Chairman, Mr. Archer Smith, District Manager, presented him, on behalf of all branches of the District Office and Trunk Exchange and some friends on the Engineering Staff, with a silver tea service. Other handsome gifts, consisting of fish servers, coffee service and crystal-ware, from the City, Central, and Sub-Exchanges respectively, which had been previously presented, were also on view.

The Chairman referred to Mr. Staite's long, happy, and valued association with Manchester telephones, tracing the great development of the District from the date when he joined it to its present leading position in the provinces. Miss E. Townsend, Messes. A. C. Godfrey, H. Elliott, and W. P. Richards followed with expressions of appreciation and long friendship, and all joined in wishing him and Mrs. Staite every happiness and prosperity in their new surroundings.

Mr. Staite, in reply, in happy, reminiscent manner voicing his sincerest thanks for all the good wishes expressed, and the valuable and artistic presents, referred to the happiness which his association with Manchester for so long as 20 years had brought him, and his regret at severing his official connection with so many kind and loyal colleagues and friends in the District.

COMMUNICATION WITH OTHER PLANETS.

The Director of the Extra-Terrestrial Communications Branch of the Post Office is held in popular estimation to be a cold, austere individual, engrossed with the work and responsibilities of his high position, a man who will not readily deviate from official routine; a man who will not willingly stoop to discussion—even on official subjects—in a semi-official or official way.

With this impression in our mind it was with some trepidation that we entered the Director's room. We may say at once that we had nothing of which to complain on the subject of our reception. We were greeted, with official precision perhaps, but not unkindly. His tone was precise, his manner was precise, his habits, we learnt subsequently, were equally precise. He carried a rose at the correct angle in his buttonhole. A vase containing some attractive specimens of dahlias stood exactly in the centre of his side table. Their presence recalled to our mind that our colleague had the reputation of being an enthusiastic gardener and that he was a prolific writer on the subject of his hobby. His treatise on the smaller garden vegetables has, indeed, been accepted in horticultural circles as the standard work on that interesting and complicated subject, while his work on "Primitive Types of Rhododendra" narrowly missed running into a second edition.

When we mentioned that our visit was on behalf of the *Journal* the Director's expression relaxed. "I have a great admiration for the way in which that periodical is conducted" he said, with much deliberation and emphasis. Such a tribute will give great and unqualified gratification to the readers and well-wishers of the *Telephone and Telegraph Journal*.

"Yes," the Director said, looking at us in that keen impressive manner which we associate with men of his position; "I have taken, in common with other electrical men, an interest in the description given by Marconi of the mysterious signals received at wireless stations in Italy. I am not prepared to say that it is not possible that they represent an attempt by the inhabitants of a neighbouring planet to get into communication with this world."

We had discussed, before this impressive statement was made, a number of current official subjects—to wit, the proposed abolition of Treasury Control, the need for the Office of Works, the case for the suppression of the Auditor, the humorous side of Traffic Instructions, and Broadcasting. From Broadcasting we migrated by easy stages to the subject of wireless possibilities, and it was at this stage that the Director gave utterance to his astonishing observation.

We were, we must confess, unprepared for such a statement. We knew that electrical men generally regarded these signals with doubt, if not, indeed, with actual suspicion. Some had gone so far as to say that the signals were due to nothing more than disturbances arising from atmospheric discharges or, at the most, to stray signals from other stations.

"The subject raises the whole question of inter-planetary communication," the Director continued. "I see no reason why the gulf between the earth and the nearest fixed star should not be traversed. The nearest fixed star," he went on, warming to his subject, "is, as I daresay you know, Alpha Centauri, distant, shall we say, not more than 30,000 millions of miles from the earth."

"Not more than that," we murmured. It seemed a fair journey for a few electric signals to undertake. How long would they take to do it?

We must have unconsciously uttered the thought aloud, for the Director replied to the question.

"Not more than 4 years. A wireless signal from the Eiffel Tower to America—the distance traversed was 7,674 miles—took, you may remember, .066 of a second."

We did not remember, but in any case were not disposed to question any of these figures, which, we hope, we have given correctly. We felt, however, that it was time to get on more solid ground, to get back to earth as it were. In order that the transition should not be too abrupt we referred to Mars as affording greater attraction for inter-planetary communication than Alpha Centauri. We made it clear, however, that we had no personal objection to Alpha Centauri. So far as we knew, its attitude towards us, although perhaps a trifle distant, was not unfriendly. At any rate, we knew where we stood with regard to it, and that was more than could be said of certain other planets and satellites, which appeared to be subject to continual and irritating changes of front and direction.

"Communication with Mars," the Director replied, "that will become a simple proposition. We shall do more than communicate by signals. With the development of motive power, due to the inevitable discovery of the secret of atomic energy, there is no reason why we should not navigate the gulf between us and Mars. You've read Wyatt's recent article on the subject, of course?"

We shook our head. The Director resumed, with a slight frown of disapproval: "Once the secret of atomic energy is discovered, mankind has at its disposal an enormous motive power, which will open up vast and hitherto undreamt of possibilities of rapid transit. Speed will be limited only by the point at which rapidity causes combustion. At the rate of a mile a second, and with the harnessing of atomic energy to our use there is no reason why that speed should not be attained, the passage to the moon could be done in 60 hours."

We hastened to agree with these views. We were not exactly sure with whose views we were assenting—the Director's or Wyatt's, but that at the moment was a point of no importance. We must admit, however, that we agreed with some mental reservation. We had hitherto looked upon the disintegration of the atom, in so far as we had looked upon the subject at all, as a dream of the philosophical chemist. Harnessing the energy of the tides—surely that were a more practical solution of the problem of obtaining new sources of energy. We had read somewhere recently that round our shores a weight equal to millions of units of horse power was raised and lowered twice each day.

"The problem of freeing atomic energy," the Director resumed, after a short pause, "must sooner or later be solved. In the past we have discovered various ways of applying natural energy. We discovered that physical energy was derived from the vaporisation of steam, that the explosion of dynamite released greater forces. Here, in the atom, we have something which had held, for millions of years, electric particles which contain forces infinitely greater than those released in dynamite explosions. You've read Professor Soddy's science addresses to his Aberdeen students," the Director broke off abruptly.

"Soddy," we replied hesitatingly, "ah, yes, of course, Soddy, the Professor—at Aberdeen—N.B."

"Precisely," the Director replied, somewhat drily. "Soddy of Aberdeen, N.B. He's been examining for years the structure of the atom as revealed by the radio-active minerals. We have at our disposal a vast amount of information about the descendants of the two ancestral metals—uranium and thorium, and their periods of life. An atom of thorium will live 25,000 millions of years."

"And then?" we asked timidly.

"And then," the Director replied, almost without a pause—it was clear that he had mastered the subject—"And then it changes into other atoms, some of which live comparatively short

lives. Radium is a descendant of uranium. Its life is only 2,440 years, while an atom of uranium may live 8,000 millions of years."

"But isn't there some danger," we ventured, after a futile effort to grasp the significance of these figures, "that all this knowledge which is being acquired of the atom may be used for destructive purposes?"

"The old objection," was the reply. "Every attempt after knowledge has encountered it—astronomical research—electric research—psychical investigation. The thing to bear in mind is that we need more sources of energy and power. Coal and oil won't last for ever—and we don't want them for ever. The harnessing of the energy of the atom will open up vast new possibilities."

"It will not be achieved in our generation," we ventured to affirm.

"I see no reason why it should not," and the tone was one of conviction. "We've discovered a good deal in recent years—the outer shell, the inner shell, the nucleus."

The entrance of a member of his staff with some charts which looked like development study prints interrupted the discourse. We were glad of the interruption. The figures were getting too much for us, and, besides, we had got clear away from official subjects, from the subject of wireless telegraphy, for instance, with which the conversation had opened.

Not that we need apologise for publishing the Director's views on matters not directly connected with his work. By learning his views on outside matters, whether scientific, social, or political, we shall be better able to understand and appreciate his standpoint on official problems.

Lest some readers should dispute this, let us illustrate the point from our personal experience. We frequently exchange views on social, political, and economic subjects with a highly-placed colleague, whose point of view with regard to official matters it is necessary for us to know. Knowing his views on subjects outside the official curriculum we can readily estimate what he will think about official questions. We can anticipate his objection to courses which we desire to pursue, and when he proposes to take a certain course we can foresee his arguments against our inevitable objections to that course. It will readily be seen that a large saving of official time accrues from the possession of such knowledge.

It is a great mistake not to trouble about a Chief's views on matters outside the official sphere. Find out his views on Welsh Home Rule and you will glean an idea as to his attitude towards the necessity for greater devolution in telephone administration. Ascertain his opinion on the National Budget and you will know whether he is likely to support the movement for better scales of pay for his staff.

Tact is, of course, required in broaching subjects not allied to official questions. Probably at first your Chief, however tactful your behaviour, will be a little surprised, perhaps even bewildered, at your interpolations. He will get used to them in time. He will begin to look forward to your visits and will gradually come to realise that, as you were gaining a greater knowledge of his views on general questions, so you were able to anticipate his wishes in official matters. Promotion, if not rapid, will, at least, be certain.

We awoke from our reverie with a start—the Director was speaking again.

"You saw that young man who was in here," he was saying; 'He's one of my smartest men. I've just put him on development work. Forecasting the future, he explained, observing our look of surprise, "forecasting the future—for that is what development study work amounts to—and the problems associated with extra-terrestrial communications work have many points in common. That is why, when the new branch was formed, development work was transferred to it. The actual studies are, of course, made by the contract people."

"There is a good deal of conjecture about their work," we suggested.

"Of course there must be conjecture, a considerable amount of conjecture," the Director replied, almost acidly—had we stirred up some unpleasant memories?—"but it is, or should be, reasonable conjecture. You may say we can never state definitely that development of areas will take place as forecasted, that we can never be sure,—and yet," he added slowly, and that earnest and far-away look, which we were beginning to know so well, came into his eye, "what can we be sure of in these days of rapid change? Our most cherished beliefs are being upset. Look at Einstein's relativity theory of gravitation. It came upon the scientific world like a bombshell. A magnificient triumph! Let us see what he solved." He rose, and began to pace the floor.

It was clear that the Director was again endeavouring to recall scientific facts to his mind—with or without the aid of Pelman. He was on the point of opening up vast subjects of thought once more.

Were we to resign ourselves to the inevitable? Were we to be whisked back to Alpha Centauri, to say nothing of Mars and the Moon, without a protest on our part? We glanced at our watch. The afternoon was far spent. We were anxious to get away. It was already doubtful if we would be in time for our dinner. We looked round for our hat.

"Yes," the Director was saying, "Einstein's theory incidentally solved a problem which has hitherto puzzled astronomers—the movement of the perihelion point of Mercury's orbit."

This was too much. The introduction of a fresh planet or two into the conversation was apparently nothing to the Director of Extra-Terrestrial Communications. It was too much for us. We seized our hat while he was pacing the floor, and measured the distance between us and the door.

"Mercury's perihelion—the point at which it approaches nearest to the sun," the Director continued, his eye fixed on some point in the ceiling, "has a slow, progressive movement."

We commenced a slow, progressive movement towards the door.

"Newton's law of gravitation, after allowance was made for all known disturbing causes, did not explain the whole of the movement. We had a period of time which we could not account for, not a large period, not more than eight seconds in a century."

He had commenced the return journey, and his back was towards us. We had a period in which to make good our escape, not a large period, perhaps, not more than eight seconds possibly. Stealthily and rapidly we made for the door.

The voice continued—"The deflection of the light—certain stars—last eclipse—predicted by Einstein—"

A swift turn of the handle. The door opened easily. We closed it gently behind us—and went out into the darkness.

C. W. M.

SOUTHAMPTON.

MR. T W. WICKHAM, on the occasion of his promotion to Traffic Superintendent, Class II, at Newcastle, was presented with a travelling suit case, and a cake stand for Mrs. Wickham. The District Manager's staff, exchanges, and Engineers were associated in the presentation. The presentation was made by the District Manager, Mr. W. Howe, who expressed appreciation of the manner in which Mr. Wickham had carried out his duties whilst at Southampton, and wished him every success in his future.

Mr. S. O. Allen, Traffic Superintendent, voiced the feeling of the staff at losing Mr. Wickham, and thanked him for the valuable work he had performed during his service at Southampton.

Mr. Wickham expressed his appreciation of the gifts, and thanked all who had helped and assisted him in the successful performance of his duties.

LONDON TELEPHONE SERVICE NOTES.

Removal of Controller's Office.

By the time these notes are read, that part of the Controller's Office which was situated at 144A, Queen Victoria Street, will have completed the removal to Stamford House. This building was built to accommodate the Stationery Office, but the war came along during the building operations, and it was used as a hospital. The building will be shared with other branches of Government departments. The new office is on the south side of the river, just over Waterloo Bridge.

The task of removing the office furniture and equipment for 800 persons is a fairly considerable one, and was scheduled to occupy from May 6 to 30.

In order that the removal should not cause inconvenience to subscribers desiring to communicate by telephone with the section undergoing removal at the time, special circuits were installed in the Registry, and they were attended to by some of the staff of the section concerned.

There is no change in the telephone number, which remains City 2000, and the Private Branch Exchange is still in the City Exchange switchroom.

* * * *

London Telephonists' Society.

Although the next session does not commence until October, arrangements for the programme are well in hand. The session will open as usual with the President's address, and, in addition to the usual competitions, there will be a paper read by Mr. M. C. Pink, and one evening will be devoted to debate. It is the intention to produce a revised version of Miss McMillan's telephone play (with music), and, seeking fresh fields, a photographic competition will be held. There will be the Annual Dance, of course, and, following the success of the Society's first whist drive, it is probable that another will be arranged to wind up the session. There is every prospect of Mr. W. J. White presiding over a very successful series of events.

* * * *

Night Staff Cricket League.

The Night Staff Cricket League fixture list is to hand, and, in addition to the inter-club matches, they will play against a team of Traffic Officers on July 18, Tunbridge Wells P.O. on July 21, and the League champions will meet the Rest of League on September 16. The Traffic Officers have suffered defeat in the two previous matches, and are particularly anxious to prevent the hat trick.

* * * *

Interchange of Staff.

Last month saw the commencement of an arrangement between the British and French Telephone Administrations whereby there is an interchange of telephonists between London and Paris. This should prove exceedingly useful, and considerable benefit should be derived from the knowledge gained by both parties of the working conditions at the foreign end of the continental trunk lines.

* * * *

Visitors from Provincial Towns.

The L.T.S. has welcomed the visits of supervising officers from provincial exchanges having a considerable volume of their traffic passing through the London Toll Exchange. Four days are spent in examining the conditions and procedure at the Toll, Trunk, and Central Exchanges, and the greatest possible interest has been shown in all that London has to offer. We believe that the visits have been as pleasurable to our provincial colleagues as they have been to us.

* * * *

On the Continent.

Another visit which should be productive of much good is that paid by our Assistant Controller (Traffic) in company with Messrs. J. F. Edmonds and G. H. Taylor, of the Secretary's Traffic Section, to Holland and Denmark in connection with the development of telephonic communication with those countries.

* * * *

South District Traffic Office.

The South District Traffic Branch was the scene of a severe fire which completely destroyed its office quarters and the larger portion of its records and files, during the early morning of April 20. The cause of the fire is not established, but it appears to have smouldered for some time, as the premises were not entered after 3 p.m. on the 18th, and the fire was not observed until it became very active about 1.15 a.m. on the 20th. By the courtesy of the Superintending Engineer, accommodation was found for the Branch, early on Monday morning, at Denman Street temporarily, and within a few hours reconstruction was started. By careful salvage, sufficient of the more important records was saved to enable their restoration to be possible, and it is hoped, within a few weeks, that work will proceed normally.

CORRESPONDENCE.

BALDWIN'S TELEPHONE HISTORY.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

SIR,—Referring to Mr. Cotterell's letter in your May issue on the subject of the first Telephone Exchange in Great Britain, I certainly think that Mr. Cotterell is right in assigning it to London. I joined the late Mr. David Graham as Engineer on January 1, 1881, and was intimately associated with him for the ensuing three years, yet never knew him to claim that his Exchange was the first opened in Glasgow. This he would not have failed to do had it been correct, and such a fundamental fact would have stood out in my memory.

The date of March, 1879, given in the book as that of Graham's start is probably a mistake for March, 1880. He had very few subscribers working when I joined; his strength lay in orders yet to execute, which were very numerous. The opposition Company had a larger circle.

Graham had private wires which probably dated back to 1879, and on these, I imagine, were used the instruments obtained from the Bell Company; I never saw any but Gower-Bells on Exchange lines.

That Graham might have been mistaken is confirmed by the fact that he made several errors in the same communication to Mr. Baldwin. For instance, he says that all-night and Sunday working prevailed from the outset—that is, March, 1879. It really commenced at 9 p.m. on January 1, 1881, when he and I went from his house to Douglas Street Exchange and installed the first night operator, a lad named Donald, who was warned emphatically against going to sleep. There was no night bell, the indicators being without contacts. Graham said it was the first night work to be undertaken, and he took (deservedly, I think) much credit for the innovation.

Again, he talks of Medical, Legal and other Exchanges as being separate ones, "although means were ultimately taken to give intercommunication between them." As a fact, they were together on the same switchboard, and capable of being put through at any time. There was no compartmental working when I joined, and I never heard the operators or others speak of any.

Then the opening of St. Vincent Place Exchange is given as 1880; it was really March, 1881. The switchboard being made for it was still in Messrs. Patersons' hands, in course of altering to my instructions, until then.

Further, it is stated that the switchboards used had slipper jacks and flexible cords, and that "larger boards of this description were later made to Mr. Graham's order by Mr. Paterson." This is wrong. The only board of any size made by Paterson for Graham was that for St. Vincent Place, and that was an Edison peg board without any cords at all. When I joined, Graham had two switchboards working—Douglas Street and Hillhead, the latter for some dozen lines only. When the National Telephone Company took Graham over in May or June, 1881, five or six months later, they found three, two cords and one peg, St. Vincent Place having been opened in the interim. They were all Graham ever possessed.

Graham also tells Baldwin, "Wrought-iron tubular poles were employed at an early date." There was not one when I took charge in 1881, but I began to erect them immediately. So, instead of being early, they only appeared shortly before he sold out.

And "Phosphor-bronze (it should be silicum-bronze) wire was soon introduced in place of iron owing to its superior durability and tensile strength." The "soon" was several months after he had parted with his Exchange to the N.T.C., that is, in August or September, 1881, when I brought the first lot from Paris and erected it along Sauchiehall Street. The chief reason for its adoption was the imperative necessity that existed for superseding the No. 11 iron wire in use in order to make the supports carry more wires. Its durability, at that date, remained to be proved, and the question caused me many an anxious hour.

All these facts point to Mr. Graham's memory having become untrustworthy at the date of his communication to Mr. Baldwin.

Consideration of the rates charged may, perhaps, assist. Graham's was £12 10s. per annum when I joined, and had never been more. The Bell Company were charging £15, and, I was told, had originally demanded £20. Now, it is unlikely they would have done this had they found a competitor at £12 10s. already in the field, and had they been so ill-advised to do so, the improbability of their obtaining more support than Graham (which they did) would have been very great.

But the dubious point of priority is capable of resolution. Graham took care to have his proceedings well reported in the local press—in fact, he kept a tame journalist within call. If he opened in March, 1879, the columns of the *Glasgow Herald* and *North British Daily Mail* of that date will reveal it; and patient investigation of later issues of those papers will eventually bring the searcher to the actual date of opening. The newspapers can be referred to at the British Museum.—

Guernsey, I am, Sir, yours, etc.,

May 20, 1925. A. R. BENNETT.

TELEPHONE DISTRICT MANAGER'S STAFF, MANCHESTER [Photograph by *C. Ireland.*

PERSONALIA.

LONDON TRAFFIC STAFF.

Supervisor rssigned on account of marriage :—

Miss G. V. DASH, Asst. Supr., Class II, Putney Exchange.

Telephonists resigned on account of marriage :—

Miss M. FERGUSON, Telephonist, Central Exchange.
Miss G. M. WALSH, Telephonist, Central Exchange.
Miss D. PUDDY, Telephonist, Central Exchange.
Miss E. BROOKE, Telephonist, Central Exchange.
Miss W. A. BELBIN, Telephonist, Victoria Exchange.
Miss M. M. COLLINS, Telephonist, Victoria Exchange.
Miss J. C. SHARP, Telephonist, Victoria Exchange.
Miss M. G. F. REARDON, Telephonist, Trunk Exchange.

Promotion :—

B. C. B. WILES, from Executive to Higher Clerical Officer.

PRESENTATION TO MR. W. J. PORTER.

A SUPPER was arranged on Friday, April 24, at Anderton's Hotel, Fleet Street, for the purpose of officially bidding good-bye, and of making a presentation, to Mr. W. J. Porter, who sailed for Penang on May 8. Some 50 covers were laid, and there was a full representation from both telephone and telegraph divisions. Mr. Stuart Jones, the chairman, announced that, in a telephonic communication from Amsterdam earlier in the day, Mr. Edmonds, the Chief Inspector, had expressed regret at his unavoidable absence, and sent best wishes for a successful evening.

After due justice had been done to the meal, the Chairman called upon Mr. Deane to present a suitable inscribed gold watch to the guest of the evening. In doing so, he stated that there had been a large number of applicants for the Malay vacancy, and expressed his conviction that all who knew Mr. Porter would agree that a better choice could not have been made. None was better qualified to uphold British ideals. He wished him all luck.

Mr. Deane, speaking as an Inspector, testified to the abilities of the successful candidate, and expressed the regret he felt at losing an old and trusted Assistant Inspector. In lighter vein, he recalled the patronising manner in which he had expressed willingness to place the resources of his division at the service of Mr. Porter whenever he desired to utilise them. It was much more likely, when we wished to keep in contact with traffic progress, that we should be sending deputations to Malay, instead of to the U.S.A.

In accepting the gift, Mr. Porter said that he could not agree that he merited half the kind things which had been said of him by the Chairman and Mr. Deane, but he would do all he could to uphold British traditions, and hoist the telephone flag in his new country to the home standard. He had been reminded of the possibility of his having to return to the home service. The disturbing thought in this was : if, by force of circumstances, this should happen, " What about the watch ? "

Several mock presentations, made between the musical items, added to the joviality of the occasion, and provided Messrs. Wakeley, Ashton, Magnall, and Hemsley with opportunities for poking fun at Mr. Porter as he has been, is, or will be in dark, mysterious, old Malay. A toy pistol, a yacht, and a cricket bat and ball suggested themselves as useful, while a miniature bathing costume was obviously full dress, evening dress, and every other kind of dress for him in his new country. A series of mock telegrams, generally credited to Mr. Findley, were also a source of much amusement.

The company, by its appreciation, showed how much it was indebted to Messrs. G. W. Burton and W. F. Green, pianists, A. Hemsley and B. R. Bailey, baritones, J. Whiffen and H. J. E. Still, tenors, J. Magnall, bass, and R. M. Murché, humorist, for the excellent programme they provided. Messrs. Hemsley and Whiffen also greatly pleased with a number of duets.

MANCHESTER TRUNK EXCHANGE.

RETIREMENT OF MISS M. R. SHARPHOUSE.

AT a large gathering at the G.P.O., Manchester, on April 27, farewell was taken of Miss M. R. Sharphouse, late Supervisor of the Manchester Trunk Exchange, who retired under the age limit.

In the unavoidable absence of the Postmaster Surveyor, Mr. Archer Smith, District Manager, acted as chairman at a representative gathering, which included the Acting Assistant Postmaster, and many officers from the Telegraphs, the Telephone Traffic Department, and a strong contingent from the Trunk Exchange.

The chairman read a letter from the Postmaster Surveyor appreciative, of Miss Sharphouse's hard and conscientious work in the Trunk Exchange, and followed with a short sketch of her official history from the time she entered the service in the Lancashire & Cheshire Telephone Co., to date. He added his estimation of Miss Sharphouse's long and faithful service, and her sympathetic interest with her staff, and tendered her the heartiest wishes of the gathering for a long and happy retirement. He was followed and supported by Mr. G. R. W. Jewell, Acting Assistant Postmaster, Mr. G. F. Staite, Traffic Superintendent, Mr. J. Wadsworth, Acting Chief Superintendent of Telegraphs, and Miss Scott, of the Trunk Exchange.

He then presented Miss Sharphouse with a writing bureau from the Trunk Exchange supervising force and members of the Traffic staff, and a lounge chair from the telephonists in the Trunk Exchange ; a timepiece from members of the Telegraph Branch formerly associated with Miss Sharphouse had already been presented at an earlier date.

Miss Sharphouse, in replying, with some emotion, warmly expressed her sincerest thanks for all the kind things said about her, and the valuable presents, which last, she said, would serve to remind her of her long, happy service in Manchester, and friends she had made during her work in the Manchester Telephone Service.

THE

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All correspondence relating to advertisements should be addressed to MESSRS. SELLS, LTD., 168, *Fleet Street, London, E.C.*4.

TELEGRAPH AND TELEPHONE MEN AND WOMEN.

XVIII.—MISS A. E. COX.

MISS AGNES COX, the Superintendent of the Staff of the Telephone Exchanges, entered the service of the Post Office as a telegraphist in 1894. In 1896 the trunk telephone lines were taken over by the State and a new career was opened for Post Office women. The opportunity came to Miss Cox; a number of telegraphists were lent to the Trunk Exchange to carry on the service and to form the nucleus of that large body of telephonists now in the employment of the Post Office. Miss Cox was selected as one of these pioneers and from that day to this she has been a pillar of the London Telephone Service. In 1902 she became a supervising officer, and in 1913 was made chief supervisor in the Trunk Exchange. It is interesting to note that the staff at that Exchange had grown during Miss Cox's service there from 8 or 10 to 352. It is clear that at this time Miss Cox's exceptional qualifications for organization were recognised, for in 1915 she became Assistant to Miss Heap, finally, on the retirement of that officer in 1921, succeeding her as Superintendent of Female Exchange Staff. Everybody knew Miss Heap and recognised her forceful personality, and it was fully appreciated that in following her Miss Cox was being subjected to a very searching test. How she came through it the history of the last four years with its progressively improving service will testify. Miss Cox has thoroughly established herself in the minds and hearts of the 7,500 persons, for whose recruitment, training, discipline and welfare she is responsible.

THE LURE OF THE ADVERTISEMENT.

BY EUSTACE HARE.

GOOD wine needs no bush; for reasons other than that commonly assigned to the old adage. Good wine is a luxury of a limited and uncertain character, relished only by the discerning and fastidious, the entrance to whose cellars is not via the poster on the wall. The wise and experienced merchant knows this, and knows also that an advertisement intended to attract the multitude would be more likely to shock and repel than to impress his regular clientele—the genuine consumer of good wine. The arrival of a choice consignment he will probably announce to those interested by personal letter in which the particular characteristics of the vintage are set forth in that peculiar phraseology understood only by the elect.

The causes which underlie the futility of any attempt to boom good wine—the inferior article is another story—may be summed up in: a want of appreciation, a limited supply, and the relatively enormous cost which attends the mere drawing of a cork.

There are, on the other hand, certain commodities which, so far from being luxuries, are as needful and common as air, and yet are never mentioned on wall or hoarding; and among them may be cited meat and milk. The fact that these are necessities, and therefore need to be sought rather than proclaimed, does not explain this immunity. The main reasons are that though there is competition there is no manufacture and, therefore, no variety of ingredient to be explained and vaunted; the price is virtually fixed and the supply is regular, while the shop is its own advertisement. Custom is likewise regular, so that the vendor can gauge his sales and has no temptation to overstock himself with his perishable goods.

Now, mark the difference in the case of such an article as soap. In civilized countries there are more users of soap than there are consumers of meat, and yet a shop which purveys soap, and nothing else, is unknown. No article manufactured for the service and comfort of man has ever been so lavishly and so alluringly advertised as soap. And why? Nobody needs to be urged to buy and use soap; there is no sect or cult which denies its value or abjures its use on principle—the practice of the "unsoaped" is a matter of indifference rather than conviction—and it might, therefore, be supposed that at this period of history all the public need to know is where soap is to be bought. If there were only one or two brands the public would be saved a deal of trouble, but would be the losers of the charm of variety and the pleasure of selection. There is probably no manufactured article where the ingredients are so varied, which has so many grades of quality, and where the prices are so adaptable, as soap. Scented and unscented, transparent and opaque, one brand associated with monkeys and another with their native palms; curd and cream, milk and honey, primrose and lavender; while every colour in and under the sun is brought into requisition. What wonder that the manufacturers call to their aid cunning artists, who are puzzled to create new designs to attract and assist a bewildered public, or that the bewildered public, ever ready to answer each saponaceous novelty so furiously urged upon them, find it difficult to make a permanent choice. When one thinks, however, of the hard, dry, angular, yellow bars of forty years ago, one is thankful for the blessings of advertisement and for the enterprise which it stimulates.

It is true that advertisements have to be paid for, and it is possible that if the expense could be avoided, our soap, cigarettes, and sauces would cost us less. But it is also true that, but for the advertisement, many of these things would not exist at all, or at least could not flourish. Without diving deeply into economics, it is not difficult to understand that with every new manufacture or variety of manufacture new avenues for employment are opened up, and by the multiplication of factories congestion is avoided, while employment is simultaneously increased and distributed. Even, therefore, if the cost of making known the thing produced be thrown upon the consumer—which does not necessarily follow, for prices are influenced largely by competition and demand—it is the general community which gain in the end by every new commercial development, assuming the thing exploited be good in itself, and if the thing be not good in itself neither it nor its advertisement will last very long.

Most of us, I suppose, realize how crude and inartistic formerly were the usual efforts to attract attention by means of the bill-poster; and even to-day, among much that is beautiful and tasteful, poverty of imagination and inferior execution still offend the critical eye. It would almost seem, if some designs are to be trusted, that the whole art and aim of advertisement lies in repetition, no matter how uninspiring and insipid the presentation of the subject may be. There are, as everyone knows, many people in the world still who believe unquestioningly all they are told in print, whether in the newspapers or on the walls, and such can always be counted responsive to any catch phrase or design, so long as it is repeated often enough. There are many, however, to whom repetition provokes irritation, and if accompanied by bad drawing, ugly colouring, or wordy banalities, as so many advertisements are, it becomes tiresome and nauseating, and the way of such people is to leave the article boomed severely alone. These are they who argue that good wine needs no bush, that inferior advertising means inferior goods, and that there is no such thing as "cheapness"—anything that is wanted is worth what it costs to produce. They argue, further, that the sole object of the advertiser is to fill his purse; and, unfortunately, there are enough quacks in the world to give colour to this notion. So reasons the conservative and fastidious mind; a mind which is often a strange jumble of ignorance, intelligence, intolerance, business capacity, and prejudices, and it is its prejudices which the astute advertiser sets himself to overcome.

The foremost desideratum of a successful advertisement, and the most difficult to achieve, is to convince the reader or the spectator that the subject is genuine and the purpose sincere; in other words to inspire confidence. The thinking public are not to be drawn or misled by exaggeration or the grotesque. Such wiles may create amusement, but will not open a purse. The surest method is to tell the truth in the most striking way; to promote interest by hitting on an easy path to the imagination.

One of the greatest improvements in the art of advertising that has occurred in recent years is that introduced by the Railway Companies. It has taken a long time for the authorities to realize that the jaded city worker is not always to be impressed by the contemplation of a crowded beach, after the style of Frith's "Ramsgate Sands," or to suppose that a cheap return fare is the necessary accompaniment to health and re-invigoration. So, instead of a vast crowd of people, brilliant in red and blue and yellow, wandering aimlessly about a purple esplanade, our minds are refreshed and stimulated as we wait for our daily trains by beautiful reproductions of pictures painted by competent artists, suggesting quietude and solitude in place of the old noisy activity.

This is a refinement of advertising practice. Imagination dwells longingly on a representation of what we feel we want; and something more than that; for the true artist has the subtle power of bringing before us, graphically, beauties of landscape and seascape which unaided we should never discover. It is useless to deny that the Railway Company, not being primarily

a philanthropic institution, wants our money—they would not fulfil their duty to their shareholders if they did not—but they render us a real service by making known in a legitimate manner the possibilities of new scenes and environments which, but for their enterprise, would be inaccessible to many. This is the spirit of the new advertising, which is giving it a value and a dignity to which it has not hitherto aspired.

Now, it is a curious fact that it was not until a very late stage in the history of the telephone companies that any attempt was made to urge the general adoption of this important and beneficent invention through the medium of advertisement, notwithstanding that the undertaking was governed by a succession of what are usually accepted as business men, to some of whom the advantages of the poster and of Press announcements must have been well known. Amongst chairmen, directors, and managers, I can call to mind three or four cotton brokers, a shipowner, a railway magnate, a merchant, the proprietor of a weekly journal, and a stockbroker. Whether such professional men as accountants, lawyers, and engineers are included under the general title "business man," I am unable to say, but their very training should, at all events, guarantee the possession of a headpiece as good as the rest. Anyhow, it was under the auspices of a trio of these respective professions, after the service was well established, that a scheme of booklet and pamphlet circulation was inaugurated: but the idea came from America.

It is easy to be wise after the event, but it is difficult to understand why it never occurred to the administrators of such a powerful and revolutionary invention as the telephone to publish its vast possibilities by pages in *The Times* and posters on the walls. Instead of which, the canvassing of London—a mere scratching of the surface—was in the early days, and within my recollection, in the hands of two gentlemen who walked into the office every evening, with perhaps a couple of orders in their pockets at £20 a year each, to the tune of a commission of 10%. Incidentally, the names of neither of these modest heroes figures in Mr. Baldwin's otherwise comprehensive history of the telephone.

It is true that advertising, as we know it to-day, was in its infancy then: but railway stations were already the hunting ground for all who sought publicity for their goods and the foundation of success to many of the great commercial houses which still flourish. There is little doubt that a vigorous campaign in this direction would have resulted in an undreamed-of impetus to early telephone development, and might have placed this country in the forefront of the new enterprise. The persuasive tongue of a good canvasser is, of course, a valuable asset, but a whole army of talkers is needed even to-day, if the telephone is to serve its full purpose, which is, an installation in every well-appointed house. The spade work and the seed-sowing are the task of the advertisement; the work of the canvasser is to reap the harvest.

In one respect only, perhaps, the pioneers of telephony had reason to congratulate themselves on their slow march of progress, and that was the obligation to adopt improvements and to scrap primitive machinery—conditions inherent to all new inventions. Only those of the passing and past generation interested in the subject can remember the disastrous effects of a snow-storm which visited London somewhere in the middle 'eighties of the last century, when huge clumsy iron derricks toppled over perilously, and tubular poles were bent into fantastic shapes by the mere weight of frozen snow clinging to the wires attached to them. The catastrophe was widespread and the cost of it was a severe strain on the companies' resources. With a much larger clientele the destruction might have proved irreparable, or at the best have thrown back development for many years.

It would take an earthquake to accomplish such confusion in these days, and we have happily little cause for apprehension on this score. With our more perfect machinery, all we have to do is to go ahead; and that we are going ahead is amply proved by statistics which, in the hands of a disinterested administration, cannot lie—whatever the wits may say.

But are we going ahead fast enough; have we yet got beneath the crust? Examining our progress by the standards set up in some other countries we cannot confidently say "Yes"; it may still be said that we have only scratched the surface, which means there are hundreds of thousands of potential telephone users still to be reached, and this, again, means that our methods of securing subscribers are as yet imperfect and inadequate. If every householder in these islands were clamouring for new things and ready to welcome the visit of every missionary of progress, our contract officers might be bringing in orders by hundreds instead of tens, but their interview cards tell a very different story. What these officers want is help in the preparation of the ground. An Englishman's home is his castle, and to gain ingress is often a mighty difficult undertaking: and even when the barrier is down a parley is not always to be had for the asking.

Here it is that a judicious and sustained advertising campaign would work wonders; for startling as it may appear, there are still thousands of people who do not yet realise the time-saving and money-saving properties of the telephone, nor the manifold uses to which it may be put; and they will never know it unless the facts are constantly brought before them and allowed to soak in. A canvasser may accomplish this in time, but it may be a long time, and at the cost of repeated visits.

It may be said, and probably often is said to our disparagement, that being an uncommercial concern in the sense that profit-making is not an incentive, the Post Office does not deem it necessary to advertise its services. This is a fallacy; for every utility, be it light, water, or transport, which is dependent on borrowed money for improvements and development, must provide for interest, depreciation, and replacement; and, for safety, must leave a margin in reserve. Strictly, these items do not represent profit, for they are necessary working expenses, but unless they can be met, a profitable investment has not been created, fresh capital is not forthcoming, and the business deteriorates or lapses into bankruptcy. Logically, therefore, only those concerns which aim at unbounded dividends or personal financial aggrandizement can lay claim to the "commercial" element. The telephone service is on precisely the same footing as the railway, shipping, electric light, gas, and water companies, and is carried on in the same commercial spirit, and, we claim, with the same business acumen.

Out of all these undertakings, only one is wholly exempt from the need of advertising, viz., water; this being a necessity not only for health but for life itself. A railway company is partially in the same happy position, as those who travel daily to and from places within ten miles of London very well know. There is no need to draw attention to the delights of Surbiton, or even of Southend, but, as the distance lengthens and the booking fees increase, lures are thrown out to tempt the adventurous and to fill trains run at vast expense.

In regard to the telephone service, there is no corner in the kingdom of which it may be said the demand is so generally spontaneous and emphatic that the Post Office has only to take the wires into the house. As a rule, the advantages of a telephone are not realized until they have been tried or have been amply demonstrated, and demonstration by the individual to the individual is a very slow and tiring process. If we are ever to make up leeway, we shall never do it by canvassing alone, by a few hundred more or less persuasive tongues. The number of people still apathetic, unconverted, or untouched, is so vast, that to reach them by talking is hopeless. To reach them and to teach them the theme must be constantly before them, and what the blackboard and the diagram are to the pupil, so is the advertisement to that larger school, the public. Canvassing has been tried for over forty years,

both here and in America, and cannot be said to have fulfilled expectations. America has discovered this, and, I understand, now relies largely on advertisement.

I have recently seen some specimens of magazine advertisements used by the American Telegraph and Telephone Company for the expansion of their business. Without being in any way sensational, these advertisements are of a very attractive and compelling character, and if advertising is still necessary in the States, where the system is already so highly developed, how much the more is it needful here, where we have scarcely penetrated below the surface.

It does not necessarily follow that we should copy slavishly the American advertising formula, either in illustration or diction. No copy is equal to the original, and in copying there is always a danger of exaggerating prominent features and ending in a caricature. There are many expressions and mutilations of words current in America which not only sound and look foreign to the ordinary Britisher, but which to many are positively a cause of offence. There are still many people who would turn sniffing from a shop which invited the "honor of their favors," and these very people are among those still unreached by the telephone; and to whom the abbreviation "'phone" would be anathema. As an example of "how not to do it," I am reminded of a cartoon, current during the War, which bore the legend, "It's Our Flag." There was neither need for, nor virtue in, the lopped expression "It's." To suppose that the masses must be addressed in sloppy English is an insult to their intelligence as well as a mistake. In this case, "It is Our Flag" would have been far more striking and emphatic, and would have carried more weight at a serious and momentous crisis.

Laboured and pompous language is, of course, ridiculous when the public eye has to be caught, but there is no reason why crisp and telling phrases should not be couched in terms understood by all, and which would inflict no jar on literary susceptibilities. And if we take our cue from the best American models we shall not go wrong; but, after all, an essential feature of good advertising is originality.

We have to appeal to all sorts and conditions of men and women—in many cases, where the home is concerned, to women particularly, for some men are prone to regard the telephone as a business appendage and to cast off all that pertains to the "office" when they leave it. This is a prejudice to be overcome by stratagem, to which even an advertisement in itself may be unequal and which must be left to domestic perseverance and persuasion. Our part is to provide the weapons of attack in the shape of informing data; data of an attractive nature, telling its story on the surface.

Thus, it is as important to invade the home as the place of business, and I can imagine no surer way than that afforded by the magazines and periodicals, or by illustrated brochure of tasteful appearance. It has never, probably, occurred to a contract officer to recommend to the presiding lady of a house a telephone installation as a birthday present, but the lure might very well be set forth in a pamphlet, and I throw out this random suggestion as one which might appeal successfully to a practical mind.

In conclusion, beyond paying its way, the goal at which the Post Office aims is not profit, but something far higher. We know that the telephone is a good thing, and that it has forced itself to the forefront as an essential and necessary adjunct to the commercial prosperity and to the complicated amenities of the social life and order of the country. We know further, that with every accession to the ranks of subscribers it becomes proportionately more valuable. To extend its use and to develop its possibilities in every possible way becomes, therefore, a paramount duty.

NOTES ON TELEGRAPH PRACTICE.

By G. T. ARCHIBALD.

VII.—*Concerning Internal Circulation Arrangements in Telegraph Instruments Rooms.*

ONE of the most important problems in telegraph practice, especially at the larger offices, is that of the transference of telegrams from one point to another in telegraph instrument rooms.

At the smaller offices the problem is a simple one, the operation occupying but a few seconds per telegram, but since time is the governing factor, special arrangements must be made at the larger offices for the prompt disposal of the traffic in order to reduce internal circulation, or "office drag," as it is now officially described, to a minimum.

Generally speaking, telegrams are collected by hand and conveyed to the circulation table by human agency. Circulators (telegraphists) sort the telegrams into pigeon holes each of which bears, on both sides, an indication of the circuit, Section, or other point to which the contents must be transferred for further treatment. Distributors (usually junior Sorting Clerks and Telegraphists, Boy Messengers and Girl Probationers) then carry the telegrams to the positions indicated.

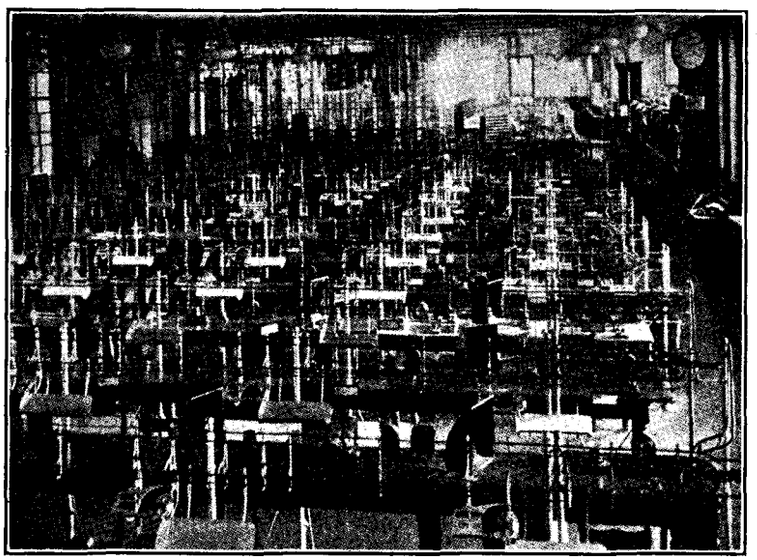

FIG. 1.—PICK-UP CARRIER. BIRMINGHAM INSTRUMENT ROOM.*

Formerly the work of collection and distribution was performed by a class of boys known as Indoor Messengers. On the creation of the class of Paid Learners the work was divided between the Indoor Messengers and the new class. Later, the Indoor Messenger class was abolished and boys required for indoor work were drawn from the outdoor class. This arrangement still continues at offices where Boy Messengers share the work. Within recent years a new class of female workers, Girl Probationers, has largely displaced Boy Messengers on the work.

With the abolition of Paid Learners it has become necessary to employ junior telegraphists on collecting and distributing work which they now share with Girl Probationers and, to a lesser extent, Boy Messengers.

Formerly Collectors were encouraged to pick out telegrams received over one circuit in their sphere of operations for onward transmission over another circuit in the same sphere, but it was

* These four blocks are reproduced by permission of the *P.O. Electrical Engineers' Journal.*

found, at any rate as far as the larger offices were concerned, that the practice led to mistakes and delay and the more general arrangement at the present time is for all telegrams to be passed through the appropriate circulation point. The Collectors place the telegrams for onward transmission at one point and those for delivery at another.

At certain offices, notably the Central Telegraph Office, London, and Manchester, auxiliary, circulation tables are necessary owing to structural difficulties; telegrams are exchanged between these points and the main circulation table by means of tubes and intercommunicating mechanical conveyors.

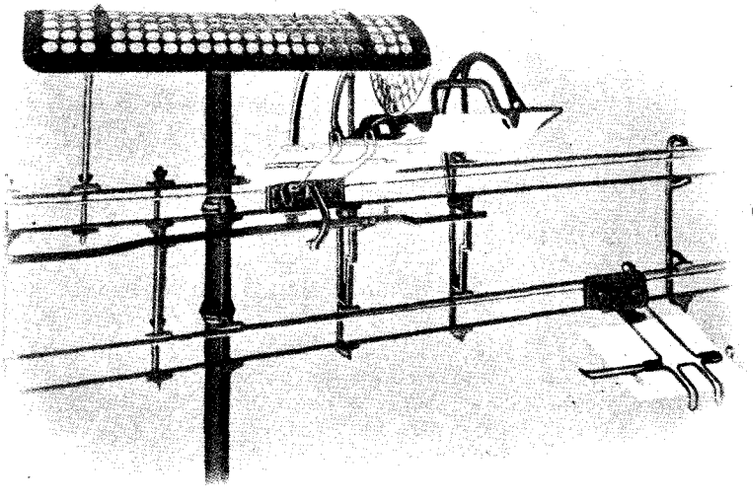

FIG. 2.—PICK-UP CARRIER. DETAILS OF HORIZONTAL RUN.

The conveyance of telegrams from point to point by hand is perhaps the weakest link in the telegraph chain. The work is of so simple a character that it must of necessity be allocated to lower paid members of the staff, but, human nature being what it is, very great difficulty is experienced in maintaining an even flow of traffic to and from the circuits and other points such as the addressing table. Satisfactory results are impossible unless supervising officers are ever on the alert. At offices where the work is performed wholly by one class the supervising officers think better results would be obtained with another class, and at offices where either two or all three classes share the work the supervising officers are unable to decide which they prefer. All agree, however, that some efficient form of mechanical collection and distribution would be an improvement.

What are the conditions which the perfect mechanical conveyor must fulfil? In other words, what is the ideal mechanical conveyor for use in telegraph instrument rooms?

I cannot do better than quote from an article by Mr. H. C. Gunton, M.I.E.E., which appeared in the Post Office Engineers' Journal in January 1914. According to Mr. Gunton:—

(1) The system of mechanical appliances should, as far as possible, be uniform throughout the instrument room, and the control should preferably be concentrated at a central point.

(2) The apparatus must be automatically selective as regards distribution to the operators, i.e. it must be possible to despatch a telegram form to any desired point on any table. The forms must also be conveyed from any point on any table to the circulation table.

(3) The despatch of telegram forms by the various operators should not involve any further break in the continuity of their work than is at present involved by the placing of the forms on the message baskets provided, and from which the boy messengers collect.

(4) The apparatus must be silent in operation, and moving parts must be arranged so as to obtrude to the smallest possible extent on the vision of the operators.

(5) The gangways and the lighting of the instrument room should be interfered with to the smallest possible extent.

To which may be added the following very important considerations:—

(*a*) The apparatus should not obstruct the view of supervising officers.

(*b*) It should not be dangerous to life, limb, or clothing.

(*c*) It should not prevent access to the telegraph apparatus.

(*d*) It should not mutilate telegrams; and

(*e*) It should practically be fool proof.

Much thought has been given to this question, many inventions have been examined and several have been tried, but the ideal system has not yet been evolved. Pneumatic tubes are useful in certain circumstances, i.e. between the instrument room and counter, delivery and phonogram room, etc., but they are not suitable as connecting links between circuits and the circulation table, or indeed between sections and the circulation table.

Cord conveyors are in use in a few cases, usually between the main circulation table and auxiliary circulation points and concentrator switches. These are not entirely satisfactory; the thin cords break frequently, and vibration of the supporting standards, which are fixed to the instrument tables, is a source of annoyance to the operating staff.

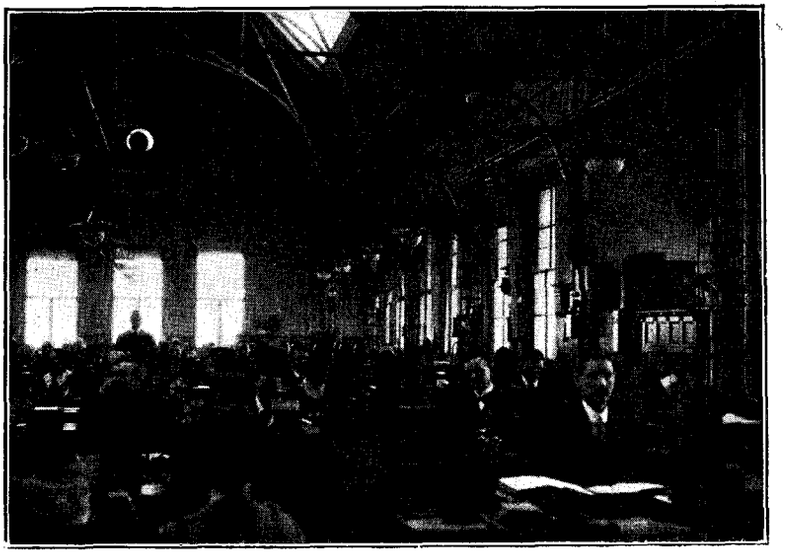

FIG. 3.—BIRMINGHAM INSTRUMENT GALLERY. TAKEN FROM FRONT OF ADDRESSING TABLE AND LOOKING TOWARDS CIRCULATION.

The most ambitious experiment of its kind ever conducted by the British Post Office was the installation of the Lamson Pick-Up Carrier equipment at Birmingham in March 1913. Under this system selective carriers borne on an endless cord running between each instrument table and the circulation position carry the messages to and from the circuits. The jaws of the selective carriers are so arranged that, by means of ramps, they open and close and so deposit and pick up telegrams only at their proper stations, one carrier being provided for each circuit. Fig. 1 shows the carrier equipment placed on the instrument table immediately in front of the operator. Incoming traffic is deposited on an endless band which carries the telegrams to the circulation table.

At first the system promised fairly well although it did not quite come up to the ideal standard required. It succeeded in

maintaining an even distribution of traffic, and it reduced the difficulty of supervising the juvenile element in the instrument room. But the system had many disadvantages from a Post Office point of view. It was unsightly (Figure 2 shows a portion of the instrument room with full Lamson equipment); it was too noisy; it obstructed supervision; it mutilated telegrams which had not been folded properly or had been carelessly placed in the pick up tablets. The distraction caused by the continuous procession of carriers along the horizontal routes acted as an irritant upon many operators. The Germans realising the pyschological effect on the staff of this disturbing feature have, in a new installation of this kind, arranged for the circulation table to be located above the instrument room, the carriers taking an acute diagonal course to the loading and unloading point. The carriers are, therefore, removed as far as possible from the normal line of vision.

As the carrier equipment was fixed behind the telegraph instruments it was almost impossible without risk of personal injury or damage to clothing, to make adjustments at the back of the telegraph apparatus. With the development of multiplex machine telegraphy this disadvantage became serious: it was

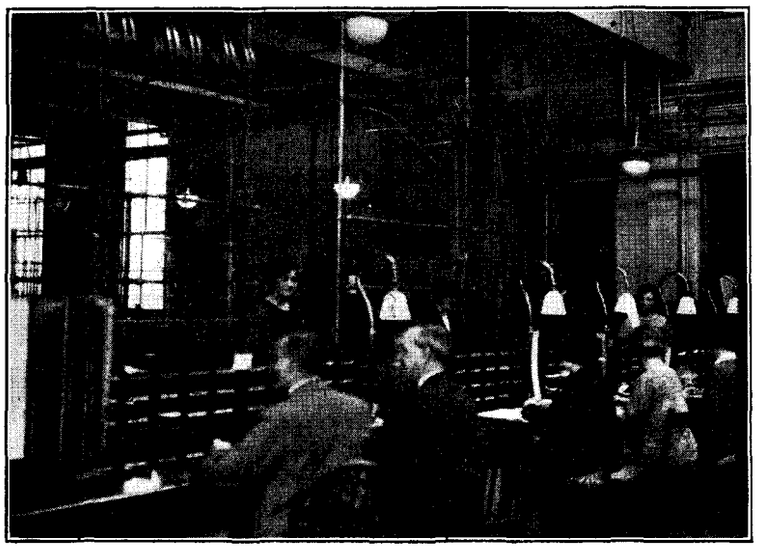

FIG. 4.—BIRMINGHAM INSTRUMENT GALLERY. CIRCULATION SECTION TAKEN FROM SIDE OF "FINISHED CHECK" TABLE, LOOKING TOWARDS CENTRAL ENTRANCE DOORS.

not possible to use the carrier on such circuits, and after an extended trial punctuated by staff complaints of noise, damage to clothing and personal injury, the complete installation was dismantled in June, 1922, in favour of a partial installation which was decided upon only after many experiments and much careful thought and study.

The modified installation provides one loading and unloading point between each section comprising three tables and the circulation table. A collector, attached to each section, is responsible for collecting the telegrams from the message baskets and placing them in the carrier tablet for transfer to the circulation point. Feeders are provided at the latter point whose duty it is to place the sorted telegrams into the tablets for transfer to the sections. Telegrams arriving at the circulation point drop on to an endless band from which they are collected, placed in order and passed to the circulation clerks.

This semi-mechanical arrangement, whilst not entirely satisfactory from every point of view, is probably the most efficient devised for Post Office use. Noise has been reduced to a minimum; the apparatus is not unsightly, it does not obstruct supervision (figure 3 shows the room as at present equipped), telegrams are seldom mutilated or lost since none of the working parts are covered. Collectors and distributors are confined to the sectional areas to which they are allocated, and the average internal transmission time has been reduced from over seven minutes as it was with the full Lamson installation to six and a half minutes. Figure 4 shows the circulation table as at present arranged. There can be little doubt that the Birmingham arrangement will be the standard arrangement, and that similar equipments will be installed in due course at some of the larger telegraph offices in the country.

It seems quite certain that the British standard layout will preclude the adoption of mechanical conveyors of the endless band type which would have the effect of blocking one end of the gangway between each two tables. Such an equipment has been fitted at the new telegraph office of the Western Union Telegraph Company in Chicago. Plans of this scheme were obtained by Mr. R. A. Dalzell, during his visit to America in 1919, but the consensus of opinion amongst telegraph officials in this country was opposed to its adoption. Nor does there seem much hope for the earlier German belt system which runs along the tables and passes from one table to another under the floor. The telegrams are, therefore, frequently out of sight during their journey to and from the circulation point and, since we in this country do not like to lose sight of our telegrams once they reach the instrument room, the system does not possess any attractive features from a British point of view. Another objection to this system is that wider tables would be required to provide proper accommodation for it.

Another feature in connexion with internal circulation is the the use of pneumatic and other tubes between the instrument room and the counter, delivery room, branch offices and railway stations. Tubes serving points within the building are known as low vacuum or "house" tubes, the others are known as high high pressure or "street" tubes. The latter serve important branch offices and railway stations, and are used for the mechanical transmission of telegrams between those points and the Head Telegraph Office. The laying of "street" tubes is usually an expensive item, the cost varying according to the underground conditions in the streets through which the tubes are to be led. In every case, however, the deciding factor, other things being equal, is the balance of cost between telegraphic and mechanical transmission. The elimination of a telegraphic transmission reduces the risk of error during transit, but this is not perhaps a material point as, normally, the telegrams would be dealt with at the branch offices by established and experienced telegraphists and by expert operators at the stations. Considerable use is made of street tubes in London, Glasgow, Manchester, Liverpool and Birmingham. These tubes vary considerably in length; the longest are in London—between West End offices and the Central Telegraph Office. Probably the longest tube in the provinces is that between the Bute Docks Branch Office and the Cardiff Head Office.

There are 52 "street" tubes between the Central Telegraph Office, London, and telegraph offices in the City and West End, the House of Commons, Cable Companies' offices, the Press Association, etc. Two tubes are required at some of the more important branch offices, one for forwarding telegrams to the Central Telegraph Office, the other for receiving telegrams from it. Except for the very rare occasions when there is loss or mutilation of telegrams owing to accidents the tubes work most efficiently. At the Central Telegraph Office, London, street tubes are staffed by an adult class known as tube attendants, at all other offices; they are staffed by junior telegraphists, girl probationers, and boy messengers.

House tubes are used in London and in the provinces. The London house tubes are used for the circulation of telegrams from point to point in the various galleries on the four floors of the office and aggregate about five miles in length. In the provinces this type of tube is used as a connecting link between the instrument room, the counter, the delivery room and the test section.

Though it is not safe to prophesy, it seems doubtful whether the ideal mechanical conveyor will ever be invented, but further consideration of the problem is worth while. It has to be borne in mind, however, that a no-delay system is not required. There is

nothing to be gained by expediting the internal circulation of traffic unless that traffic can be disposed of immediately on arrival at the point of treatment. This is an economic impossibility, and for the benefit of those of an inventive turn of mind it may be said that a conveyor which will reduce office drag at the larger provincial offices to five minutes or slightly under is all that is required.

It remains to be said that telegrams are signalled in the order at which they reach the circuits. Supervising officers are expected to examine at frequent intervals the telegrams awaiting despatch, and to expedite the treatment of any message which seems to have been unduly delayed at an early stage of its transmission.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

THE Western Union Cable Company, in an excellent pamphlet of "General Information" regarding Cable manufacture, laying, operating, and history in general, and the Company's new New York—Azores high-speed cable in particular, published by their Publicity Office, gives some especially interesting facts regarding "the engineering application of a well-known electrical principle, which gives the new cable a speed so far in excess of anything that has heretofore been achieved in cable operation, and is a method developed by engineers of the Western Electric Company of *loading* or increasing the electrical inductance of the copper conductor, by wrapping the central wire throughout its length with a thin narrow tape of a new metallic compound called *permalloy*. The immediate effect of this *loading* is to multiply by more than five the number of decipherable signals which can be sent through the conductor in a given time. . . . Under deep-sea tests, more severe than anything likely to be encountered in actual service, the new type of cable has maintained a continuous speed of more than 1,900 letters per minute."

Readers of these columns will recall that it was an Englishman, Oliver Heaviside, who first proved the effect of inductance to offset the electrostatic capacity of long cable conductors by *sharpening up* the signals.

The pamphlet goes on to relate how, thanks to the electrical research laboratories of the Western Electric Company and the American Telephone & Telegraph Company, New York, the Western Electric engineers accomplished the desirable results.

They discovered that "an alloy of iron and nickel, under certain conditions, had a magnetic permeability many times that of any other known substances; in some of its states as high as thirty times the permeability of the best soft iron. These untiring engineering pioneers worked with various percentages of nickel and iron, under different conditions of temperature and strain, and found that the proportion of approximately 80% nickel and 20% iron, annealed and heat-treated in a particular way, was commercially producible for any purpose for which a highly magnetic material might be required, at a cost which did not prohibit its use for such purposes."

This was just before the war, but, the war over, the Western Union Telegraph Company were eager to improve the output of their cables. All that could be done in the direction of improving both reception and transmitting devices appeared to have been done, when the Bell system executives suggested to their colleagues of the Western Union that possibly in the *loading* of a cable with *permalloy* (the adopted name for this new combination of metals) lay the key to improvement. The laboratories of the Western Electric Company were thereupon called upon to assist, and pursued experiments in connexion with the new alloy for three years.

A large part of the basement of the West Street building was given over to experiments with *permalloy*. What the new metal would do at ordinary temperatures in the open air was no criterion of what it would do at the bottom of the sea, with the weight of a mile or two of water upon it. It was soon found that temperature and pressure made an immense difference. Literally hundreds of experiments were made. Nickel and iron were mixed in varying proportions and the resultants heated to different temperatures, and cooled at different rates. Special machinery was devised for drawing *permalloy* into wires and strips and sheets; hundreds of short sections of cable were made with the new alloy applied in all imaginable ways, while cooling tanks were constructed in which these experimental pieces of cable could be tested between 30° and 40° Fahrenheit. Hydraulic pressure tests were of course also made, pressures up to about 10,000 lb. to the sq. in. being applied.

Mixtures of nickel and iron, both obtained from varying and all possible sources, were melted together in the Northup high-frequency induction electric furnace, a device which prevents contamination with any material outside the crucible, as the heat is transmitted by radio waves, the crucibles themselves being constructed of pure quartz or silica. So well-nigh absolute is this new alloy that it is stated that a typical billet of permalloy contains 78% nickel and 21% iron, while it is left to the remaining 1% to account for all the cobalt, manganese, copper, sulphur, carbon and silica that may be found!

After submitting a length of 300 ft. of experimental cable, its conductor wound round with a ribbon of permalloy one-eighth of an inch wide and three five-hundredths of an inch thick, to the severest possible laboratory tests, the Telegraph Construction & Maintenance Company, Greenwich, was instructed to build 120 miles of cable to the strict specification of the tested length. This length was taken out to Devonshire Bay, Bermuda, by the Western Union's cable steamer, the "Lord Kelvin," and sunk in a loop to the depth of 2,500 fathoms, where for four months the Western Electric Co., tested it out with superlative thoroughness.

The *permalloy* tape, which is wound round the copper conductor of the Western Union's 2,400 nautical miles cable is a continuous strip 10,000 miles long!

Thanks are due to the Western Union Company for their highly instructive pamphlet, which in addition to the special item above contains muchinteresting matters on their own and submarine cables, and cable ships in general.

The Stock and Share Market Report, writing on this subject under the heading of "Modern Cable Construction" says: Although the present old type cables will remain in use, it is expected that the new type of cable will eventually be adopted by the other cable companies, although the Post Office, which at present operates the two Imperial cables to Halifax unremuneratively, does not propose to join in the competition for trans-atlantic supremacy, *notwithstanding that the present Government cables will be practically put out of business by this new high-speed communication.*

The writer may be told that such criticisms should not be re-published in these columns, but it is surely interesting, at times educative and at others amusing, to see ourselves as others see us. In fact, and when, for example, as in a recent highly respectable journal an irate correspondent and critic of the Government telegraphs writes with an evident lack of knowledge of Post Office activities and signs himself "DAMSELL."

May be I am sinning again, but really one must not deprive our readers at home and abroad of interesting matter such as the following excerpts from the Eastern Telegraph Company's Annual Meeting Speech by the Chairman of that respected and enterprising corporation: "Until the past few years, there had been practically no very material alteration in the construction of cables from their early days, and such developments as have taken place in the past have been devoted mainly to improving methods of working, by the invention and introduction of apparatus with the object of increasing speed and reducing error. Now, by the development of the 'loaded' type of cable, which, in simple language, consists of a special wire wound round a copper conductor, the carrying capacity and speed of cables have been greatly increased, so that it has again become necessary to start on a fresh race between the speed of instruments and the capacity of cables. So vast are the possibilities which may accrue through this new form of 'loaded' cable that one hesitates to prophesy as to the transmitting capacity that may be arrived at in the future.

"Of course, at the present time there are certain problems connected therewith which still have to be solved, but you may rely upon it that these companies are fully alive to the situation. At the moment we have under consideration the question of duplicating certain cables, and this will be carried out with the new form of cable construction.

"I have nothing to add or any reason to modify what has been said at these meetings in the past regarding wireless, except to state that since our last meeting no less than 26,000 miles of cable have been contracted for, more than half this mileage within the last two months. This includes the Government Pacific cable, Canada to Australia; the Italian Cable Company's cable, Italy to Azores and South America; and the Western Union Company's cable, United States to Great Britain. The fact that such cable extensions have been decided upon after due consideration not by one body or one Government, but by America, Germany, Italy, England, and the Colonies, demonstrates that submarine cables are not only holding their own, but are steadily increasing in all directions, continuing their pre-eminence in ocean electrical communication.

"An agreement has recently been arrived at with the Commercial & Western Union Telegraph Companies which has enabled us again to carry traffic between Australia, New Zealand, and the United States of America via Europe. Since the laying of the Government-owned Pacific cable in 1902, the whole of this traffic had passed by the Government Pacific route.

"Since our last general meeting the number of daily letter telegrams at quarter rates has increased, and so far without material detriment to the other classes of traffic. The number of words in such telegrams exchanged between this country and other parts of the world for the year 1924 amounted to over 7,000,000, but this affords a means of communication where great speed is not a necessity. These facilities for cheap traffic, however, militate against our reaping the advantages of increased traffic hitherto accruing upon any reduction in full rates. It is not anticipated, therefore, that any substantial increase in traffic will take place as a result of the reduction in the rate between this country and Australia and New Zealand from 3*s.* to 2*s.* 6*d.* per word, which took place on December 1 last."

In the above at least the thoughtful administrator will find food for reflection, but none for despair, as regards cables and interesting traffic problems which experience will undoubtedly solve; furthermore, there is herein to be found no mean tribute to Government enterprise and business capacity. Hereunder again will be discovered a few comments on the

"Beam" system by a correspondent of the London *Times* of June 5, which show that the last word has not yet been written on that particular development of wireless transmission, although one knows well that traffic is actually being carried over long distances by this means.

"It is necessary to distinguish between short-wave working in general and reflector systems. A certain amount of confusion on this point has arisen in the mind of the public. Although the erection of an efficient reflector is only possible with short waves, and therefore the experiments with reflectors have only been made with short waves, the striking results recently obtained by amateurs were obtained without any reflectors.

"Some of the wrong impressions which are current are probably due to the fact that in a paper entitled "Results obtained . . . by the Beam System," read before the Royal Society of Arts, Senator Marconi described experiments between Poldhu and Australia and between Poldhu and Canada. Although he clearly stated that no reflector was employed in these tests, this point was commonly overlooked, and the results put down to the credit of the beam system. So far as the writer knows, no experiments with any "beam" system have ever been made over such long ranges. It is not at all certain that any improvement could be obtained with a reflector when transmitting to the Antipodes, but it would be an interesting experiment.

"The subject of short-wave working with or without reflectors is certainly a very attractive one, but there is far too little data at present to justify one in assuming that it will replace long-wave stations for long distance communication, except in the handling during a limited night period of telegrams which can be thus deferred. It does not bring us a step nearer to the ideal of a guaranteed 24-hour service every day of the year; for this we must still look to the steady improvement of the high-powered long-wave station."

Heard in the Lift.—The writer is not exactly an eavesdropper, but is one who takes a lively interest in all that is said and written about the telegraph service, and particularly items relating to the Central Telegraph Office. In any case there is not much else that one can do when in a crowded underground lift, except to listen to the murmur of conversation around one. Thus, when the familiar term of "G.P." was mentioned ears were pricked up while a sonorous male voice said: "Well, the American G.P.'s are not usually as efficient as those in this country." Ears were strained still more, but the conversation by that time had taken a more scientific and technical turn, and as we reached the top and emerged into the street the same voice continued: "No, that was a case of osseous tissue in the neighbourhood of the femur." The speaker was a medico and the reference in this case had therefore been to a sterner type of occupation than that followed by the young ladies who throng the corridors of the buildings of St. Martin's le Grand! G.P., I had forgotten, also stands for General Practitioner!

The name of Geneva brings many recollections of International service rendered to Mankind, and it must surely be with glowing pride that the Swiss remind themselves of the noble uses to which their neutral position is placed. Many have been the conventions, and leagues, and gatherings, all of which have had for their aim the codification and regulation of international laws and the settlement of disputes. To these must now be added a clearing-house for wireless broadcasting difficulties, one of which difficulties was recently settled speedily, courteously and amicably in favour of the millions of listeners-in in our own land as well as abroad.

Professor McLennan, says the *Westminster Gazette*, has been able to reproduce the spectrum of the Aurora-Borealis which gives weight to his opinion that his discovery will be able to "throw a light on the constitution of the upper atmosphere and also on the mystery of wireless."

The Heaviside layer, which is believed to direct wireless messages round the world, and the Northern Lights are both related to ionised air in the upper atmosphere, so that in investigating the Aurora the Professor may well have found some essential connexion between them.

On the 8th inst. the well-known personality of Mr. E. Bradley, upon reaching the age-limit, retired from the Service after 45 years in the Telegraphs, Inland and Foreign combined. His early training was naturally in the former, but his love for travelling and the fascination which foreign lands held for our colleague, no doubt had not a little to do with his translation to the cable room. In that department, through all the years he spent amongst us, the wizardry of long-distance telegraphing never ceased to charm and interest him, and the fact that in a walk through the galleries and within a few feet one could communicate with Rome and Amsterdam, Berlin and Prague, Geneva and Bordeaux &c., never lost its mysterious lure. Those who were the most intimate with him appreciated his interest and love for art, for architecture, and for Nature in all her moods and phases. Our kindest thoughts follow our friend into his retirement where, well within the circle of the metropolis, he is nevertheless within easy sight and sound of trees and woodland and all the happy life of their feathered inhabitants.

Here may he live to see the end of many, many perfect days!

It is not known for how long the following experiments will be continued, but the item which follows is published from the *Electrical Review* as a matter of world-wide interest.

The Metropolitan-Vickers Electrical Co., Ltd., recently succeeded in spanning the globe with radio transmission at 21 metres. The transmissions were made from the experimental station (G2AC) at the Company's Research Department, Trafford Park, and the signals were picked up by Mr. Ralph Slade (Z4AG) of Dunedin, New Zealand. An interesting point is that the signals were received at noon, New Zealand time, so that by whatever route they travelled they must have covered half the distance in daylight. It is believed that this constitutes a record in that reception was carried out at the greatest number of wave-lengths distance from the transmitter yet achieved. The power input was 1.25 kw., and no reflector was employed during the test. It is proposed to continue the experiments with increased power and reflector aerials. The co-operation of amateurs and others who receive the signals would be welcomed; reports on reception should be addressed to Mr. A. P. M. Fleming, Research Department, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, England.

St. Erkenwald's Chronicle reminds us that in these pleasant Summer days, when detained in London City with half an hour on our hands, one might do worse than visit some of the interesting monuments which are scattered about within a few minutes of the C.T.O. Thus, in the pleasant churchyard of St. Mary Aldermanbury, stands a memorial of deep interest to literary lovers, and students of Shakespeare.

It was erected to two parishioners, John Heminge and Henry Condell, who in 1623 published the celebrated "first folio" edition of Shakespeare's plays.

The striking granite monument is surmounted by a fine bust of Shakespeare, below which is represented a copy of the first folio opened at the title page, showing the publishers' preface which reads:—

"We have but collected them and done an office to the dead, without ambition either of self-profit or fame only to keepe the memory of so worthy a Friend and Fellow alive as was our Shakespeare."

The inscription is as follows:

To the Memory of
JOHN HEMINGE
and
HENRY CONDELL

Fellow Actors and Personal Friends of Shakespeare
They lived many years in this parish and are buried here
To their disinterested affection the world over all that it calls Shakespeare
They alone
collected his Dramatic Writings
regardless of pecuniary loss and without the hope of any profit gave them to the world
They thus merited the
Gratitude of Mankind."

This monument was given to the nation by Charles Clement Walker, of Lilleshall Old Hall, Shropshire, in 1896.

AUSTRALIA.—The Postmaster-General, Mr. W. G. Gibson, recently announced that the broadcasting of Australian news from the Government stations at Sydney, Perth, and Darwin to ships at sea was to begin on June 5th.

CANADA.—The Ottawa correspondent of Reuter's agency, records that there are over 100,000 amateur radio sets in use in Canada to-day, on each of which an annual tax of one dollar is levied, *though not always paid*, irrespective of the value of the set. The suggestion has been made in the House of Commons that there should be a graduated tax, proportionate to the value of the sets, which range in price from 1.50 dollars to 1,000 dollars, or even more. [The italics were not in the original note sent to this journal.]

FRANCE.—According to *Science*, the Parisian radio enthusiasts are hopeful that a new substance to replace the galena crystal will prove to be something more than just another substitute. The substance was discovered by chance by Mr. Felix Thuaud, a prominent French steel manufacturer. While studying the by-products of steel, Mr. Thuaud noticed a material that was something like the crystal used in radio sets. He tried a few pieces and heard over longer distances and with greater clearness than with galena points; also it was not necessary to hunt for special points of contact, as the new material was adequately sensitive at any point. The basis of the material is a combination of silicon and iron, with the former dominant. The product can be made in an electric furnace or in an ordinary crucible. It can be sold at about one fourth the price of substances now used.

GREAT BRITAIN.—In view of the increasing importance of directional radio telegraphy for the safer navigation of ships, the Board of Trade is setting up a Committee to inquire into the subject for its own information and that of Trinity House. The terms of reference are, says *The Times*, as follows: "To be a Committee to advise the Board of Trade regarding development in the United Kingdom of the service of wireless direction finding stations, wireless beacons or similar aids to navigation, and the location and types of such stations to be maintained." The Admiralty, Air Ministry, General Post Office, and Trinity House have been asked to nominate representatives, and Sir R. Burton Chadwick, M.P., Parliamentary Secretary to the Board of Trade, will be the Chairman.

Oscillation and how to prevent it was discussed at a recent meeting of the executive of the Radio Association, held in the House of Commons. It was pointed out that the executive had received information to the effect that, owing to the increase of oscillation, the Post Office had in view drastic steps with regard to the use of reaction in radio receiving sets, and it was decided that a campaign against the nuisance should be instituted without delay. With the assistance of improved direction-finding apparatus definite information of persistent offenders could be obtained, and it was proposed to institute a test case against one or more offenders. The executive also decided that a deputation should be appointed to wait on the Postmaster-General and discuss the whole question of interference.

IRISH FREE STATE.—The Free State Government's radio broadcasting policy was outlined in the Dail on May 27 by Mr. J. J. Walsh, Postmaster-General, who stated that the Minister of Finance had agreed that the service should be conducted by the State. It was intended to establish the main station in Dublin and a subsidiary one in Cork; the installation cost was estimated at £9,000, and the "mechanical" upkeep and cost of the programme at £20,000 per year. It was hoped that in the third year the station would be able to pay its way. There were 20,000 subscribers in Northern Ireland.

ITALY.—Loud speakers were used for the first time in St. Peter's Cathedral in Rome during the service held there by the Pope on the occasion of the canonisation of Sister Teresa. Prayers, speech, and music were amplified from within the precincts of the Vatican for the benefit of people outside by means of Graham "public speech" equipment and "Amplion" loud speakers. The chief engineer of the Vatican has intimated that the Pope will be pleased if Messrs. Graham can arrange to repeat the amplification for the coming ceremonies.

PERSIA.—Reuter's agent in Moscow says, that according to the *Commercial and Industrial Gazette*, at the end of May the Weak Current Trust (Russia) sent engineers and workmen to set up a powerful radio station at Teheran (Persia). The material for six radio stations in other districts is already completed, and tests are to be made at once.

SOUTH AFRICA.—A fine exploit was carried out in the Union of South Africa when the Prince of Wales arrived at Cape Town on April 30. The cheering, music, and speeches which marked the Prince's arrival were carried by land line from Cape Town to Johannesburg with the aid of five repeaters. At Johannesburg—the station call is JB—the audible elements of the welcome were amplified and broadcast. Durban picked up the sounds with the aid of a land line from Johannesburg, and so the broadcasting of an event 1,500 miles from the scene where it took place was accomplished. Speech, it is reported by *The Times*, was generally well heard, though now and again it faded into the intermittent cheering and shouting.

An interesting, if rather elaborate, system by which listeners' fees are paid by instalments has been introduced in the Union. By an arrangement between the postal and the broadcasting authorities, listeners may pay a first instalment of 15*s*. and the remainder in three monthly instalments of 10*s*. each. Of the whole sum, 5*s*. goes to the Government and £2 to the Cape Peninsula Broadcasting Association. Grumblers in this country should note this fee!

SPAIN.—Wireless enthusiasm has taken a firm grip and a brisk business is being done in sets and spare parts, chiefly of French or German manufacture. Serviceable sets of Spanish manufacture are able to compete with foreign articles, owing to the protective Customs tariff, and their manufacture is a prosperous nascent industry, says *The Times*. Broadcasting, however, is still in an initial stage. The Spanish Telegraph Department, which grants the concessions for broadcasting, has chosen for the general characteristic of Spanish stations the letters EAJ, and up to last April 25 stations, numbered from EAJ1 to EAJ25, had been sanctioned or were in course of approval. The Spanish Compañia Nacional de Telegrafia Sin Hilos, holding the Marconi patents, is erecting on the roof of a large general stores in Madrid a 6-kw. station, E.A.J.20, and hopes to begin broadcasting on a wave-length of 370 metres.

SWITZERLAND.—Telegraph traffic is giving way before the rapid growth of telephony; during 1924 several telegraph lines were converted into long-distance telephone circuits, and numerous telephone trunk lines were put into service. The international telephone service was improved by the opening up of new connexions between Switzerland and neighbouring countries; it will be further extended during 1925. The establishment of direct telephone communication between Switzerland and London is under consideration. At the end of 1924 three automatic exchanges were in operation and three others are being opened in a few months.

There are five broadcasting stations, the last, the Zürich-Hoengg station, having been opened in August last. The erection of a radio station at Basle for broadcasting and civil aviation is under consideration, and a Federal subsidy is contemplated for the purpose. The number of licensed receiving sets increased from 1,100 in 1923 to about 17,000 in December 1924; this increase was partly due to the opening of the Zürich-Hoengg station. An international radio exhibition is to be held in September next. The Marconi station at Münchenbuchsee has been equipped with a 15-kw. transmitter which uses the same aerial as the 25-kw. plant, which has also been improved. The Confederation has acquired a controlling interest in the Swiss Marconi Radio Company.

UNITED STATES.—SUBTERRANEAN BROADCASTING.—It is reported that Dr. James Rogers, of Hyattsville, Maryland, recently conducted experiments with broadcasting on a low wave-length through the earth. An interesting point was the almost complete absence of static interference. The transmitting antenna system consisted of four cables, each 50 ft. long, buried 3 ft. under the ground so that they radiated from a central point along the four points of the compass. The cables were constructed of terra-cotta piping, 18 in. in diameter, within which was laid copper tubing ¾ in. thick, and packed in insulating glass, the direction being determined by which of the four legs was employed. Reception was by means of the usual type of ground aerial.

Custom.—To follow precedents, and wink
With both our eyes, is easier than to think.
—*Cowper.*

J. J. T.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

DURING the month of April 18,479 new telephones were added to the system, counterbalanced by 10,491 cessations, the total number of stations working at the end of April being 1,281,788.

The growth for the month of April is summarised as follows :—

Telephone Stations—	London.	Provinces.
Total at April 30...	452,335	829,453
Net increase for month	2,947	5,041
Residence Rate Installations—		
Total	83,336	141,200
Net increase	1,032	1,552
Exchanges—		
Total	105	3,711
Net increase	1	15
Call Office Stations—		
Total	4,206	14,720
Net increase	24	72
Kiosks—		
Total	117	1,012
Net increase	20	33
New exchanges opened under Rural Development Scheme—		
Total	—	689
Net increase	—	17
Rural Party lines—		
Total	—	9,420
Net increase	—	46

The number of inland trunk calls dealt with during the month of February—the latest statistics available—was 5,886,109. On an average rather more than 250,000 trunk calls are dealt with per "working day."

Calls to the continent numbered 17,009 during February, the French calls, which represent more than half the total international traffic, being especially heavy. The traffic from the continent to this country amounted to 19,995 calls, the outgoing calls representing 46% of the total bothway traffic.

Further progress was made during the month of May, with the development of the local exchange system. New exchanges opened included the following :—

LONDON—Tilbury.

And among the more important exchanges extended were :—

LONDON—Harrow, Mountview, Richmond (Surrey), Wembley.

PROVINCES—Attercliffe, Belfast, Chichester, Cradley Heath, Dorking, Fort William (Belfast), Gillingham (Kent), Harrogate, High Wycombe, Ibrox (Glasgow), Nottingham (Trunk), Preston (Lancs), Reading, Walton-on-Thames.

During the month the following additions to the main underground system was completed and brought into use :—

Paisley—Beith—Dalry cable,

while 64 new overhead trunk circuits were completed, and 63 additional circuits were provided by means of spare wires in underground cables.

The
Telegraph and Telephone Journal.

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Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

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EAST AND WEST.

ABOUT a year ago we drew attention to the fact that the number of telephones in the United States was approximately equal to the number of motor vehicles, viz., fourteen and half millions, whilst in this country about a million of each of these modern conveniences had to suffice for the needs of its inhabitants. We observed that diversity of ideals and requirements in two different countries did much to account for a striking dissimilarity of development.

A recent newspaper report suggests that the automobile habit is growing even faster than the telephone habit in America, rapid though the development of the latter may be, and that the number of motors now greatly exceeds the number of telephones judging by the vast numbers of new cars and combinations which are put on the road every week. We imagine that in this country the motor car is outstripping its rival; but the ratio of both telephones and cars to population in Great Britain is still somewhere about one to 35, whilst in the United States it is 1 to 7. No very useful deduction can be drawn from these figures save that there is huge field here for development of the sale or hire of both commodities. They also demonstrate the vanity of attempting to attribute to Governmental control, high rates or quality of service, the alleged backwardness of British telephone development. It is stated that practically every farm in America has its telephone, whilst telephones in English farms are rare—although the rural development of the telephone has latterly been proceeding apace. It is not stated that every American farm has not a postal delivery, and that few rural districts have any telegraph service. It is not, in short, usually made clear when these comparisons are drawn how different are the conditions of life in the West from those in the countryside of an older civilisation. As widely different are the respective farm folk themselves in their habits and outlook on life. The same newspaper contained the result of a sort of census of the modern conveniences to be found on American farms, and gave the proportion of farmers possessing not only telephones and cars but washing machines, vacuum cleaners, wireless outfits, victrolas (American for gramophones), patent sinks with running water, and so forth. We imagine that the households of most English farms pursue their domestic rounds without these exciting aids.

Even those who clamour for the attainment of an American standard of telephone development in this country do not always look kindly on American ways. The Secretary of the Telephone Development Association, in a recent address suggested that the English housewife did not make sufficient use of the facility of shopping by telephone, and observed that salesmen in American stores were wont to ring up subscribers and draw their attention to a new line of goods or to exceptional bargains. This statement caused a mild sensation in the provincial press, one journal seeing in it a "'PHONE TERROR THREAT". Tradesmen hastened to assure the reporter that never, never would such a course do; "the buying mentality of Englishwomen was different," and so on.

In telephony it would seem that the line between East and West is drawn not at Suez but by the Atlantic. Nevertheless, the telephone is steadily invading the farm in this country and is making rapid strides in the surburban private houses. The telephone habit is one which grows—slowly at first, but very fast when a certain stage of development is reached. This stage draws nearer with every hundred thousand telephones added to the system, and the problem of making up our leeway is, we believe, on its way to being settled on lines which are in consonance with native manners and customs.

HIC ET UBIQUE.

From the *Geschäftsbericht* of the Austrian Ministry of Trade for 1924 it appears that the Austrian telephone system has made considerable progress during the year. The total number of telephones is now 145,511, distributed thus:—

Individual lines—	
Automatic	3,465
Semi-automatic	69,715
Manual	41,056
Party lines—	
Semi-automatic	20,594
Manual	10,681
Total	145,511

Vienna has 94,318 stations, Graz 6,159, Linz 4,334, Innsbruck 2,958, and Salzburg 2,568. The Vienna exchanges are worked on the semi-automatic system, and Graz on the full automatic. Linz was also expected to be working on full automatic lines in the first half of this year. The length of telephone lines is 24,939 km., and of telephone wire 601,884. Telegraph lines have a development of 11,239 km., and telegraph wires of 76,455 km.

A new subscriber in the west of London, volunteers the following :—

In reply to your application, I have pleasure in enclosing cheque in payment for installation of telephone.

I must thank you for your quickness in getting me fixed up. The instrument is giving every satisfaction, and has already paid for itself five times over.

The *Financial Times*, referring to the New York Telephone Co.'s report, says :—

It is interesting to learn that in proportion to the millions of connexions established on the New York Company's system, operating errors and irregularities have been comparatively infrequent. At the same time, we doubt whether the London operators are anything behind their American contemporaries in speed, accuracy, and courtesy.

According to the *Telegraph and Telephone Age* the first man in the world to pay for a telephone was James Emery, Jr., a wholesale fish dealer, who lived in Charlestown, Mass. About May 15, 1877, he had a telephone put at each end of a line connecting his house with his brother's home across the street, and on May 30 of the same year paid the sum of $20, which was the first money ever paid for a telephone. On June 8 he returned and paid $10 additional and took away three more telephones, which he placed in near-by houses, connecting all five on an extension of the original private line. At that time he signed the first telephone lease. Although James Emery, Jr., was beyond question, the first man who actually paid money for telephones, he was not the first to install and use telephones under an agreement to pay. This honour falls to Roswell C. Downer, a banker of Somerville, Mass., who, on May 1, 1877, established the first commercial telephone line between his home and the office of Stone & Downer, bankers in Boston, connecting them by an existing telegraph wire. The third commercial telephone user was James R. Osgood, a book publisher, who lived at 100 Mount Vernon Street, Boston. Late in May or early in June, 1877, he placed a telephone in his office and another in the printing plant of the University Press in Cambridge, these being connected by a telegraph wire.

According to the same journal, morality appears to be the main qualification for a receiving licence in Roumania. A bill, which has just been presented to Parliament at Bucharest states that all private persons desirous of possessing receiving licences must apply in person, bringing with them their baptismal certificate, a proof of their Roumanian citizenship, and a statement as to their high moral character from a priest or other responsible religious leader. Free licences, according to the bill, will be issued to schools, churches, municipal and national organisations, and to ships and aeroplanes.

From the *Fruit Garden of Learning for the Nourishment of the Discerning* :—

I have heard that the hakim, Abu Hassan, was once plunged in a sea of meditation and lost in an ocean of contemplation. And when he arose from his immersion, and his soul was returned from its sublime excursion, they asked him : "What refreshing fruits of knowledge has thou gained in thy trance, O hakim, and what pearls of wisdom canst thou strew before us ?"

And he said : "It came to me that men in these days trust over much in the adventitious aids of science, and pin their faith to many a nerve-wracking appliance. They live at the pace that killeth, and health is not in them. For science proceedeth too fast for Nature, for man is not so adaptable as he vaunteth, nor can he assimilate all he wanteth. And he rusheth to and fro in self-driven carriages and snorting trains, and is here to-day and there to-morrow, storing up future sorrow, and trieth to accomplish in a day what the wise in a week would essay."

But Merwan, the mocker, said : "I am younger than thou art, but meseems I have heard all this before. Divinely gifted was the poet who said :

'All that is old was in its season new,
What has been done had someone first to do.
And your successors in this changing scene
Shall deem familiar what was strange to you.

Times change, we with them. Do not cry : Alas !
For he who would from Al Medinah pass
To Mecca and disdained to take the Train
And chose the Ass, must be himself an Ass !'"

Abu Hassan said : "Truly, the train beareth pilgrims to the shrine, for which Allah may prolong its line. But as for the telephone and the car nothing can excuse them, and they are demented who use them. For the shrill bell of the former tyrannizeth over our leisure and interrupteth our pleasure, so that we are immersed in the toils of business beyond reason and measure. Verily, the muezzin calls to prayer, but this calls to cursing :—

When in the Market or the Street, with Friends and Neighbours
I would deal,
The Carpet of Security beneath my feet I firmly feel.
But whensoe'er a voice unknown, importunes me by telephone,
Perplexities like changing seas, beat thick upon my judgment's keel.
I know not if with unbeliever or with rogue my lot is thrown,
Yet, eye to eye, I could descry if he were worthy of my steel.

"As for the car, it is the work of Sheitan ! For it moveth us to fly hither and thither in undignified haste and on purposeless journeys. And together, these abominations wear out the senses and soul, and take of man's health heavy toll."

But a sojourner in those parts, Al Bostoni, said : "In my country they call a cheap car a flivver, and they reckon it a health giver, for it shaketh up the liver. And the telephone saveth man wearisome journeys and conduceth to the smoothness of social life and the avoidance of strife :—

"O hakim, much I marvel at thy tale—
To hakims ever new, to others stale—
For shouldst thou not with thy experience,
Use and Abuse distinguish without fail ?

To pioneers of progress own thy debt,
O boy, it's me for progress, you may bet,
The guy who 'knocks' thereat sure gets my goat
(Assuming that I have a goat to get).

Teach rather that the benefits we know,
Should make these mundane wheels more smoothly go,
Nor raise thy voice with each recurring year,
To seek in them a new-found source of woe."

W. H. G.

MR. J. L. PARRY.

PRESENTATION TO TELEPHONE TRAFFIC SUPERINTENDENT.

MR. J. L. PARRY, traffic Superintendent of the Leicester and Coventry Telephone Districts has been appointed to a similar post at Manchester. At a representative gathering of the district staffs, Mr. Parry was presented with a wireless set as a mark of esteem from his colleagues.

In asking Mr. Parry to accept the gift, Mr. A. C. Haley, district manager referred to the happy relationship which has existed between Mr. Parry and himself and the staff generally, and remarked that by Mr. Parry's promotion, he had lost not only a valued colleague, but a personal friend.

Mr. S. J. Ching, postmaster, referred to the cordial relations that had existed between Mr. Parry and the postmasters and their staffs, and associated himself with the good wishes that had been expressed.

Mr. F. Lucas, contract manager, and Mr. W. L. Eveleigh, assistant traffic superintendent, also spoke appreciatively of Mr. Parry, who in reply expressed very feelingly his regret at leaving Leicester, and his warm thanks for the cordial co-operation of his colleagues, and their good wishes for his future success.

THE POST OFFICE AND AUTOMATIC TELEPHONES.*

BY COLONEL T. F. PURVES, O.B.E., M.I.E.E.

(Continued from page 170.)

Each section is built up of flat punched strips of brass or other suitable metal about 42 in. long by 1 in. wide. There are three strips to each circuit, two of these corresponding to the line wires and one, used for local control purposes, corresponding to the sleeve connexion of manual exchange circuits. The 300 strips in a panel are securely bolted together and are insulated from each other and from the framework. The two long edges of a strip are each formed with 30 projections with which the selector brushes can make contact. Selectors to the number of 60, with their vertical rods and brushes, are associated with each 500-line panel, 30 of them being mounted on the front and 30 on the back of the panel. Each of the 500 sets of three metal strips, with their front and rear projections, thus represents, in itself, a multipled line with which any of the 60 selectors can connect the circuit of its brushes.

When a selector is searching it is trying to find either a particular circuit or a disengaged circuit in a particular group. That circuit or group of circuits will appear on only one of the five 100-line sections of the panel, and it is necessary that, of the five brushes on the selector which are all connected together in multiple, only the one opposite that particular section should be active. Each brush is therefore normally retained in an inactive position, and it is arranged that in the process of selection, before searching begins, the correct brush shall be thrown into the active position. This is effected by means of a rod carrying trip fingers, one of which unlatches the selected brush as soon as the brush rod begins to move upwards. The four brushes opposite the other sections of the panel remain inactive and pass over the projecting contacts on the line strips without touching them.

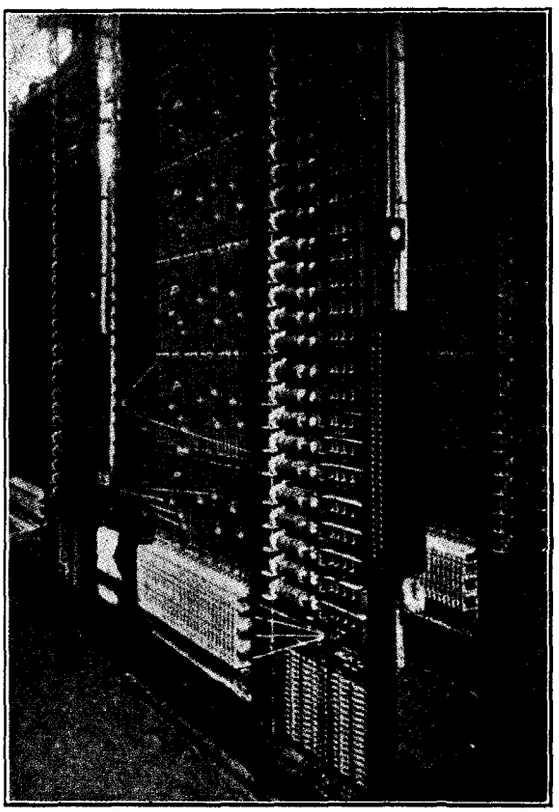


FIG. 14—Panel selector frame.

Associated with each selector is a "sequence switch," the function of which is to make and unmake in the proper order the various circuit combinations required as a connexion progresses through its various stages. This very important item consists of a central shaft fitted with a number of cams, or segmental contact rings, so cut that the various contact springs associated with them close and open circuits in a definite sequence and at definite points during the motion of the switch from position to position. The switch has 18 positions in any one of which it may be stopped as required. It is operated by means of an electromagnetic clutch from the motor that drives the selectors.

Fig. 14 is a general view of a selector frame. The five panels are marked P, the commutators at the top are marked C, the brushes are marked B, and the brush carrying tubes E. At the bottom the clutch magnets are marked M. The sequence switches and other apparatus associated with the selectors can be seen on the frame at the sides of the panels.

Four principal types of selector besides a line-finder switch and a sender selector are used in the panel system. These four are all similarly constructed, but differ in circuit details. Their relative positions in making connexions are shown in Fig. 15.

For calling purposes, subscribers are connected in groups of 300 to line-finder switches which are of the same construction as the selectors except that there are 15 panels of 20 lines each and 15 brushes per switch. When a subscriber lifts his receiver to make a call he operates a relay at the exchange, bringing a line-finder into use. The particular brush opposite the 20 group in which the subscriber's line is situated is tripped and hunts for his line. When the line is found the switch comes to rest with the brush on its terminals. At the same time a sender selector, which may be a switch of the rotary type, hunts for a disengaged sender which it connects to the line-finder and to a district selector associated with the latter. The subscriber now hears a tone signal, and as this is an indication that he may do so, he dials, in order, the first three letters of the wanted exchange name and the four digits of the wanted subscriber's number. The dialled impulses having been received and translated in the sender, a circuit is established between the sender and the district selector. The object at this stage is to extend the calling subscriber's line by means of a junction to the exchange of the wanted subscriber. The district selector has access to a total of 500 circuits; but as 45 of these are used for local service purposes, the maximum number of outgoing circuits which it may use is limited to 455. As the total number of junctions outgoing from an exchange is likely to be very much greater, it is necessary to place the outgoing ends of most of the junctions upon office selectors and to arrange for the district selector to find either a junction direct or a circuit to an office selector having access to the desired junction group.

As soon as the fundamental circuit is established between the sender and the district selector, a clutch on the latter is operated and the brushes move upwards. After they have taken one, two, three, four or five steps the circuit is interrupted by the sender, and the brush trip magnet on the district selector operates, so that when the brushes again move upwards the one associated with the 100-line section of the panel containing the required junction group will be tripped into the active position. There may be several junction groups on this section, and therefore the next selective operation is to find the right group. The fundamental circuit is now re-established, the district selector again moves upwards and as it does so it sends impulses back to the sender. The sender counts them and, when the number corresponding to the position of the group on the panel is reached, the sender again interrupts the fundamental circuit and the district selector comes to rest with the brush resting on the terminals of the first circuit in the group. If that circuit happens to be engaged, the district selector is re-started and continues upwards till it finds a disengaged circuit and makes connexions to an office selector.

A similar sequence of operations having taken place at the office selector under the control of the sender, connexion is made to an incoming selector at the wanted exchange.

Now, as the unit of the system is an exchange of 10,000 subscribers' lines—numbered from 0000 to 9999—and as 500 subscribers' lines are multipled on each final selector, there will be 20 groups of final selectors in a fully equipped exchange. It is arranged, therefore, that each incoming selector shall be equipped with a multiple of 20 groups of 24 circuits each, outgoing to final selectors, distributed four groups per panel. The process of selection at the incoming selector is again a matter of tripping a brush, finding a group, and finally a disengaged circuit to a final selector: this is done by the process used in the previous cases, under control of the sender.

At the final selector a brush has to be tripped, a tens group found, and finally an individual line, all under the control of the sender.

As soon as selection is completed the sender is freed and may be used at once for another connexion.

Calls for manual exchange subscribers in the same area, which are dialled in exactly the same manner as calls for automatic subscribers, are taken by the sender, translated and sent out to the manual exchanges, where they are displayed on call indicators in front of the junction operators as already mentioned.

It will have been gathered that the "sender" which controls all these operations is a remarkable piece of electrical equipment. In addition to the duties already mentioned, however, it fulfils a multiplicity of other functions. It has to distinguish the type of exchange to which a call is destined, so that it may control the operations associated with the progress of a call to an automatic exchange in one way, and to a manual exchange in another way. It distinguishes between calls for a terminal exchange and those for a tandem exchange, and causes them to be operated in an appropriate manner for each case. It distinguishes between connexions which will pass out over loaded

*Paper read before the Post Office Telephone & Telegraph Society of London.

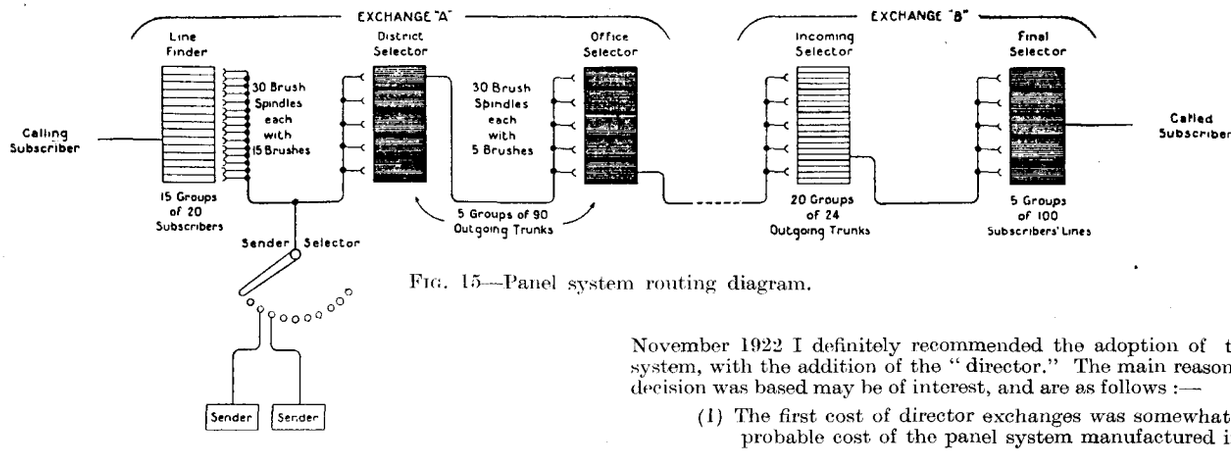


FIG. 15—Panel system routing diagram.

and unloaded lines, and it directs the selector switches in the setting up of the proper transmission conditions accordingly.

Certain senders associated with groups of coin-box lines test the calling lines and determine whether the callers have deposited the necessary coins before putting connexions through. They also determine in each case whether a fee is chargeable and cause the coins deposited either to be collected or returned to the callers. When its work is done the sender must cut itself free and return to its normal condition in readiness for another transaction.

The panel system in its entirety includes a multitude of electrical circuits of great complexity. It is the product of many wonderful brains, and its rapid development and installations are the outcome of probably the greatest engineering effort so far made in any field of industrial endeavour. Its future will be followed with keen interest by all telephone engineers.

(9) THE CHOICE OF A SYSTEM FOR LONDON.

Four years ago the development of the "panel" system had reached a stage which placed it far in advance of other then existing systems in respect of suitability for the equipment of the largest cities. The Post Office was eager to start the introduction of automatics in London, as many large new exchanges were required to provide for development and for the replacement of existing obsolescent or inadequate exchanges, and the installation of these important exchanges on the manual system would have had the effect of postponing by many years the ultimate complete conversion of the area to automatic working. The panel system was, therefore, very closely studied and the opinion reached was so favourable that it was decided to proceed as rapidly as possible with the preliminary arrangements for its adoption. It was admittedly both costly and complex; much design and engineering work still remained to be done before it could be said to have reached a state of comparative finality, and many of its features, which had been developed to meet the telephonic conditions of to-day in New York, could not without modification be applied to the very different conditions of London. On the other hand it was obviously a system of unbounded possibilities and no one doubted that it could be made to meet any legitimate service requirement that might arise. A factor not to be overlooked was that it had behind it the high prestige of the American Bell System, which had staked very large financial commitments on its success, and whose able engineers would, for years to come, continue to strain every effort to bring it to perfection.

Plans were prepared for a first panel exchange in London, to be known as "Blackfriars," and at the same time the Post Office started to negotiate an agreement with the Western Electric Co., in accordance with which the manufacture of panel equipment would have been commenced in England under conditions that would ultimately have permitted other British telephone manufacturers to obtain a share of the work. While these arrangements were proceeding, the sponsors of step-by-step automatic systems had not been idle or asleep, and early in 1922 the Automatic Telephone Manufacturing Co. called our attention to a notable development of the Strowger system by the Automatic Electric Co. of Chicago, who had succeeded in devising and combining with the step-by-step system a call-storing and translating scheme, which had endowed that system with practically the same elements of numbering and trunking flexibility that had first been conceived in association with the panel system. To this new development the name "Director System" was given. The matter was, naturally, one of first-class interest and, although the immediate proposals were in a somewhat embryonic stage, they were at once investigated very fully.

In association with the Automatic Telephone Manufacturing Co.'s engineers, a miniature multi-exchange system was laid out in such a way as to cover as far as possible all the different types of service required and exchange conditions met with in London, and was installed at the General Post Office as a working model of the director system. (A similar working model formed part of the Post Office exhibit at the British Empire Exhibition at Wembley.) Exhaustive study and trial led to the conclusion that the director system contained all the essentials required as a basis on which to frame a complete equipment of circuits and apparatus admirably fitted for the service of such an area as London, and it was evident that a practicable alternative to the adoption of the panel system hae become available. In November 1922 I definitely recommended the adoption of the step-by-step system, with the addition of the "director." The main reasons on which that decision was based may be of interest, and are as follows :—

(1) The first cost of director exchanges was somewhat lower than the probable cost of the panel system manufactured in England.

(2) The fundamental electrical plan of the system is very much simpler than that of the panel. Circuits for particular purposes are easier to design and easier to understand.

(3) The Post Office engineering staff was already familiar with step-by-step systems, and it had been found that men could readily be trained to undertake all the duties of maintenance. The difficulties involved in securing and intensively training the requisite staff for handling the panel system—on the large scale of the necessary programme—would certainly have been considerable, and might have involved serious delay.

(4) The apparatus to be employed in the director system was all of existing types which had stood the test of years of actual use, and which could be depended upon to give first-class service. The scheme was purely one of new electrical circuits and combinations. It was possible, even at that early stage, to visualize the lines on which circuits for all purposes might be designed and, in fact, to see right through the eventual London system to a far greater extent than was possible in the case of panel equipment.

(5) The director system applied readily and naturally to small, as well as to large, exchanges and to "satellite"* exchanges as well as main exchanges. The panel system had not been developed with a view to serving small or satellite exchanges. The fact that it could be made to do so was not doubted, but it did not appear that the solution was likely to be an economical one. This would be a matter of little importance in New York where the dense population of its large business buildings and apartment houses, combined with its high percentage of telephone development, necessitates that nearly all exchanges must have a capacity approaching 10,000 lines. In the "down-town" area of New York many of the exchange buildings will have capacity for four or more exchange units of 10,000 lines each. In widespread and less opulent London there have to be very many small exchanges and satellite exchanges, and it is essential to have a system which can be applied economically to such conditions. It is estimated that in 10 or 12 years' time there will be at least 130 separate exchanges in the London area. Of these not more than about 50 will be in the business districts of the City and West End, and of this number only about 30 will have an ultimate capacity of 10,000 lines, while about 20 will be limited to 5,000 lines. The remaining 80 exchanges in the area will include about 50 of 3,000 lines, 20 of 2,000 lines, and 10 of 1,000 lines. (In several cases two or three exchange units of 10,000 lines each will be accommodated in the same building.)

(6) The Post Office was already committed to several variations of the step-by-step system on a considerable scale in the provinces. The possibility of using the same system in London replaced the somewhat dismal prospect of adding another and very complex system to the rather divergent group already established, by the much more attractive prospect of being able to standardize a type of automatic system for general use throughout the country. As a direct result of the adoption of the director system, a large measure of standardization has since been accomplished, as referred to later. It will in future be possible to move staff from one district to another as may be necessary, without confronting the transferred men with unknown types of apparatus and circuits in the exchanges.

(7) Prior to the adoption of the director system, it had been ascertained that arrangements could be made for spreading the work among the regular exchange contractors of the Post Office at an early date. The important question of supply was thus greatly eased,

* A "satellite" exchange is one provided only with subscribers' line switches and local selectors, and dependent upon an adjacent main exchange for all manual services and for the routing and handling of all its external traffic.

as existing British factories became at once available for production purposes. The necessity for placing even the initial orders abroad was avoided, and the Post Office was able to enlist the co-operation of the skilled engineering staffs of all the contractors who had been producers of step-by-step equipment.

The negotiations in hand for the introduction of the panel system were therefore broken off and agreements were entered into with the Automatic Telephone Manufacturing Co. for the supply of director switching equipment for the equivalent of about 55,000 exchange lines, and with the Western Electric Co., Messrs. Siemens Brothers and the General Electric Co. for smaller quantities. Provision is made for existing patents, and for future patents during a specified period, to be pooled on terms which will enable the Post Office to call upon all the firms to install plant covered by patents in the possession of any of them. At the end of the period of about three years covered by the contracts it will also be possible to utilize the services of other competent firms who may desire to take up the manufacture of step-by-step automatic equipment. These agreements cleared the way for standardization of system, and before proceeding to specify circuits and layout a very careful study was made of the characteristics of the systems identified with each of the firms named, of all of which the Post Office had had practical experience.

Subsequent to the decision to adopt the director system, the firm of Siemens Brothers had submitted an analogous development styled the "translator" system, applicable to its type of step-by-step equipment, and at a later stage the General Electric Co. also brought forward a proposal to embody in its system an equipment of devices having the same object, which had been termed the "controller" system. The "translator" and the "controller" systems existed, for the most part, on paper, but they furnished interesting evidence of the readiness and flexibility with which the long-established step-by-step system lent itself to the grafting on of developments designed to achieve a newly conceived purpose.

STANDARDIZATION.

It was recognized that the complete standardization of the automatic system for Post Office use could not be effected in a single step without long initial delay and the temporary paralysis of some of our sources of supply. The most pressing need was to secure that all future automatic exchanges should be of such design that they would be able to intercommunicate directly one with another, without requiring the addition of any special devices or circuit complications for the purpose. First attention was therefore given to the standardization of electrical circuits and operating currents for all inter-exchange purposes, and this has now been accomplished. Each contractor is allowed to supply plant of his own type of mechanical construction, but all types must be capable of operating in the prescribed manner on the circuits which represent, for the time being, the standard methods of fulfilling particular functions. It will therefore be possible to equip any area, large or small, with exchanges supplied by any contractors who may, from time to time, secure the orders for their installation. The subscribers' automatic telephone and calling dial, and the operating impulses sent therefrom, are rigidly standardized, and the same applies to all trains of operating impulses and controlling or signalling currents sent from one exchange to another. Much progress has also been made in the standardization of the circuits which are purely internal to an exchange and do not affect intercommunication with its neighbours. All our contractors are also encouraged to unify the details of the mechanical construction of their apparatus as much as possible, with a view to the gradual evolution of a fully standardized Post Office automatic system. Such standardization has, of course, nothing whatever to do with any ideas of finality or fixation of practice. It simply means that at any given moment there is one standard way of making or doing any given thing. Improvements emanating from any source can be studied and introduced, not in partial and possibly conflicting ways as in a divergent collection of systems, but on a systematic general basis which greatly facilitates effective progress.

The first standardization study soon narrowed itself down to a choice among various important features in which the systems of the Automatic Telephone Manufacturing Co. and of Messrs. Siemens Brothers differed from each other. These features could not, as a rule, be considered independently; to a great extent the adoption of one dictates the adoption of one or more of the others. The decisions on the points at issue were as follows:—

(1) Impulses over junction circuits to be signalled round the loop, and not over one earthed conductor.

(2) Supervisory signals to manual exchanges and auto-manual positions to be sent by reversal of battery.

(3) Subscribers' talking and signalling current to be fed to the loop at final selectors, or at outgoing junction repeaters.

(4) Main battery to have E.M.F. of 50 volts (25 cells).

(5) Registration on subscribers' meters to be effected by means of a "booster" battery.

(6) Subscribers' lines to enter via 25-point rotary line switches having a "home" position and 24 outlets to selectors.

(7) The "private" banks on the levels of group selectors to have 11 points.

(8) The "busy" test on private bank contacts to be provided by an earth connexion.

(9) Trunk-hunting switches to be stepped forward by individual, self-controlled drive.

Six of these points (1, 2, 3, 4, 8 and 9) represent the established practice of the Automatic Telephone Manufacturing Co.

With regard to point (5), the Department's experience with the Automatic Telephone Manufacturing Co.'s standard system of registration—by means of an electro-polarized relay operated by reversal of current when the called subscriber replies—indicates that, although accurate, it requires special testing and voltage-regulation plant to maintain it. For "booster battery metering," which has been adopted as preferable, the subscriber's meter, with the normal exchange voltage behind it, is wired to the "private" or test wire at the subscriber's rotary line switch. The meter is designed not to operate on this voltage. The "test" wire is linked up successively throughout all the switches used in a connexion up to the final selector in the case of a local call, or to the outgoing circuit repeater in the case of a junction call. When the called subscriber replies, the operation of relays at the final selector or repeater applies a separate booster battery of 50 volts to the "test" wire in series with the main battery for about ½ second. The meter operates on this and its armature remains attracted on the normal battery voltage—the test wire being normally earthed at the final selector or repeater. It is confidently expected that this method will give complete immunity from false registration.

It should be mentioned that in "director" areas a simpler method of operating the subscriber's meter is practicable and has been adopted. In such areas the first selector switch, which is next in the train of switches to the calling subscriber's rotary line switch and meter, contains a relay operated by the reply of the called subscriber. A separate conductor can therefore be provided, at little cost, between the two switches, enabling metering to be effected by the simple closure of the meter circuit when the called subscriber answers.

The use of subscribers' rotary line switches with a "home" position—point (6)—is made necessary by the system of grading the outlets from the line switch banks to the first selectors. With graded outlets it is, of course, necessary that search over a level shall always start from the first outlet on that level.

The use of an 11th contact on selector levels—point (7)—is dictated by the desire to obtain traffic overflow measurements on each working level.

As soon as the leading characteristics of the general system had thus been determined the process of assimilating it to the director method of operation, and of designing the circuits and plant layout for all classes of service, began. For many months the engineers and traffic experts of the Post Office automatic group were engaged in almost daily discussions with the engineers of the four contracting companies who are responsible for the manufacture and installation of the exchange plant. The matter involves the consideration of masses of meticulous technical details, and great numbers of proposals and devices have been suggested, considered, tried out, and accepted or rejected. This work is now complete, so far as the initial system is concerned. Equipment for several large exchanges is now in course of manufacture, and in the cases of the Holborn exchange and the Mechanical Tandem exchange the work of installation *in situ* has been commenced. It may be mentioned that it takes, under present conditions, about 6 months to plan the traffic and engineering details of a large automatic exchange, about 12 months to manufacture it, and a further 12 months, or more, to install it in position and tune up its circuits for service.

BOWLING MATCH, BLACKBURN.

A very pleasant evening was spent on June 15, 1925, at the Butler's Arms, Pleasington, by the Male Staff of the North Western District Telephone Office, Blackburn, on the occasion of the Annual Bowling Match for the "Gold" Challenge Cup, which was fought for by two teams captained respectively by Mr. WHITELAW (District Manager) and Mr. BARCLAY (Traffic Superintendent). The District Manager's team proved victorious, and the scores were:—

	Single.	Double.	Total.
Mr. Whitelaw's Team	154	119	273
Mr. Barclay's ,,	113	74	187

During the subsequent proceedings which were somewhat "spirited," the cup was duly presented by Mr. Barclay, to whose brief and witty speech Mr. Whitelaw suitably responded. An impromptu concert closed the proceedings which everyone voted very happy.

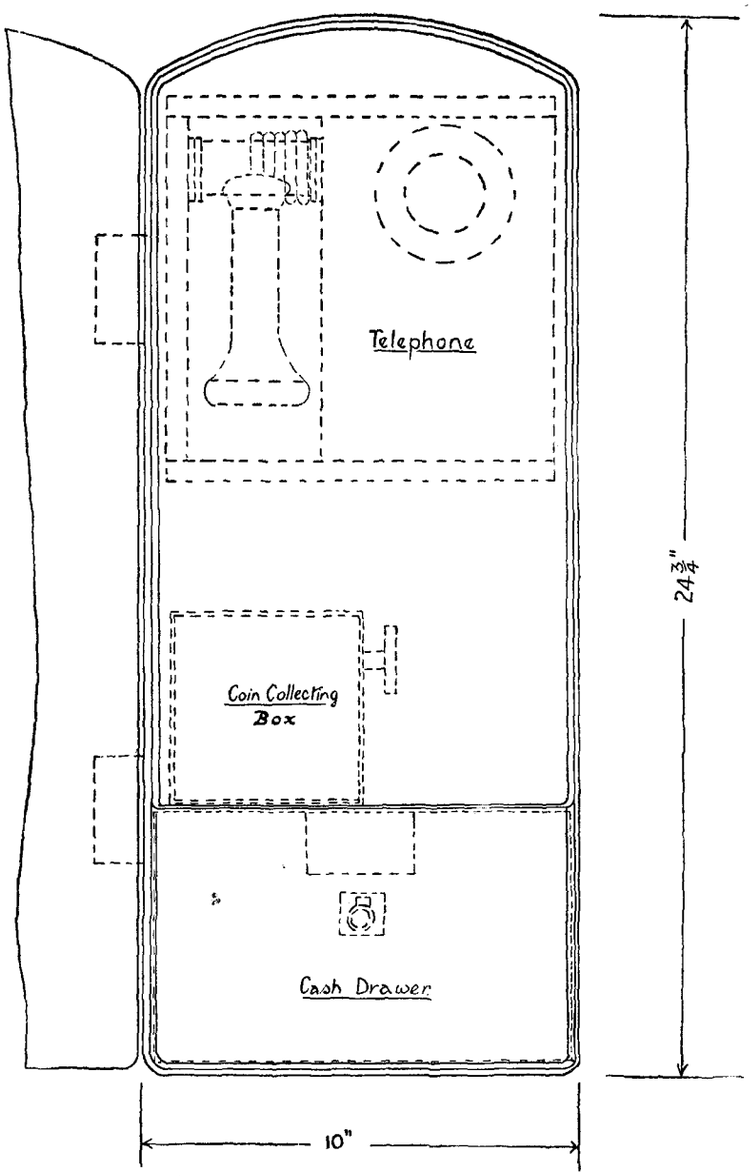
CANTERBURY.

On the occasion of his transfer to Exeter on April 1, Mr F. J. Frost, Traffic Superintendent, was presented with a gold wristlet watch from the District Office Staff, and a silver cigarette case from the operating staff of the Folkestone Exchange.

THE TUNBRIDGE WELLS TELEPHONE CALL BOXES.

BY RAMBLER.

ONE may possibly picture Tunbridge Wells as a languid "Sleepy Hollow," but if so, a rude awakening is sure to follow as soon as so ill-informed a critic runs up against its Telephone and Telegraph Advisory Committee, which is a vigorous and active organisation. It is well alive and undeniably persistent in its applications to the Post Office authorities for improved call office facilities in the town. Call offices have been established at all the telegraph town sub-offices and a telephone kiosk has been erected in a central part of the town. Owing, however, to the fact that the sub-offices are open for telephone call office business only during the usual Post Office hours, there were but two call offices available at which a continuous service could be obtained. The Telephone and Telegraph Advisory Committee thereupon politely expressed its dissatisfaction with this limitation of the call office service in the town, and asked that either the hours of the call office service at these offices should be extended, or more telephone kiosks should be provided.



Wall-Box, For Telephone Call Offices.

The wishes of the Committee, indeed, were that a certain number of call offices, besides the one at the head office and the telephone kiosk already mentioned, should be available for use by the public *at all hours of the day and night.*

The provision of additional telephone kiosks was found to be out of the question, owing to the cost and the small amount of business expected, and the problem was how to meet the reasonable wishes of the Committee in some less expensive and practical way. It was the Postmaster, however, who eventually hit upon the idea of affording the desired facilities by means of small metal boxes, just sufficiently large to contain a telephone, a coin box, and a local telephone directory. The boxes, it was suggested, could be built into walls, or on brick or stone piers in the same way as letter boxes, permission for their erection being obtained in the same way and on the same terms as those for letter boxes, or they might even be fixed to telegraph or other poles or standards by means of suitable iron clamps. It was also suggested that the boxes should be painted red, a colour which the public readily associate with the Post Office.

A wall telephone call box of the type indicated was erected experimentally in October, 1923, at one of the town sub-offices in Tunbridge Wells, an office at which call office facilities were already afforded during the usual hours of Post Office business. The existing call office circuit is switched through to the new wall telephone call box at the closing time of the office, and the new box thus becomes available for use by the public until the office is re-opened, when normal arrangements are resumed. The arrangement is an inexpensive one, and the number of calls made from the box has fully justified its provision. Such a box from a public point of view has not, of course, all the advantages of the usual telephone call office. For example, a caller using it is exposed to the weather. The secrecy of the communications voiced by the caller also cannot be ensured. On the other hand, it is a means of affording a twenty-four hour telephone call service at a comparatively small cost, and the experience derived from the experiment has shown that even this limited facility meets urgent needs and is much appreciated by the public.

Before the box was erected some doubt was expressed as to whether it would not be subjected to mischievous interference by irresponsible members of the public, but as a matter of fact during the period of its existence there has been no single instance of malicious damage to the box or instrument. It would, perhaps, not be safe, however, to argue from this that such a box erected in a less highly respectable town than Tunbridge Wells would be free from malicious interference. [Tunbridge Wells, the writer understands, from a Post Office point of view has one of the lowest records for insufficiently paid letters and post cards, a tribute either to the probity or the mathematical exactitude of its inhabitants or may be both !] At the same time it can be urged that wall telephone boxes are not likely to suffer any more damage than do letter boxes.

The experiment having been successful, three other boxes of a similar type are about to be erected in suburban districts of Tunbridge Wells; one on a bridge in a district in which call office facilities are entirely absent, and two others at town sub-offices, which already provide call office facilities during the hours of Post Office business. In the case of the box to be erected on the bridge, a new exchange line will have to be provided and the annual cost in this case will only be £3 or £4 less than the cost of a telephone kiosk.

The diagram shows a sectional drawing of the arrangement and indicating the positions of the telephone and the coin box. The door is fitted with a catch spring so that it can be opened easily by the public. In the case of boxes at sub-offices the scheme provides for the painting on the door of a notice to the effect that the box is for use only when the office is closed.

The scheme is capable of adoption not only in towns but also in villages and rural districts. A wall telephone box could, for example, be erected at the village Post Office in a case where the provision of a night-call service was otherwise difficult or impracticable.

The Advisory Committee attach great importance to the attention of the public being effectively drawn to boxes of the new type by suitable signs, and in the case of the box already in existence call office signs have been liberally provided.

It is pleasing to record that the Telephone and Telegraph Advisory Committee in their last annual report expressed their appreciation of the services of the Surveyor and the local Postmaster who were mainly responsible for the introduction of the experimental wall telephone boxes.

Yes, Tunbridge Wells is alive !

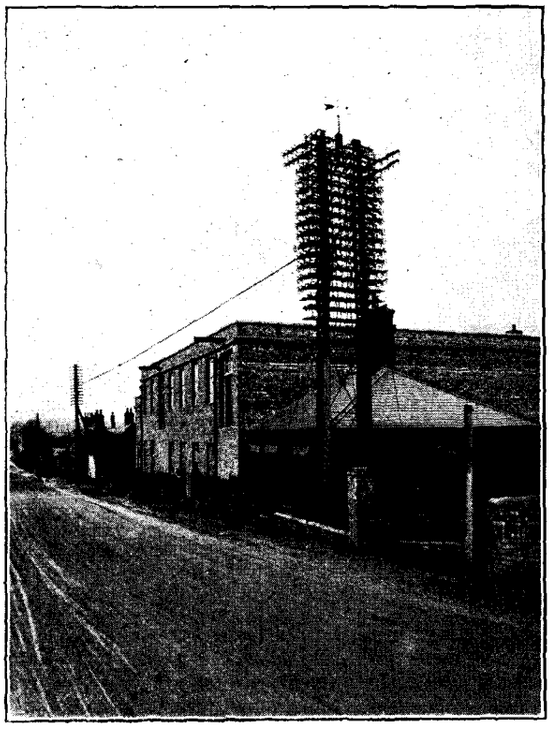
LEICESTER AND COVENTRY DISTRICT.

MR. G. R. PARSONS, *Assistant Traffic Superintendent, on leaving* Leicester with a view to taking up the duties of an assistant surveyor, class II, in the Eastern District, was presented by his colleagues with two framed etchings. Mr. J. L. Parry, Traffic Superintendent, in making the presentation, referred to the excellent qualities of Mr. Parsons, and Mr. A. C. Haley, District Manager, in a few kindly words wished Mr. Parsons every success in his new sphere.

FENNY STRATFORD TELEPHONE REPEATER STATION.

WITH the evolution and subsequent perfecting on a commercial basis of the thermionic valve came possibilities of its successful application to long distance or trunk "wire" telephony as distinct from wireless telephony in which the various functions of the thermionic valve in detecting, rectifying and amplifying minute, high frequency and speech currents are already familiar to all wireless enthusiasts. Ever progressive where new inventions and improvements in the means of communication under their control are concerned, the Engineering Department of the British Post Office were quick to realise the applicability of valve amplification to long-distance telephone conversation as a means of overcoming or compensating the losses due to capacity, inductance, leakance, &c., in long telephone cable and aerial routes.

As a result of exhaustive and prolonged experiments and investigations taking into account existing and projected trunk telephone cable routes, the Post Office some time ago decided to erect and equip telephonic repeater stations at certain convenient centres where they could be most advantageously



FENNY STRATFORD TELEPHONE REPEATER STATION. TEMPORARY BUILDING IN FOREGROUND.

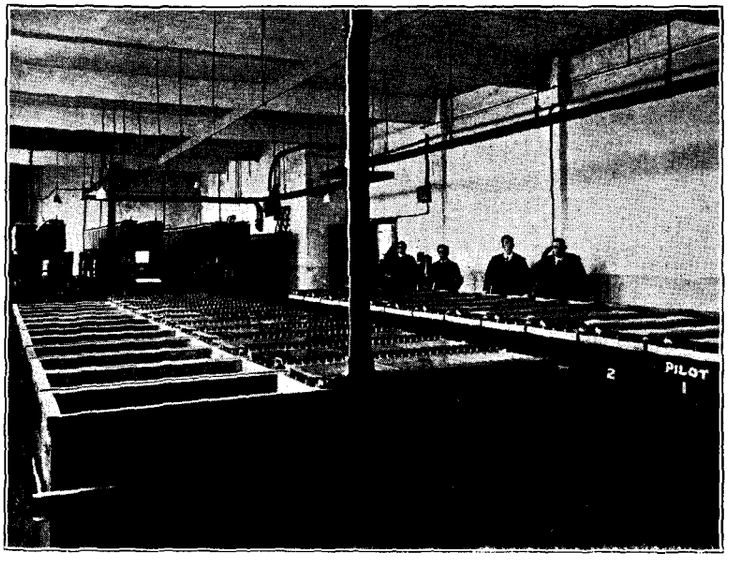
applied to the improvement of the telephone service between distant cities and towns. One of these Telephone Repeater Stations which has just been equipped is located at Fenny Stratford, a market town on the N.E. border of Buckinghamshire. Fig. 1 shows the substantial building which houses the power plant, batteries, valves and accessory apparatus, whilst in the foreground is a smaller temporary building which did service pending the completion of the larger station. A terminal pole for aerial routes is also shown in front of the building.

As current supply to the valves is the principal factor in a repeater installation, interest in the Fenny Stratford equipment is naturally focussed on the power plant which is of no mean order or capacity, having regard to its sole function, viz., that of facilitating telephonic communication. Current has to be supplied at three distinct voltages to the filaments, anodes, and grids of the valves, storage batteries being employed for the purpose. This, in turn, necessitates a primary source of electrical energy for charging purposes, and since no public supply is available within reasonable distance of the repeater station it has been necessary to include oil engines and generators for the purpose. The charging plant is in duplicate and comprises two Ruston & Hornsby Oil Engines, each direct-coupled to two generators arranged in tandem. Facilities are provided for an immediate change-over from one machine to the other in case of partial or total breakdown.

A power switchboard carries all necessary equipment for the control of the various circuits, whilst ringing current is furnished by ringing alternators, a continuous supply being assured.

Having thus outlined the principal components of the plant we will proceed to a more detailed consideration of the several items.

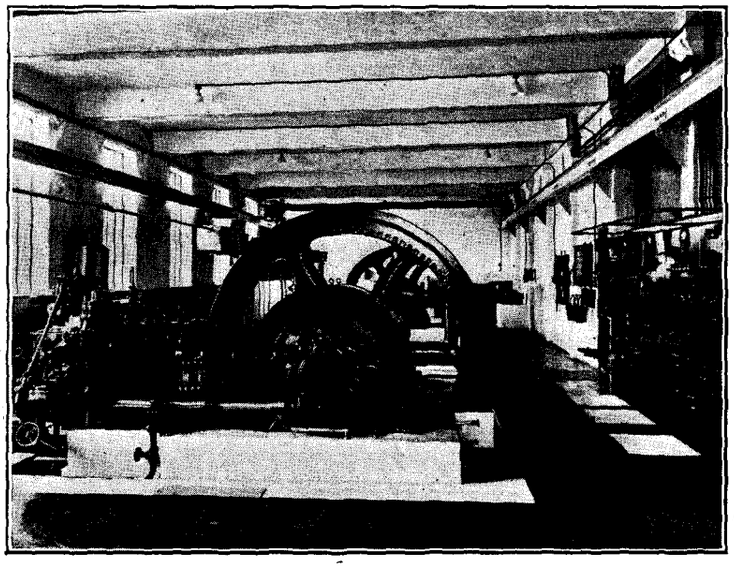
The Storage Batteries are of the Alton Battery Company's manufacture. The Filament Batteries, which are in duplicate, are designated "A1" and "A2." Each battery comprises 12 cells and has an initial capacity of 4,900



GENERAL VIEW OF STORAGE BATTERIES. "A" FILAMENT BATTERIES IN FOREGROUND.

A.h. and an ultimate of 9,180 A.h. at the 9 hour rate. The main discharge cables from these batteries are rated to carry 1,000 amperes. An impression of the size of each cell of the "A" Batteries is conveyed by the approximate overall dimensions of a single cell, the figures being—length 2 ft; width 8 ft. 6 ins.; height 2 ft. 6 ins. The Anode Batteries provided in triplicate are designated "B1," "B2," and "B3." Each comprises 75 cells and has a capacity of 300 A.h. at the 9 hour rate. The main discharge cables from these "B" Batteries are rated at 50 amps.

In addition to feeding the valve anodes, current from the "B" Batteries is also employed for driving the ringing alternators, the auxiliary oil engine motors, and for lighting the Repeater Station.

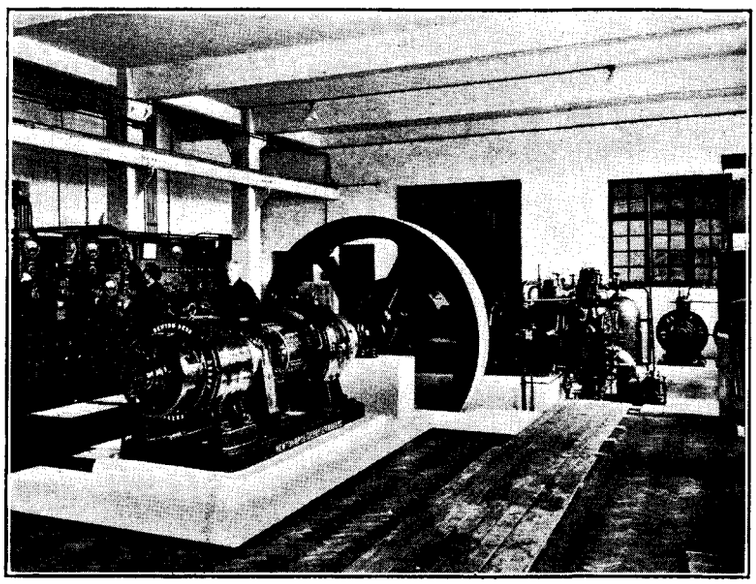


RUSTON ENGINES. POWER SWITCHBOARD ON RIGHT.

The Grid Batteries are in duplicate, and are designated "C1" and "C2." Each grid battery consists of five cells, the capacity being 20 A.h. at the 9 hour rate.

To regulate the discharge voltage from the Anode or "B" batteries when current is used for lighting or driving the Ringing Alternators, 5 end-cells are provided, together with facilities enabling them to be used in conjunction with any one of the three "B" Batteries. For the purpose of reducing the Anode circuit voltage there are also provided two batteries, each comprising 10 counter E.M.F. cells, designated respectively "D1" and "D2." For charging purposes two main generators are installed in duplicate. The machine for charging the "A" Batteries has an output of 1,000 amperes at 24-32 volts, and that for the "B" Batteries an output of 50 amperes at 150-220 volts. The two sets of generators are arranged in tandem and are direct-coupled to their respective oil engines. The generators were manufactured by Messrs. Newton Bros. Derby.

The prime movers consist of two "Ruston" single-cylinder Cold Starting Heavy Oil Engines each capable of developing 69 b.h.p. under continuous load. Each engine has a main fuel tank of 2,500 gallons capacity, together with intermediate and service tanks all interconnected, so as to enable either engine to be run from any tank according to the reserve and disposition of fuel oil available. A subsidiary tank furnishes a supply of paraffin to facilitate starting under adverse conditions. Auxiliary equipment for each engine includes an electrically driven fuel pump for replenishing the intermediate fuel-tank from the main tank; a motor driven air-compressor for charging the compressed air cylinder for starting purposes; together with a water-cooler and associated water pump, air fan, and electric motor drive. The latter is permanently connected to the 200 volt generator, thus ensuring automatic starting and stopping of the auxiliary gear with that of the engine it serves.



"RUSTON" ENGINE AND "NEWTON" GENERATORS. A.T.M. POWER SWITCHBOARD ON LEFT.

It is noteworthy that special attention has been devoted to the silencing arrangements which are very efficient, all undue engine noises being entirely eliminated.

The Power Switchboard consists of four enamelled slate panels mounted in an iron framework. The panels carry the various circuit breakers, knife switches, measuring instruments &c., for controlling the charge and discharge of the batteries. The battery controls are grouped on individual panels, No. 1 being devoted to "A" Batteries; No. 2 to "B" Batteries; No. 3 to "C" Batteries and Auxiliary Electric Motors; whilst No. 4 takes care of the Ringing Alternators. The Power Board was manufactured and installed by Automatic Telephone Manufacturing Company, Liverpool, who were the responsible contractors for the whole of the power equipment and batteries. The Voltage Control Boards are installed on the first floor near the racks which carry the valves and associated equipment. Two panels have been provided initially upon each of which are mounted the distributing bus bars, fuses, two voltage regulators for controlling the filament voltage, and a voltmeter fitted with contacts for closing a local alarm circuit should the "A" discharge voltage vary outside the permissible limits of 22-24 volts.

Fenny Stratford Telephone Repeater Station has been built and equipped under the supervision and to the design of the Engineering Department of the Post Office, who are to be congratulated upon this recent contribution to the efficiency of the Trunk Telephone Service.

LOCAL RADIO SOCIETY TALK.

BY ALAN ROBERTS.

(*Postmaster of Stockport and Chairman of the Stockport Wireless Society.*)

FROM 2ZY MANCHESTER BROADCASTING STATION, ON 17TH MARCH, 1925.

MY local radio talk deals with the origin, growth, and activities of wireless societies in general, and of the Stockport Society in particular, and I will endeavour, during the time at my disposal, to make the subject interesting to all listeners without entering too deeply into the technical side of it.

Wireless or Radio societies were established for the study of wireless science some years before the inception of broadcasting by the B.B.C., and they were formed for the purpose of research and experiments in *any* sphere of wireless work.

The Stockport Society was founded about 5 years ago, by a small band of ex-wireless operators who had been on active service during the Great War. They visioned great possibilities, and so the study of the wireless science became a fascination. They were not lacking in enthusiasm, and so became the nucleus of our present progressive Society. I can assure you that no little trouble was experienced in finding a suitable room at a reasonable cost for our meetings, the financial aspect being our stumbling-block. However, after having from time to time removed to at least 4 different rooms during the first 3 years of our existence, and despite the inconvenience, we still maintained our regular weekly meetings. We finally established ourselves in our present quarters at Mersey Chambers, King Street East, Portwood, Stockport, and it will be interesting to many people to learn that from these chambers one can see the actual source of the River Mersey, for it is at this point that the Rivers Tame and Goyt meet, and these converging streams form the commencement of the Mersey's flow.

Now to proceed with my subject. It was felt that without the Society's own receiving set, very little progress was likely to be made. In the absence of a bank balance, we contrived by means of loans from the members who then only numbered 12 to obtain a sufficient sum to attain our aims, and it was thus that our first receiving set was procured. The sums so advanced were very quickly repaid, for, on the establishment of the set—a wonderful thing in those days—the membership increased beyond all expectations. This co-operative movement proved a blessing, for it gave our Society a real healthy start, and from which it has never receded.

Much time, labour, and expense were incurred in the early days in the preparation of lectures and in experimental work, which included reception, transmission, and direction-finding, but the results achieved amply justified the efforts put forward. The lectures on many occasions took the form of dealing with the fundamental principles of magnetism and electricity as applied to the wireless science, and proved very helpful to those who had only a limited knowledge of the subject and, indeed, beneficial to the lecturer himself, who was forced by reason of circumstances to read up and carefully review his subject, so as not only to be able to give a clear exposition, but to be in a position to deal effectively with any points raised in the subsequent discussion, and I can assure you that quite a lot of fallacies were discovered. In the friendly debates and criticisms which always followed the lectures, it was soon observed that the self-confidence of the members gradually improved, so that even the once-upon-a-time tongue-tied individuals developed into vigorous debaters and fluent speakers.

Allow me, please, at this stage, to point out that Wireless Societies do not exist for high-brows only, but for all, old and young, of either sex, who are *keenly* interested in the work. Apathy is very harmful to any society and I, therefore, would lay stress on the importance of members being more active than passive. Many men are reluctant to join a wireless society because they feel that they don't know sufficient about the science. This idea is quite erroneous. I can assure "Listeners-in" that Wireless Societies welcome all who are really interested in Radio, whether they are humble possessors of crystal sets or the proud possessors of multi-valve sets. Intending members at Stockport will be met with every cordiality, helped and encouraged in their studies; they will find our members very sociable, and ever ready and willing to explain as far as lies within their power any of the technicalities of the science and in such simple terms as the least informed individual may readily understand.

It is, however, just as well to mention, in passing—and I feel confident that I am voicing the opinion of all wireless societies—that no society desires to enrol as a member the person who joins with an ulterior motive (such as having his set doctored, or obtaining such information and assistance as will enable him to rectify an inefficient receiving-set) and, after having his ends served, regretfully submits his resignation. Such a person is *not keenly* interested in the society's objects. We at Stockport, constituted as a mutual improvement society, *do not* want this type of member, but *we do* heartily welcome the right sort.

Broadcasting has given an abnormal impetus to the study of the science and its associated industries. Retailers of wireless apparatus and equipment abound throughout the land. The daily newspapers and periodicals, including

the *Radio Times*, give a material "lift-up" to these industries by publishing many valuable and interesting diagrams and articles—and, by the way, such articles can, in a large measure, supplant the preparation of lectures by members. As a result of this propaganda, it is now the common practice of people to build their *own* sets. The financial aspect, however, deters many from experimenting, but this, to some extent, may be overcome by joining a society where such work is carried out, and I desire to direct your special attention to the fact, that one phase of the Society's work in Stockport is the construction of experimental sets. We have all the necessary equipment which may be and *is* freely made use of by the members. It will be obvious to most people that persons who intend constructing their own sets will avoid disappointment and unnecessary expense and labour if they have the guidance of their more experienced fellows. Members, if they *so* desire, may bring their component parts to the Society's room, have free use of implements, and obtain assistance in building up their sets on the spot.

Several of our members are constantly constructing new and up-to-date sets experimentally, which are brought to the Society's rooms for the purpose of demonstration. A description of the circuit is given from a diagram drawn on the blackboard, and its efficiencies or defects fully explained. The usual friendly discussions follow, and by these methods we learn from one another. These discussions are specially beneficial to those who have constructed somewhat identical sets, but with varying degrees of efficiency, *despite* the fact that they have been built according to a standard diagram. Why is this? is the *natural question* asked by the inexperienced. My reply is: Join a wireless society and you will soon find out some of the mistakes made by the *experimenter in his work. It will, undoubtedly, pay an amateur to associate* himself with a wireless society, for it must be admitted that the interchange of ideas has a tendency to broaden one's views, and so leads to progress. The practical work carried out in the room teaches the student in detail, when building experimental sets, how to proceed on sound lines, particular attention being paid to the assembling of the component parts, the most effective method of wiring, soldering of joints and so forth. This must necessarily be helpful to those who are young in experience. The learner who makes his first set experiences some thrill and delight when his anticipation of successful reception is realised, and the immense pleasure thus afforded is an incentive to further experimental work. The crystal set is soon displaced by the one-valve set, and this in turn by a multi-valve set, and so, he goes on.

Wireless societies are our class rooms, research depts., and workshops, where we are able to gain knowledge of, and practical experience in, this new science which is attempting to solve the mysteries of the ether. Stockport listeners are fortunate that they are in such close proximity to the Manchester Studio, for good reception is obtained on all sorts of crude contrivances. This is a pleasing situation, provided we are more or less content to receive the excellent programmes transmitted from this station, but I realise that there are many of us who are desirous of receiving other broadcast programmes than those transmitted by 2ZY.

This very desirable attainment adds considerable interest to radio amateurs' efforts. To be able to cut out the local station and receive other B.B.C. programmes is an achievement we may well be proud of. These remarks lead me to make some reference to oscillation and its disturbing effects when reaction is wrongfully used, generally due to tight coupling of the reaction coil. As, no doubt, many of you know, disturbance is caused by re-radiation of the wireless waves. Reaction is now permissible and is useful if properly used. There is, however, both a *proper and improper* way of using reaction when tuning in other stations. The movement of the coil, and the rotation of the condensers must be very gradual to obtain the best results. Its wrongful use (mainly through ignorance) not only causes interference with the reception of broadcast signals, but its "howls, screams and whistles" create great annoyance to listeners in the immediate neighbourhood of the offending set, crystal users being the worst sufferers, for the disturbance may cut them clean out. Perhaps some listeners will say that they are tired of listening to the repeated requests of the B.B.C., and wireless societies in this connexion, but *are* you not rather *more* tired of listening to these appalling disturbances, night after night? I would specially appeal to the owners of valve sets who use reaction beyond a reasonable limit to cease giving us these nightly rocket-like demonstrations.

It should be remembered that many thousands of listeners are receiving broadcast programmes on crystal sets and, having duly paid their licence fee in the same manner as the valve users, they are entitled to receive equal value for their expenditure, and it is extremely unfair that they should be deprived of their due.

Our energies are now being concentrated in investigating the question of installing a transmitting set, so as to be in line with other large wireless societies, and providing the necessary licence is granted by the Post Office, of which there is very little doubt, there is every probability that our hopes will be realised at no distant date. The Stockport Committee have, as it will be seen, a very progressive policy, and the fact that our weekly meetings, which are held on Wednesdays at 7.45 p.m., are so well attended, and the interest so well maintained—for it is usually after 10 p.m. before we close down—it must be admitted that we are a real live society. Prior to the days of broadcasting we used to meet twice a week, one night being specially reserved for morse practice. We only had morse telegraph reception to engage our attention in those days. The morse signalling code requires a fair amount of practice before one is able to translate the intermittent sounds of varying length into language, but when *once acquired your receiving set* will give you added pleasure.

The study of wireless has not only become a national hobby, but a world-wide one, and consequently many societies have been established in various parts of Gt. Britain and Ireland, most of them being affiliated with the Radio Society of Gt. Britain, whose head-quarters are in London.

From what I have said this evening, I trust it will appeal to you that wireless societies are really worthy of the utmost possible support, both practically by persons becoming energetic members and financially by others in the interest of the science generally. It is pleasing to know that our views are supported by such an eminent authority as Capt. Eckersley, the Engineer-in-Chief of the B.B.C., who strongly recommends enthusiasts to join a society.

The larger the membership of a society, the greater, of course, are its resources, but with a limited, or rather, a small membership, its activities are necessarily restricted, so far as its expenditure is concerned, which must (working on business lines) be proportional to its revenue, and consequently it is the desire of committees, to increase *within reasonable limits* the membership of their respective societies. Many benefits are to be obtained from association with the Radio Society of Great Britain, and the co-operation of local radio societies, especially if funds would admit of the interchange of lecturers, but I am afraid that in this respect the small societies are somewhat handicapped, otherwise they would gladly participate in such an excellent mutual arrangement.

TELEPHONE NOTES.

The "Cut-over."

The opening of a new telephone exchange is becoming more and more an occasion for something in the nature of a public ceremony. Not a few humorous stories have gone the rounds of the devices used for symbolising the act of "cutting over" the lines to the new equipment. On one occasion, the Mayor was supposed to effect this by pulling a cord. This was led through a hole in the partition between the reception and apparatus room. On the other end was—a piece of wood to prevent the cord "pulling through" and giving the game away. Another ruse was the employment of a huge double-pole switch. Precisely at the hour fixed, the Lady Mayoress broke the switch according to programme and—rung a trembler bell, situated out of hearing of the engineers at the main frame. According to a story related by *Telephone Review*, such an event is taken more seriously sometimes in other lands. "The opening of a new telephone exchange in Turkey, a few years ago, was made the occasion for a celebration of ancient Mohammedan rites," it says. "Islam being the state religion of Turkey, the Government took a hand and issued orders that facilities be provided for carrying out the religious ceremonial. Accordingly, the firm which installed the telephone system was obliged to purchase two sheep, which were offered as a sacrifice with all due ceremony."

An Interesting Japanese Telephone Custom.

It is a pretty general experience of Telephone Administrators in England, nowadays, to be faced just before a new exchange is opened, with having to decide nice points of precedence in the matter of allocating a meagre amount of available spare telephone numbers on the old exchange, amongst a large number of applicants for immediate service. On the one hand, there are orders which have been outstanding for a long period awaiting cable development, and on the other the newly-formed company to whom telephone service means much. It is interesting, therefore, to see how other administrations meet similar situations. Here is the Japanese way, as reported in *Telephone Review* by an American engineer. "Even under normal (pre-earthquake) conditions, telephone installations were extremely hard to get in Japan," he says. There was a long waiting list of would-be subscribers, and those lucky enough to have a telephone were allowed to sell their right to telephone service. Telephone numbers were freely dealt in on the Stock Exchange. From £50 to £250 would sometimes be paid for the right to have a telephone. Substantially higher prices than these even were said to have been paid for "lucky numbers." For instance, telephone number "Eight" would be eagerly bid for, this number being regarded by the Japanese as signifying success. Numbers such as "forty-two" and "forty-nine" symbolising pain, unhappiness, death, are "unlucky" and usually reserved for public institutions such as prisons, police stations, and lunatic asylums.

Anglo-Continental Telephone Service.

A great deal of comment is being made in the technical Press, both here and in America, on the progress of the development of direct inter-communication between the capitals of Europe. The departure of two London Trunk Exchange telephonists, on May 5, for a two weeks' visit to Paris, was commented upon by the *Electrical Review*, which also stated that later,

28 girls and 3 supervisors would follow, and that there would be parties of French telephonists visiting London. "The official language of the exchanges is French, which is used exclusively in operating, so that the English girls of necessity speak it fluently" it says. It may not be without interest, therefore, to state the position more fully. All the Anglo-Continental lines are terminated on 19 positions at the London Trunk Exchange. The Continental service at present is provided by 16 circuits to Paris, 4 to Brussels, 3 to Antwerp, 6 to Amsterdam, 4 to Rotterdam, 1 to the Hague, and 1 each to Lille, Calais, and Boulogne. These provide service from practically the whole of Great Britain to most places in Northern France, in Belgium, Holland, and to the important towns in Southern France. A service between Switzerland and London is also available via Paris. Something over 2,300 calls pass over these routes on an average day. The new Dutch cable which is on order, and which will consist of 8 physical and 4 phantom loops, will be used for providing service to Germany.

"This Freedom."

"It is sometimes refreshing and enlightening for any one who has been very close to an activity for a long period, to hear the view points of a sane thinker who has not been so close to that particular 'grindstone,'" says *Electrical World*, by way of introducing a report of an interview on public ownership with Britton I. Budd, President of the Public Service Company of Northern Illinois. "What is this will-o'-the-wisp, this Government ownership?" he asked. "Sometimes called Government ownership, sometimes called State ownership, sometimes called municipal ownership, sometimes called socialism, sometimes called nationalisation of industries, one definition seems applicable to what is meant; that is, the confiscation of private property, of all industry and business, even of the land, with the stimulus of competition abolished, and all business and industry put under political management to be provided by the "sovietiers." It is at least interesting to see it thus acknowledged that a widespread attempt to introduce this "will-o'-the-wisp" is being made in America; that "industry generally seems to have encountered the propaganda." If, as B. I. Budd says, "it is the duty of all private enterprise jointly to disillusion the proponents of this form of ownership and operating," we heartily agree that (as far as America is concerned) it is "about time to find out what is meant by 'Government ownership.'" He asks, further: "Do we know what it is all about? Have we any definite information about it?" If we were not fully aware of the American tendency to state any issue as the opposition of two extremes, we should answer the first question in the negative. Also, we would invite him to England, for the Glasgow and Sheffield municipal tramway undertakings, innumerable municipal gas, electricity and water works, and the British Post Office telephones are but a few of the "sovietiers" which yield nothing in efficiency and service to any of the public utilities in other lands.

Shorter Notes and Comments.

Sunderland has saved £15,000 a year by closing divisional police stations and establishing a police telephone box on each beat instead. The constable from his box rings for a car when he has a prisoner, using the box for detaining the prisoner until the car arrives. Doncaster, Exeter, Middlesbrough, Rochdale, Tynemouth, Plymouth, Wolverhampton and Torquay are said to be following Sunderland's lead.

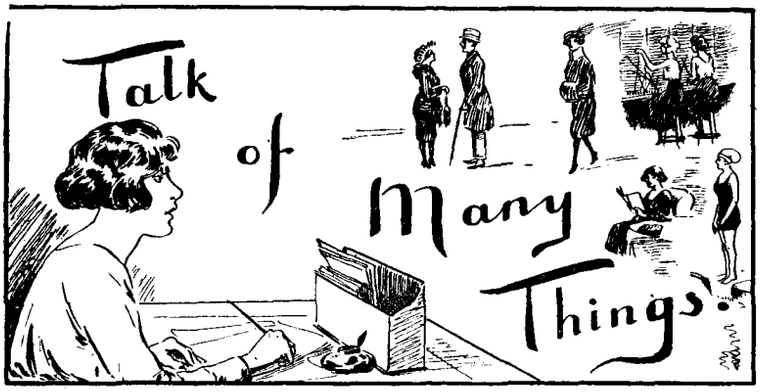
The autobiography of Michael I. Pupin has just been published by Scribners, under the title "From Immigrant to Inventor." It tells in Prof. Pupin's own words the story of how, after being a herdsman's helper on the plains of Serbia, he landed in America at the age of sixteen, an immigrant, alone, destitute and friendless, and of the vicissitudes through which he passed, as such, while securing the education upon which his genius founded the achievements which were to earn and find him an honoured place amongst the leading scientists of to-day.

According to Vice-President Ihmsen, the American Telephone & Telegraph Company (or Bell System) supplies toll (trunk) service to 9,252 independent telephone companies. On reading this we sighed with relief, believing that at last we were able to see "what we were up against" in an intriguing matter. But—"this by no means represents the whole of the Independents, for many of them have not yet been connected for toll service, and so-called farm line companies are not included."

The work of fitting the German railways with telephones on fast trains is so advanced, says the *Financial Times*, that trains between Berlin and Hamburg will open the service in June. The charges are but slightly higher than those for the ordinary telephone service. It is reckoned that the service will be immediately remunerative, as an average demand for from 15 to 20 conversations or dispatched telegrams per hour is anticipated.

Is it legitimate for an American company to go into the radio business? One exchange in Kansas is said to be serving 360 loud speakers, which are owned by subscribers, for $1 each per month. It is claimed that this "is a legitimate part of the telephone business, as the company is thus selling its line service at a price that would appear profitable." On the other hand, "the District of Columbia Public Utilities Commission has ruled that an investment in a radio broadcasting station equipment is not a proper portion of the valuation for rate-making purposes, and that expense of radio operation is not properly chargeable to the telephone operations of the company if a deficit is incurred."

WE TELEPHONISTS



Other People's Business.

IT was not until I began to cultivate a garden of my own that I realised how much my neighbour knew not only of gardens but of all conceivable subjects—for, of course, in a discussion on gardening one word brings up another, and we talk "of shoes and ships and sealing-wax, of cabbages and kings." He was one of those remarkable men with a wide range of information on many themes, and he had such a facility of dogmatic expression that after listening to him for a time I have felt concerned at the apparent depth of my own ignorance. He seemed to have a friend in every known and many an unknown trade and profession, and they appeared to be constantly telling him some special piece of priceless information which had been concalled from the common herd. He would tell me for example, that a particular brand of tobacco was absolutely the finest obtainable, and he would go into elaborate detail to explain the innermost secrets of its preparation—meanwhile dipping heavily into my own inferior but beloved brand.

After listening to his encyclopaedic torrent my esteem of my own knowledge used to disappear, but it began to return when I found later that most of his information was wrong or out of date or muddled in some way. But I was never able to trap him: he invariably explained away the misunderstanding—as he called it—in so convincing a manner that I used to fear that my powers of penetration were becoming weak.

It would, of course, have been fatal to seek advice from this type of person because, apart from the uncertainty as to whether his reply would be reliable, he would never cease giving advice upon all sorts of questions at all sorts of times until in desperation I should have been compelled to move into another district. Even then he would have told me where to go and and what sort of house to buy, and would have let me into all sorts of secrets about builders and bricks. I did not, therefore, seek his views about my garden—but he gave them freely and at length. He leaned on the fence each Saturday afternoon and Sunday morning, and told me what to do. In the end I hardly dared to go into my garden except by stealth, and if by chance he were not at the fence I used to feel that he was probably peering from behind the curtains of his windows muttering advice. How much simpler it would have been had he taken over my garden and run it himself. I should have been delighted to have remodelled his, for he was remarkably untidy, and had an extremely bad eye for colour and straight lines.

In the larger sense it is probably best for the world that none of us minds his own business. From the benevolent State which pensions our elders, to the aproned matron who would train our child better than we do, we are always interfering. If chaos results from our management of other people's business it's just as well we're not entrusted with our own. If, on the other hand, others manage our affairs with success it seems a pity to disturb a system which provides a good deal of fun, maintains our opinion of our own capabilities and removes the centre of life from self.

PERCY FLAGE.

Mes Vacances.

Spring has "been and gone," also one week of my annual leave, spent amongst the mountains of Wales.

How far away telephones, and typewriters, complaints and faults seem to be. It would seem out of place, somehow, to talk about filing and sorting papers, about plugs and switches, and of forms for late attendance in a country lane. Here, at any rate, thought I, I'm far away from those things that essentially belong only to the busy city. Nothing round here to remind me of work! Instead of gazing on telephone notices and listening to the aforementioned complaints I see the tall mountain of Snowdon surrounded by numerous lesser peaks, and footed by the pretty Llanberis lake. The rocks and boulders round the lake are still in Spring attire—patches of light grey rock broken by pale and dark green firs. The hedges are a blaze of bright yellow gorse, and violets grow in profusion below. The fields are full of daisies and buttercups and tall bluebells. Some sheep with their lambs pass me on their way to the mountain pastures to spend the summer there. A foal in a field came hurrying to the hedge on my approach to be *very* timidly rubbed on his nose. Calves are not nearly so "matey." Try to entice a calf near you and it will gaze supiciously at you and then retire to the furthest

corner of the field. For the first time in my life I heard a cuckoo calling, and, furthermore, saw him, and numbers of robins, stonechaffs, thrushes, jackdaws, and wrens.

Here is the pretty village with most of its cottages scattered about high up on the hillsides. The first thing that meets my eye in the only street it boasts is the old familiar sign, "Public Telephone!" Did I say there was nothing here to remind me of work? The error is regretted!

Getting Back Into Harness.

WE don't like it! It isn't natural that we should, for we have tasted freedom, and it was very sweet. What visions can be conjured up, as we sit and think. Country lanes, with wild flowers on either side. Tall cliffs, with the blue sky overhead and the blue sea underneath. Seagulls circling over the water in graceful motion. Winding roads, and meadows carpeted with buttercups. Graceful ships in harbour, and tiny boats tossing on the waves. Days of delicious idleness, when we could go where we would, or simply lounge in a deck chair and bask in the sun. Nobody but ourselves to please; nobody to interfere with our own sweet will. Drifting! drifting with the tide. Eating, drinking, sleeping, and generally enjoying ourselves. Well, we have had our "fling," and now we are back at work again. We have got to do our bit once more in the great world, and put our shoulders to the wheel, instead of resting them against the back of a deck chair. Well, what of it? Holidays are good for everyone, but they are given in order that we may obtain fresh energy with which to carry on our WORK. We can't go on holiday-making for ever, and as we all know "Idleness is the key to beggary and the root of all evil." Besides, all the best of the Summer is before us, and given good weather, we can, after we have performed our tasks, still enjoy pleasant evenings out of doors, and occasional week-ends by the sea or in the country. There are so many nice things to do in the Summer months: taking snaps, playing tennis, gardening, and there is always the consolation of music whatever the weather. Let us take heart then, and instead of longing for our freedom, let us realise that work and play combined are much better for us than all play, and after all, if we were given nothing but cake to eat we should soon get tired of it. We have got our memories, and with the blessing of health, let us put on our harness again with a willing heart, or in the words of an old Devonshire saying, "To a steep hill put a stout heart."

The solution of last month's Cross Word Puzzle is given below. A number of readers sent in solutions, but none was quite correct, "Valentine" and "Venue" being given as "Burlesque" and "Bench" in nearly every case. As these words have proved such a stumbling block, it has been decided to award the prize to the first *nearly* correct entry opened. The prize, therefore, goes to Mr. W. N. Burrows, of Morfa Nevin, with our congratulations. A year's "Journals" will also be sent to the inventor of the Cross Word Puzzle, Miss Howard, of Langham Exchange. It is hoped to hold another competition shortly.

CLUES.

Across		*Down.*	
1.	Sc.	1.	Strophes.
3.	Valentine.	2.	Chancery.
5.	Owe.	3.	Venue.
8.	Thee.	4.	Era.
10.	Royal.	5.	Oyu.
12.	Rainham.	6.	War.
15.	Treasury.	7.	Ely.
16.	On.	9.	Ei.
17.	S.E.	11.	Os.
18.	P.C.	13.	Asleep.
19.	La.	14.	Meandering.
20.	Harrow.	15.	Telegraphs.
25.	Hem.	20.	Hat.
27.	Pen.	21.	Air.
28.	Ai.	22.	Ran.
29.	A.A.A.	23.	Oak.
30.	Erected.	24.	Was.
32.	Trunks.	26.	Men.
33.	Syncope.	27.	P.T.O.
34.	Alights.	31.	C.C.
40.	Nilgheri.	35.	L.E.R.
46.	Penn.	36.	'ino.
47.	Ou.	37.	Gnu.
48.	Ocean.	38.	Toe.
49.	Enshrouded.	39.	Sud.
51.	Diaphragms.	40.	Nod.
		41.	Ici.
		42.	Lea.
		43.	Gap.
		44.	HN-H.
		45.	Rea.
		50.	SM.

Further Education.

To My Two Co-Educationists at the Hop Exchange.

1. They say that writing is an art, and if we should desire
To express our thoughts quite clearly some lessons we require,
So to the lectures now we go, all other things we leave
To be instructed in the art, on every Monday eve.

2. I travel up to Carter Lane, dear me! I fret and fume
In case my train should make me late to reach the Conference Room.
The lecturer is handsome, well! well! Oh! here, I say!
The Whitley Council chose a man who's got a real "M.A."

3. The studies seem a bit advanced, the lecturer would show
How we can be great playwrights—just write drama, don't you know.
He says that if we write a play his duty he'll not shirk,
So come along my dear old "cols" and let us get to work.

4. Start right away, my two old friends, your characters begin,
And I will do the choruses, and with you work them in.
Ruby, you "do" the hero, Rosie the villain make,
But you must not be too drastic and burn them at the stake.

5. The atmosphere of this our play, must have some careful thought,
And we must listen with intent to all that we are taught.
We mustn't set the groundwork in an unromantic age—
An Ancient Briton cannot chase a fairy round the stage.

6. When England was so merry, in days of Robin Hood,
Villains were everything that's bad, and heroes none too good.
From this period of History, our drama we will form,
And add a ray of sunshine, a little snow, a storm.

7. We'll have a great grand chorus of fays and demons too,
With just an angel here and there to make our play seem new.
The speaker said how Shakespeare of his great skill could boast,
From others therefore let us learn and introduce—a Ghost!

8. There'll be a splendid final scene; we'll crown the hero king,
And let the merry wedding bells go ting-a-ling-a-ling.
The audience will cheer, and cheer, and cries of "Authors" raise,
Then Ruby, Rose, and Gertrude will receive their well-won praise.

9. Although on Monday evenings telephonists are few
We'll show them what two shillingsworth of lecturing can do.
Our names we'll print in capitals for all the world to see
We are just humble 'phone girls weak, but three great playwrights we.

—G. M. TURNER,
Sydenham Exchange.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

LONDON TELEPHONE SERVICE NOTES.

Cornwall House.

By a slip of the pen, it was stated in these notes last month, that the Controller's Office was moving to Stamford House, Stamford Street, but as all the world knows it is to Cornwall House that the trek was made.

The big removal was carried out according to schedule and the old premises at 144a, Queen Victoria Street, were strangely silent. Only for a short time, however, for structural alterations have to be pushed on to provide accommodation for the staffs of the Trunk, Annexe, Central and City Exchanges whose present dining-room and cloak rooms are required for new switchrooms and apparatus rooms.

* * * *

Cricket Match.

The teams have been selected for the Annual Cricket Match between the Traffic Staff and the Night Staff Cricket League. The Traffic team will be captained by Mr. E. A. Pounds. The match will be played on the ground of Messrs. Dunn, East End Road, East Finchley. The ground can be reached by tram from Golders Green, alighting at the Queen's Head, or from Highgate, alighting at the Bald Faced Stag. Play will commence at 2.30 p.m. and the date is Saturday July, 18th. Spectators will receive a cordial welcome and teas will be obtainable on the ground.

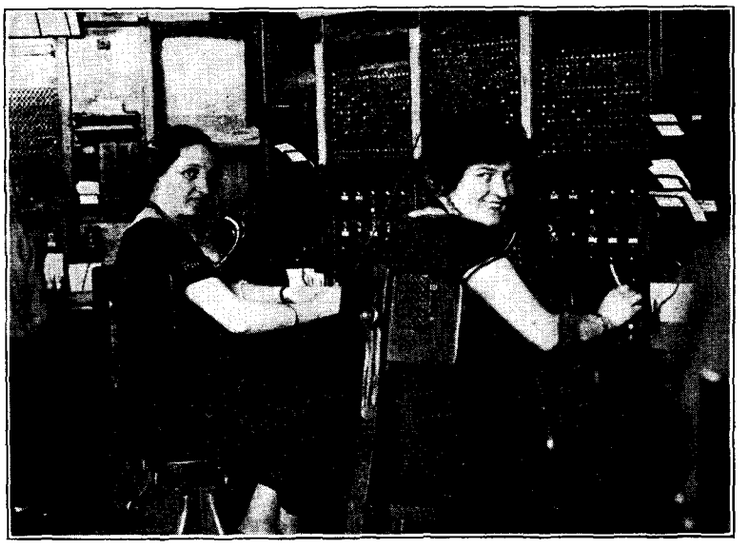
* * * *

Towards Automatics.

Further advance will be made towards the introduction of machine switching by the time the October issue of the *Telephone Directory* is in the hands of subscribers. There will be three further changes in exchange names. East Ham will be re-named Grangewood, Woodford will become Buckhurst, and Kingsbury will be known by the name of Colindale. Single digit telephone numbers will disappear, and big business houses such as Harrods, Selfridges and Whiteleys will have four digit numbers instead of the long familiar Number One. The practice of calling for certain commercial exchanges by names only will cease, and "Lloyds" and "Baltic" will henceforth be known by a telephone number. These changes are all imperative in preparation for the automatic scheme and mark a distinct step forward.

WHERE TO STAY.

MISS G. MADFLEET. MLLE. OUDET. MME. MARGRON. MISS HOLLIDAY.



FRENCH TELEPHONISTS AT LONDON TRUNK EXCHANGE.

INTERCHANGE OF FRENCH AND BRITISH TELEPHONISTS. [*Photos by James's Press Agency.*

YE ANCIENT LIGHTS OF YE TELEGRAPHS.

CHEERFUL Caligraphic Charlie Keen was as usual the organiser of the annual gathering which took place amid glorious sunshine on June 10, in the present year of grace. No less than 153 pensioners and their partners participated in the merry fête.

A list of these merrymakers will doubtless prove deeply interesting to many of the readers of this journal. Who would not wish to know that Jimmy Bailey was still the same J. B., and Adam Gordon still pursued him with all the old Vigour of Cynicus? Who also would expect Alec McEwen to make a speech without the addition of a few French epigrams—touched with a Scotch accent, and who wondered why the one hundred and fifty odd pensioners, who had strained their eyes for years in trying to decipher the results of C.S.K's. pen, out of sheer despair had presented the Airedale member with a typewriter?

Among those who put in an appearance were:—Abrey, Mr. W. W.; Adams, Mr. and Mrs. H. E.; Adams, Miss W.; Allison, Mr. G. W.; Allison, Mr. T. J.; Allwright, Mr. J. R.; Ampleford, Miss E.; Ampleford, Mr. and Mrs. W. H.; Askew, Mr. and Mrs. B. G.; Bailey, Mr. J. (I.S.O.); Bath, Mrs. H. E.; Batho, Mr. and Mrs. F. J.; Beevers, Mr. and Mrs.; Bennett, Mr. G. T.; Bent, Mr. and Mrs. C.; Berry, Mrs. M. R.; Binsted, Mr. and Mrs. R. D.; Bird, Mr. and Mrs. E.; Boddington, Mrs. M.; Booth, Miss A. E.; Browne, Mrs. F. Hargreaves; Carr, Miss M.; Chapman, Mr. E. T.; Clarke, Mr. E. J.; Clarke, Mr. H.; Clements, Miss F. A.; Conway, Miss E. M.; Cook, Mr. W. H.; Cooper, Miss P. L.; Couldrey, Mr. J. H.; Crook, Mr. and Mrs. E.; Donaldson, Mr. and Mrs. R.; Donne, Mr. E.; Downing, Mr. J.; Embury, Mr. and Mrs. A.; Evans, Mr. H. W.; Faunch, Mr. C. J.; Fryatt, Mr. F. W. and Miss; Fulcher, Mr. E.; Furness, Mr. and Mrs. R. A., and Miss; Geary, Mr. J. N.; Gibb, Mrs.; Gittins, Miss E.; Goldsack, Mr and Mrs J. J.; Gordon, Mr. Adam; Grealey, Miss M.; Guenigault, Miss E. J.; Gunn, Miss E.; Haggerty, Mr. W.; Hale, Miss A.; Harrison, Mr. and Mrs. F. W.; Havard, Mr. J.; Hilton, Mr. E. L.; Hodes, Mr. W. F.; Hollingum, Mr. and Mrs.; Holloway, Mr. and Mrs. F.; Hutt, Mr. J. H. and Miss A. M.; Hyde, Miss C. L.; Ireson, Miss E. M.; Johnson, Mr. and Mrs. A. E.; Keen, Mr. and Mrs. C. S.; Keen, Mrs. F.; Kemp, Mr. R. E.; Kent, Mr. H. W.; Kings, Mr. A. E.; Langmaid, Mrs. T. F.; Lawrie, Mrs. J.; Lee, Miss A. E.; Lewis, Mr. E.; Longhurst, Miss F. E.; Lowe, Mr. C. R.; Ludlow, Mr. and Mrs. A. W. F.; McEwan, Mrs. A. C.; Malein, Mr. and Mrs. A. W.; May, Mrs. M.; Mayersbach, Miss E. C.; Miles, Mr. F. W.; Moore, Miss E.; Morgan, Mr. A.; Morgan, Mr. F.; Morgan, Mr. J.; Morris, Mrs. S.; Muller, Mr. F. J.; Murray, Mr. and Mrs. J. B.; Nash, Miss R. M.; North, Mr. and Mrs. A. W.; Oakman, Mr. H.; Packham, Mr. Ben; Payne, Mr. W.; Pearce, Mr. S.; Penney, Mr. H. J.; Philpott, Mr. J. J.; Picking, Mr. W. T.; Pond, Mr. H. and Miss G.; Powell, Mr. L. W.; Riorden, Miss C.; Sadler, Mr. T.; Senhenn, Mr. and Mrs. H. W.; Shand, Miss L.; Sloan, Mrs.; Smith, Mr. and Mrs. S. J.; Smith, Mrs. V. M.; Strachan, Miss L.; Talbot, Mr. R. J.; Tayler, Miss K. S.; Tibbles, Mr. and Mrs. E.; Tinson, Mr. L. H.; Treby, Mr. and Mrs. S. J.; Turner, Mrs. A. M.; Turner, Mr. C. J.; Turner, Mr. W.; Twyford, Mr. J.; Twyman, Mr. W. J.; Tyler, Miss F. A.; Webb, Mr. W. C.; White, Mr. F.; White, Mr. F. J.; White, Mrs. F. W. G.; Willis, Mrs. D.; Willis, Mrs. E. M.; Wiltshire, Miss J. M.; Underwood, Miss F. M.; Young, Mr. and Mrs. R.

PERSONALIA.

LONDON TELEPHONE STAFF.

The following promotions have been made:—

Mr. W. S. BAZLEY, Appointed Executive Officer.
Mr. W. LIMBERT, Appointed Executive Officer.
Mr. A. R. MOODY, Appointed Acting Executive Officer.
Mr. A. C. SILBY, Executive Officer to Higher Clerical Officer.
Mr. H. B. TAYLOR, Executive Officer to Higher Clerical Officer.

CENTRAL TELEGRAPH OFFICE.

The following promotions have been made:—

Mr. P. DIGGINS, Overseer to Assistant Superintendent.
Mr. T. G. BEAVIS, Assistant Superintendent to Superintendent (lower grade).
Mr. T. E. WESTON, Overseer to Assistant Superintendent.
Mr. W. A. DELLBRIDGE, Telegraphist to Overseer.
Mr. J. M. CHUBBOCK, Telegraphist to Overseer.
Mr. R. J. B. BIDWELL, Executive Officer to Staff Officer (Higher Executive Grade).
Mr. D. J. WELLS, Telegraphist, to Overseer.
Mr. G. A. COSTELLO, Overseer, to Assistant Superintendent.
Mr. G. H. CLAIR, Overseer, to Assistant Superintendent.
Mr. H. F. SMALL, Telegraphist to Overseer.
Mr. H. MAIDMENT, Telegraphist, to Overseer.
Mr. L. A. CHERINGTON, Telegraphist, to Overseer.

LONDON ENGINEERING DISTRICT NOTE.

C.B. Clay Football Challenge Cup Final.

THE final match in connexion with the above competition for season 1924-25, was played on Saturday, April 26, at the Woolwich Garrison Sports Ground, Woolwich Common. The competing teams were L.E.D. Headquarters and South East External (holders), after a splendidly fought out game, which was thoroughly enjoyed by the large crowd present. Headquarters ran out winners by 4 goals to 1. In a speech at the conclusion of the game, Lieut. Colonel C. B. Clay, said how pleased he was to be present to see such a splendid exhibition of football and to meet so many of his old friends. Mr. Clay then presented the Silver Challenge Cup to Mr. J. S. Thomson, the Headquarters Capt., and medals to the team. The proceeds from the match, which amounted to £15 3*s.* 3*d.* was divided equally between the Post Office Relief Fund and the Woolwich War Memorial Hospital. The general meeting of the Competition takes place at Denman Street (Refreshment Room), on Monday, July 16, and the Committee will be pleased to meet anyone interested in the Competition.

THE

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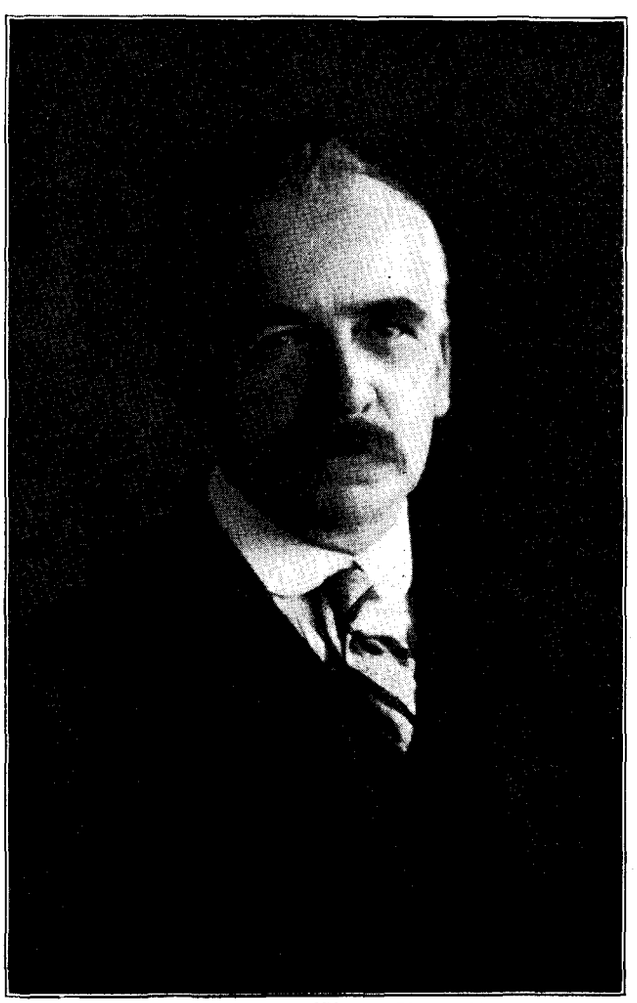
TELEGRAPH AND TELEPHONE MEN AND WOMEN.

XIX.—"J. J. T."

FOR the first time we are dealing with a prominent telegraph man under his initials and not under his name. It is a matter of which the conductors of this paper have every reason to be proud that they are responsible for "J. J. T." It was not difficult to discover him. In the C.T.O., where he has spent his life, his wide knowledge of all aspects of electrical communications and his keen interest in the day by day developments were well-known. I am not sure that it was equally well-known that he had a unique power of expression and a comprehensiveness of range of thought such as have made his articles into being an outstanding feature of the contents of this Journal. However that may be, from the very first he has been one of our most valuable and faithful and far-sighted contributors.

It is one of the curious functions of this Journal to find its way all over the world. "J. J. T." has a universal repute. He is quoted in journals in many countries and in many languages and indeed he is responsible for an atmosphere of universal mutual recognition in telegraphy. That atmosphere may bring something else in its turn in the fullness of time and if it does so our wide-minded and catholic colleague deserves largely the credit.



[*Photo by Photographia, 17, Cheapside.*

Mr. J. J. Tyrrell is one of the Superintendents of the Cable Room of the C.T.O. He has seen the whole history of the Cable Room and is intimate with all its developments, and especially intimate, I think, with the developments which seem to be coming so rapidly over the horizon that we do not quite grasp them in their fullness. He is a man with a philosophy of his own, a humaneness of outlook which is the very foundation of his philosophy, and a regard and appreciation of the fraternity of telegraphy which he has done so much to foster.

J. L.

THE HISTORY OF TRANSIT AND TERMINAL INTERNATIONAL TELEGRAPH RATES.

By J. J. T.

IT would appear to be necessary to preface these collated facts by a few preliminary remarks relative to the history of national and international telegraphy. The following one or two paragraphs show, how from the first, on the Continent, telegraphy was largely in the hands of the State, in contrast to the situation in the British Isles where telegraphy was entirely in the hands of private enterprise, with the result that in many of the first negotiations therewith, Great Britain had no *locus standi* at any of the important, if minor, conferences in connexion with international telegraphy at its initial stages.

The first telegraph system to function regularly was designed by the Frenchman, Claude Chappe, with aerial wires, and was first called the "tachygraphe," but by order of the French Minister of War, was henceforward changed to "telegraphe" April, 1798. The first actual wire was authorised to be erected between Lille and Paris by decree of the National Convention in 1793, and was opened the following year. In 1847 the French authorised Jacob Brett to lay a submarine cable between Cape Gris-Nez and Dover.

This authorisation was renewed in 1849, soon after the extension of the Paris–Lille line to Calais, and prepared the way for the first Paris–London direct circuit, which was the first underseas international telegraph circuit.

Brett successfully laid his cable but it did not last many hours, and after some further negotiations, an organisation known as "La Compagnie des télégraphes sous-marins de la Manche," took over the project and after many vicissitudes laid, opened, and worked the Calais–Dover cable, Oct. 23, 1851.

The correspondence and discussions concerning this project were probably the first arrangements ever agreed upon by any two nationalities regarding international telegraph rates; but a protocol was signed between Austria and Prussia, Oct. 3, 1849, visualising the establishment of a telegraph communication between these latter two countries, which was actually realised at the end of 1850.

In these very early days of international telegraphy, telegrams were not transmitted direct through from one country to another, but were stopped at the frontier at a "station d' echange."

For example, a telegram from Paris to London was first transmitted from Paris to Calais over the aerial line by a telegraphist of the French Government, who handed it to another French telegraphist, an employee of the Submarine Telegraph Company, who transmitted it to Dover, where the receiving telegraphist handed it to the employee of an English company who telegraphed it to London, the telegram being translated at each frontier into the language of the country of destination.

Thus, at the frontier railway station of Oderberg, there were two separate quarters, one each for the Prussian and Austrian employees, who were thus able the more expeditiously to interchange the correspondence.

In the case of the communication between France and the Duchy of Baden, opened some time in 1852, apparently, it is more definitely stated that Strasbourg was not only the handing-over office but the office where the telegrams were actually translated into French or German before being forwarded.

It does not appear how the number of words was adjusted between any two countries in cases where, obviously the translated copy would at times necessarily contain a greater or less number of words than the original.

In this same year direct communication between London and Paris apparently became a fact for the *Illustrated London News* of Nov. 13, 1852, records the "very interesting event of the opening of the direct telegraphic route between London and Paris," and publishes the information that "the new line of telegraph follows the route of the old Dover Coach road," and adds, "we now engrave the instrument room of 'the European & Submarine Printing Telegraph Company,' in Cornhill."

At the opening of the London–Paris route, the rate at first consisted of three charges, i.e., the inland French rate, plus the cable rate (sixpence), plus the inland English rate. At the end of 1853 this rate was apparently consolidated into one of 12 francs between Paris and London or any other office in the United Kingdom.

On June 1, 1855, the English charges were unified for all offices, viz., 10 francs for 25 words. To this would be added the French charge of 2 francs for 25 words plus 12 centimes for every 10 kilometres of wire travelled by the telegram.

Up to this period there had been no actual convention but from an agreement between Prussia, Austria, Baden, and Saxony, in 1850, there gradually followed, one by one, other States who gave their adherence to certain agreements regarding rates, &c., thus Wurtemberg, in 1851, Hanover, and Holland, July, 1852, the Grand Duchy of Baden, August, 1852, and Mecklenburg-Schwerin, 1852. These arrangements were ratified successively in treaties signed at Vienna 1851, Berlin, September, 1853, and Munich, 1855. This latter group was known as L'UNION AUSTRO-GERMANIQUE.

Prior to these treaties there had been no attempt at any international agreement, and it will be noted that the Austro-Germanic Union was basically German.

The Austro-Prussian charge for the interchange of traffic was the sum of the two interior rates, while that between France and the Grand Duchy of Baden was based on the two interior rates plus 24 Kreuzer for crossing the frontier!

Practically coincident with these happenings there grew up a second grouping which centred round France, known as L'UNION DES PAYS OCCIDENTAUX, and originating with a treaty between Belgium, France, and Prussia. This treaty was signed in Paris, Oct. 4, 1852, and was followed by another between France and Switzerland in the same month. Switzerland and Sardinia followed in June, and Switzerland and the Grand Duchy of Baden in August of 1853. In November of 1854, Spain and France also came to an agreement.

With reference to the signing of the Paris treaty of October 1852 by Belgium, France, and Prussia, it should be emphasised that this act of the three States mentioned, for all practical purposes, constituted a liason between l'Union Austro-Germanique and l'Union des pays Occidentaux, and was the beginning of the trend towards a real International treaty.

In matters relevant to the subject of this memorandum the contracting States of both Unions agreed to the following:—

(1) To suppress the exchange stations on the frontiers so that direct telegraphic communication might become in reality uninterrupted international communications.

(2) To recognise the right of every private person to use the international telegraph service upon previous payment of the necessary charges.

(Prior to this, as on the Austro-Prussian lines, the public were *permitted* to use them, but the governments concerned could, *at will*, close down the whole or part of a route without notice and apparently without cause.

(3) The following regulations regarding counting and charging :—

(*a*) The charge to vary according to distance.

(*b*) Each State to be divided into a certain number of zones with a distinct charge for each zone.

(*c*) According to its distance from the frontier, 1st zone 2.50, 2nd 5 f, 3rd 7.50, &c.

(*d*) The minimum charge to be for 20 words. Telegrams of 21 to 50 words paying double rate, 51 to 100 words triple rate ; above 100 words the same graduation to recommence.

(*e*) All rates doubled for night service.

In the first few years following these arrangements the minimum charge was raised to 25 words, then brought back to 15 with a free address of not more than 5 words.

In 1853, at Turin, there was an attempt to introduce regulations more in accord with the ideas of the Union of the Western States, but those of the Austro-German combination were eventually adopted. Three years after the meeting of Belgium, France, and Prussia, in Paris (1855), the same three representative States of the two Unions met in Berlin and agreed upon 41 Articles, many of which in substance remain in the current Convention (Lisbon 1908) to-day.

It was then laid down that international telegrams should only be written in French, German, or English, in plain intelligible language, in ink, and without erasure or abbreviation. The agreements arrived at in Turin included the transmission of international telegrams in the language of their origin, and thus came the abolition of the regulation which permitted a State to translate such telegrams at the Frontier. The counting and charging was further modified thus :—

(1) In each telegram the first five words of the address were free.

(2) The length of a chargeable word was on a syllabic basis, seven syllables counting as one word, anything above counted as an extra word.

(3) The tariff was based upon the number of words and according to the distance traversed thus :—

By Distance.	Up to 25 words.	From 26 to 50 words.	From 51 to 100 words.
Up to 75 km. ...	2.50	5.	7.50
75 „ 190 „ ...	5.	10.	15.
191 „ 340 „ ...	7.50	15.	20.50
341 „ 525 „ ...	10.	20.	30.
526 „ 750 „ ...	12.50	25.	37.50
751 „ 1,015 „ ...	15.	30.	45.

In each State, for transit rate purposes, distances were reckoned from the office of origin in a straight line to the point at which the telegraph line crossed the Frontier.

The maximum length of a telegram was also fixed at 100 words ; beyond this limit the charges on the scale of 1 to 25 words were again to apply. The receipts were shared between the countries interested *pro rata* according to the distances traversed by the telegrams in any particular State. The adjustment of accounts was to be made at the end of each month, by payment in the current coin of the creditor State. This agreement was to last two years, and was brought into force in France by a decree dated Nov. 6, 1855.

Nevertheless, on Dec. 29 of the same year, another agreement was signed in Paris by Belgium, France, Spain, Sardinia, and Switzerland. This agreement laid stress upon the necessity for adding to the three authorised languages of English, French, and German, those of Spanish and Italian, leaving to Spain the right of accepting or rejecting telegrams written in German. The basis of the tariff was re-modelled :—

By Distance.	From 1 to 15 words inclusive.	Additional charge for each 5 words in excess.
1st Zone, 1 to 100 Km.	1.50	0.50
2nd „ 101 „ 250 „	3.	1.
3rd „ 251 „ 450 „	4.50	1.50
4th „ 450 „ 700 „	6.	2.
5th „ 701 „ 1,000 „	7.50	2.50

It also split up private telegrams into two classes, Ordinary and Urgent, the charge for the latter to be at triple rate. It also subjected government telegrams to the same charges as those of private individuals as regards the repetition of the former.

This agreement came into force on May 15, 1856, Holland and Portugal giving adherence soon after, and was supposed to last for four years, but it anticipated *annual* conferences in order to exchange experiences.

In September 1857, at Stuttgart, the Austro-Germanic Union took steps to facilitate an understanding with the Western European countries Union. This convention was signed by the representatives of Austria, Prussia, Bavaria, Saxony, Hanover, Wurtemberg, Baden, Mecklenburg-Schwerin, and Holland, and formed the basis for the International Conference held in Brussels in 1858. The calculation of rates upon the number of words and the distance traversed was maintained, transit rates through the territory of the " Union " being calculated on the word rate and the distance in a straight line from one frontier of the Union to the other.

The use of English, if not prohibited, was on this occasion omitted from all mention.

On June 30, 1858, at Brussels, the Western Countries took further steps towards uniformity of treatment; Belgium, France, and Germany, acting on behalf and in the name of the Austro-Germanic Union. The adhesion of this group carried with it that of the Scandinavian countries, of Russia and the Ottoman Empire, while Belgium and France meant the agreement of Holland and that of the submarine companies which connected them to the British Isles as well as those enterprises which exploited the land-line net-work of Great Britain and Ireland.

At this conference, also, English was reinstated and definitely added to French and German for use in private telegrams, other languages being accepted at the will of the accepting office.

The conversion rates as between French and German countries were fixed at :—

3 francs 75 = one thaler.
0 „ 12 = 5/10 groat.

The tariff changes included :—

(1) The abolition of the free address.

(2) In cypher government telegrams the figures and letters were to be totalled and divided by 3, the quotient giving the chargeable number.

(3) The charges for Belgium and France were fixed somewhat elaborately in 10 zones, as follows :—

Distance.	Charge for telegrams of 1 to 20 words.	Charge for each extra 10 words.
1st Zone, 1 to 100 Km. ...	1.50	0.75
2nd „ 100 „ 250 „ ...	3.	1.50
3rd „ 250 „ 450 „ ...	4.50	2.25
4th „ 450 „ 700 „ ...	6.	3.
5th „ 700 „ 1,000 „ ...	7.50	3.75
6th „ 1,000 „ 1,350 „ ...	9.	4.50
7th „ 1,350 „ 1,750 „ ...	10.50	5.25
8th „ 1,750 „ 2,200 „ ...	12.50	6.
9th „ 2,200 „ 2,700 „ ...	13.50	6.75
10th „ 2,700 „ 3,270 „ ...	15.	7.50

To these, in the case of transit or terminal charges for Prussia, would have to be added another complicated distance and word rate, as the Prussian zones were based on smaller sections of 10, 25, 45, 70, 100 *miles*, &c.

Conferences and agreements continued. On Aug. 1 of the same year (1858) in the Palais Federal, at Berne, representatives of Switzerland, Belgium, France, Holland, Portugal, and Sardinia were present, Spain adhering later to the findings of this conference of the Union of Countries of the West.

The special aim of the conference was "to simplify the telegraph service and to introduce uniformity of principles between the various administrations." The sittings finished on Sept. 1, and so far as rates were concerned the urgent tariff appears to have been abolished. Telegrams could now be indited in seven of the European languages including English. The situation thus resulting, however, was that European telegraph correspondence as a whole, was subject to three sets of regulations, those of Berlin, Berne, and Brussels.

(To be continued.)

NOTES ON TELEGRAPH PRACTICE.

By G. T. ARCHIBALD.

VIII—Concerning the method of working at Branch and Sub-Offices.

AT the inception of the State Telegraph Service only one office was provided at each town, but with the rapid growth of traffic, following the transfer, additional facilities became necessary. Accordingly telegraph business was added to the work of a large number of branch and sub-post offices. Generally speaking these offices were provided with a means of communication with their own head offices either by wire or tube; this was the fundamental basis of telegraph development until the telephone system came to be regarded as a suitable medium for the transmission of telegrams.

There are now upwards of 12,000 post offices and railway stations in Great Britain and Northern Ireland at which telegrams are accepted from the public; in this respect, as in many others, the British Telegraph Service is superior to that of any other country in the world.

In the more important commercial areas and in the more populous districts, telegraph business is conducted at branch post offices, and at salaried sub-post offices, both town and country; these offices are staffed by established Post Office servants.

The larger proportion of sub-offices are, however, controlled by Scale Payment Sub-Postmasters who combine a Post Office agency with their private business. The scheme of payment of Sub-Postmasters is based on the volume and character of the work, and the scale of valuations is so graduated as to enable smaller offices to earn proportionately higher payments than the larger offices. The Sub-Postmaster's remuneration covers office accommodation, most of the fittings, fuel, light, &c., and, where necessary, indoor assistance; the Post Office pays the wages of boy messengers who may be employed in delivering telegrams from his office.

The prompt disposal of telegrams at this class of office, which deals with only a small number of messages a day, has always been something of a problem. The volume of traffic is not sufficient, except in a relatively small number of cases, to justify the employment of an assistant at the telegraph circuit alone; the Sub-Postmaster and his staff deal with all classes of Post Office business, and also attend to customers at the shop counter, and, for these reasons, the circuits over which the telegrams are transmitted must be as simple in character as possible.

At one time Wheatstone A.B.C., double plate sounder, and single needle were the more usual methods employed; the last named being a most efficient system for the kind of work it was called upon to perform. A working knowledge of the apparatus could be gained within a month and age was not, generally, a bar to manipulative efficiency.

A few telephone circuits made their appearance about 1890, but there was no great development in this direction until 1900 when it was decided that Wheatstone A.B.C. circuits should be substituted by telephone circuits wherever the change could be made economically.

At the same time it was decided to substitute Morse Sounder working for the double plate sounder and single needle circuits. The change was, apparently, based on two factors. It was assumed that aural reception was generally superior to visual reception—there was solid ground for this belief subject to one important qualification—and, secondly, it was felt that greater all round efficiency would follow the standardization, or virtual standardization of the means of telegraph communication.

It was also suggested that the larger offices would be enabled to draw upon the smaller offices for such additional force as was required during periods of seasonal pressure.

It is noteworthy that, coincidentaly, a wave of standardization was going on all over the telegraph world, Holland developed Hughes communication, France extended the use of Baudot working, and the United States of America planned an extension of the Autodot or Vibroplex system.

Opinions differed as to the wisdom of the change and many telegraphists thought that too much importance had been attached to standardization or universality. It is true that aural reception is superior to visual (other than printed) reception provided that the training in the former is given at an early age. Many Sub-Postmasters and a large number of their assistants—people of mature years—experienced difficulty in mastering the Morse sounder system. They had lost that suppleness of wrist necessary for the correct formation of Morse signals, their mental equipment was unresponsive to the subtleties of Morse sounder reception, they could not determine the fine distinctions between the up-click and the down-click of the sounder, and their opportunities for practice were so few that their efforts to learn were, in very many cases, more or less useless.

Practically every single needle and double plate sounder circuit had been converted to Morse working by 1906, by which time telephone working had begun to attract more attention. It soon became apparent that the telephone was an efficient telegraph medium for all cases where the number of telegrams to be dealt with daily did not exceed sixty. Conversion to this method of working has gone steadily on since 1908; it received a great impetus during the war when skilled telegraphists were difficult to obtain, and at the present time upwards of 4,000 telegraph offices are dependent upon the telephone.

The telephone possesses three important advantages over the Morse sounder system.

(i) A long manipulative training period is not necessary.

(ii) The circuit can be used jointly for telegrams and for telephone calls.

(iii) Telegrams may be telephoned direct in certain cases to the office of destination, and the number of transmissions is reduced.

On the other hand telegraph transmission possesses two important advantages over telephone transmission.

(*a*) There is less liability to error, each word being signalled letter by letter; there is, therefore, no danger of phonetic error and

(*b*) the rate of working is higher.

As regards (*a*) there are many evidences that the comparison is daily becoming more favourable to telephones, and now that arrangements are being made for telephonists to receive a more complete training in phonogram procedure &c., and to perform this class of work for longer periods the percentage of errors should rapidly diminish.

If the telegraph rate of working is better (*b*) there are compensatory features on the telephone side. A transmission can be saved on many telegrams sent by telephone, the time saved in these cases being generally greater than the difference between the telegraph and telephone rates of working.

Moreover, telephone subscribers in the areas concerned receive their telegrams direct from the last transmitting office—which means that a transmission is saved and the services of a messenger are not required.

The type of apparatus to be used on a telegraph circuit is dependent mainly upon the volume and incidence of the traffic to be carried and also upon the length of the circuit and the number of offices it serves.

At the present time telephone working is provided in all cases where the traffic does not exceed seventy telegrams a day with a busy hour load of fourteen. Call office circuits may be used jointly for telegrams and telephone calls when the daily load does not exceed seventy telegrams and telephone calls with a busy hour load of fourteen telegrams and calls.

Morse sounder working is usually adopted when the busy hour load exceeds the capacity of a telephone; where the busy hour load often exceeds 40 telegrams an hour or where there is a preponderance of traffic in one direction which causes undue delay, duplex equipment is provided. In this respect telegraphy possesses another advantage, for duplex telephony is not yet a practicable proposition.

As a general rule branch offices and salaried sub-offices are connected with their own head office by means of Morse sounder circuits. Certain of the busier offices in these classes are, however, provided with power tubes through which their telegrams are sent in carriers to the head office; a telegraphic transmission being avoided (see chapter VII). A more recent development is conversion certain branch circuits from Morse to printing telegraph working. The London—Borough High Street, London—Paddington Railway, London—Savings Bank Department, Edinburgh—Leith and Hull—Hull Fish Market circuits have been so equipped, with excellent results, and many more similar routes will shortly be converted to this method of working.

At one time it was thought desirable to connect sub-offices in one town to the head office in another town, largely for the reason that only a small proportion of the traffic handed in at those offices is for local delivery. Thus a sub-office in Llandudno was connected with Liverpool, a sub-office in Blackpool was connected with Manchester, and similar offices in Hastings, Brighton and other seaside resorts were connected with London. The introduction of newer types of apparatus has been responsible for a change of view and it is now accepted that it is more economical for such offices to send their traffic to their own head offices for transmission over printing telegraph circuits.

During the war the principal railway stations in London were connected with various provincial offices in order to save transmission at the Central Telegraph Office. Euston was connected with Birmingham, St. Pancras with Manchester, Waterloo and Paddington with Bristol, and Victoria with Brighton. The last named circuit alone remains and serves a useful purpose as, owing to the short railway journey, the time involved in the additional transmission at the Central Telegraph Office would frequently render a telegram useless.

It seems improbable at the moment that any radical change will be made for many years in the methods employed in centralising telegraph traffic. The laying of street tubes is becoming increasingly costly, and the more probable development seems to lie in the use of a simple printing telegraph machine which will work efficiently at a speed of not less than 40 words a minute. There is plenty of scope for the right machine and the improvements so far made in this type of telegraph apparatus are so satisfactory as to encourage the hope that in the next few years Morse telegraphy will have largely disappeared.

(*To be continued.*)

TELEGRAPHIC MEMORABILIA.

ON the 22nd ult. Mr. Sherrington of the Superintendents' Class Cable Room retired on a well-earned pension after 45 years of combined private and Government telegraph service. In the departure of "Sherry" from our midst the Department has lost one of its most zealous and loyal officers, and the staff a greater friend, may be than they will ever know. As a linguist he was a complete master of the French tongue, and as a follower of sport he was himself no mean competitor on the cinder-path, and only ceased to take an active part these last two years. He leaves behind him many friends, and those that know him best are those who most completely realise that in our friend there will continue to live a personality whose word was always as good as his bond.

Exactly 11 years last month direct telegraphic communication between London and Vienna was interrupted by what we did not at that moment realise was the shadow, no smaller than a man's hand, of the World's Great Tragedy. It was therefore with something more than the normal interest in the opening of additional international circuits that we greeted the renewal of direct working between these two cities. The London staff and supervision very much appreciated the kindly thoughts and greetings from the *chiefs* and *personel* of the Austrian office and trust that before long something of the old flow of traffic will return.

We feared it would come! The electrophone service, which for many years has enabled subscribers to the ordinary telephone service to hear theatrical plays, concerts, church services, &c., in their homes, is now terminated. Many subscribers had given up the "hearings" in favour of broadcast radio reception, and as the revenue had largely decreased, the Postmaster-General, says a contemporary, decided to withdraw the licence granted to the Electrophone Co., which for years has rendered excellent service, but has simply been out-classed by modern scientific progress.

A recent number of the *Financial Times* gave the following names of the undertakings at present incorporated in the International Cable Companies' Association:—

Eastern Telegraph, Eastern Extension, Australasia and China Telegraph, Western Telegraph, Indo-European Telegraph Companies, all of London.

Commercial Cable and Western Union Telegraph, New York.
Great Northern Telegraph, Copenhagen.
Campagnie Française de Cables Telegraphiques, Paris.
Deutsche Atlantische Telegrafengesellschaft, Berlin.

According to this authority "the Association is at present engaged chiefly in considering the proposals which have been put forward by various Government Administrations for discussion at the International Telegraph Conference, which is to open in Paris on Sept. 1, next. It is the practice in some Continental countries for the Government Administration to collect and deliver telegrams, and they are not quite satisfied with the charges. In particular, they propose that there be an increase of 50% on code messages. It is argued that users of the telegraph services invariably employ the maximum number of 10 letters when employing code, as opposed to the average of 6 letters in plain language. Code messages, owing to the use of awkward words, are not so easily dealt with as 'plain' messages, and so various Administrations are seeking the increase mentioned. The proposals emanate entirely from Government authorities and not from the cable companies. Code users are the best customers of the companies, and the latter are not anxious that any increase should be made." It is understood they would not however actually object.

DAMPED-WAVE DIRECTION FINDING.—In a paper recently read before the Wireless Section of the I.E.E., Mr. R. C. Smith-Rose, Ph.D., M.Sc., A.M.I.E.E., summarised the hitherto published knowledge on the relative advantages of damped and undamped waves for accurate direction-finding, and then describes some special experiments which have been carried out in this country by the N.P.L. for the Radio Research Board on this particular point. It is concluded that when direction-finding is employed at such times and under conditions which are known to produce the well-known "night effects" of variable errors in bearings and broad signal minima, these effects are equally likely on damped and undamped waves. Since the conditions under which direction-finding is accurate enough for marine navigation purposes at all times are now well-known to be connected only with the distance of transmission over land and sea, it is to be inferred that the type of transmitted wave is immaterial to the accuracy and that continuous waves, whether modulated or not, may in future be used with perfect confidence in all cases in which the damped waves from spark transmitters have given satisfactory results. These views confirm directly experiments that have been carried out by the United States Lighthouse Service with radio beacons provided with modulated continuous-wave transmitters for the use of direction-finders on board ship. Comparative tests made with them and with the ordinary spark beacon transmitter showed that at various distances up to 132 miles over sea the accuracies were practically identical in each case, both by day and by night. The faith of the authorities in their results is exemplified by the fact that they are already introducing modulated continuous-wave transmitters into their beacon stations.

A most interesting announcement was recently made, according to the *Morning Post*, by Prof. McLennan before the Royal Society, that he had determined the conditions that give rise to the peculiar green line found in the spectrum of the Aurora Borealis. This knowledge may be of the greatest

value in elucidating the problem of the transmission of "wireless" waves around the world. Photographs of the spectrum of the Aurora Borealis have been taken by numerous workers, and in the spectra obtained there has always been a green line amongst the bands at a definite point. Lord Rayleigh identified the bands with the spectrum of nitrogen, but the green line remained a puzzle, having never been reproduced in the spectrum of any element, *nor in the spectra of compounds of elements in laboratory experiments.* The green line was obtained recently at Toronto by the Professor and his co-worker, Dr. Shrum, in the spectrum of oxygen and helium, with the latter in excess. One peculiarity of the green line was that it could be obtained on almost any night from the light of a cloudless sky. Prof. McLennan now shows that the green line spectra ordinate in highly rarefied oxygen, and that the intensity is gradually enhanced when helium is added to the oxygen. The Aurora light comes from a region some 60 or 100 miles above the earth, and *the origin of the green line indicates that at this height the atmosphere* contains 20 to 30 times as much helium as oxygen.

The Electrical Review reports, in some detail, as follows, that two mission ships have recently been fitted with wireless apparatus:—(*a*) The s.s. *Strathcona II*, belonging to the Royal National Mission to Deep Sea Fishermen, which has been equipped with Marconi apparatus; *she is the only ship belonging* to the Mission to be fitted with a transmitter, thought other ships carry receivers. The vessel will undertake the duties of tender to the hospital stations on the shores of Newfoundland and Labrador. The transmitter is the standard Marconi ½-k.W. quenched-spark installation, and the receiver has been specially constructed to receive on all wavelengths up to 26,000 metres, thus covering all transmissions of meteorological bulletins, time signals, &c., which will be of especial value to the fishing fleets. Only one valve is employed in the receiver, and inductive coupling is used, which makes the tuning very selective; and (*b*) the Moravian Mission boat *Harmony*, which recently left the London Docks on her annual visit to Labrador, which is taking out a four-valve wireless set which has been specially made for use in the Mission boarding school for Eskimos and the children of settlers at Makkovik. The set is a present from listeners who heard Captain Jackson speak about the mission work in Labrador from 2LO. He hopes that the Makkovik school will be able to get American stations like Schenectady regularly, and be kept in touch with "home" through the news bulletins from Chelmsford.

BEAM STATIONS.—At the last meeting of the Spilsby Rural District Council it was decided to offer no opposition to the Government's scheme for the erection of a "beam" radio-telegraph station at Winthorpe, near Skegness, to communicate with Australia and India. The masts will be 300 ft. high. The Dorchester station, which will be used for communication with America, is the most advanced of the "beam" stations, and four masts have already been erected. Bodmin will be *the sending station*, and Bridgewater the receiving station to and from Canada and South Africa.

Writing on "Long and Short Wave-lengths" and "The Beam System," some two months ago, a correspondent of the London *Times* made the following remarks, the italicised portions of which appear to be of special value and application during these days of *experiment and of premature verdicts and* criticism:—

"When the path between two stations is in darkness, the results recently obtained show that communication can sometimes be established with the Antipodes using short waves and relatively small power and small aerials. With regard to the power employed it must not be overlooked that *great* advances have been made in the efficiency of high-frequency generators and of the aerial systems, and that consequently a much greater fraction of the *nominal* power is radiated than was the case a few years ago. In addition, the detecting and amplifying apparatus has been steadily improved, so that satisfactory reception can be obtained with weaker received field strengths than was formerly the case. *Although as a general rule it may be assumed that atmospheric disturbances are less troublesome with short waves, little is yet known about the reliability of these long night-ranges under various atmospheric conditions.*

"In making a comparison between short and long-wave transmission one should first determine what power would enable a modern long-wave station to guarantee a service for eight or 12 hours out of the 24. It must also be remembered that the long-wave station has been tried out over a long period of years and that the powers now employed are the result of great experience; whereas in the case of the short-wave system there is only a very meagre supply of experimental data and *no experience of the operation of a station under commercial working conditions.*"

In short-wave working there are also likely to be periods, and those during simultaneous darkness of the two terminal stations, when reception will probably be at zero efficiency.

BORNEO.—The Sarawak Government is installing Marconi telegraph and telephone instruments in two of its radio service stations, and is also opening new lines of communication by the use of further equipment of similar construction.

BELGIUM.—The *Times* states that daily radio communication between Belgium and the Belgian Congo has been obtained by the transmitting station at Machelen, near Brussels, using a wavelength of about 100 metres, and the receiving station at Stanleyville, in the Belgian Congo. The power used is about five kilowatts, and the station employs a dismountable pattern of valve of the Holweg type. The Elizabethville Chamber of Commerce recently complained of the paucity of news from Belgium, which hitherto has reached the Belgian Congo *via* Paris and the French Congo, or through the Johannesburg papers. The Government is now building a great radio station at Ruysselede, near Bruges, which will ensure direct communication. The work, however, has only just been begun, and will not be finished until 1928.

BOLIVIA.—According to *Commerce Reports* the Director-General of Telegraphs has sent to the President for approval a plan for the installation of a radio station at Puerto Suarez, in the Department of Beni, near the Brazilian border. The receiving station will be at Viacha, near La Paz. Power will be generated by a dynamo coupled to a petrol engine. The estimated cost of the installation is 45,000 Argentine pesos.

GERMANY.—An interesting decision to "broadcasting" in general and a decision of importance to the German broadcasting companies in particular has been given in a Berlin Court of Appeal. Two cases affecting the Funkstunde (Berlin) and the Mitteldeutsche Rundfunk A.G. (Leipzig) had come up for rehearing. In the first, the Berlin broadcasting station had been condemned to pay damages in a lower Court for having broadcast *Herr Hugo von* Hoffmansthal's drama "Der Tor und der Tod," without permission. The plaintiff in the second case, who had also been successful at the first hearing, was Herr Gerhart Hauptmann, whose play, "Hanneles Himmelfahrt," had been broadcast from Leipzig without the author's authority. The Mitteldeutsche Rundfunk was restrained by a temporary injunction from repeating the performance. In both cases the appeals of the broadcasting companies were dismissed.

Upon the same authority, the *Times*, it is stated that the Rhineland Commission is considering the possibility of rescinding to some extent the prohibition of broadcasting in the occupied area. The use of wireless apparatus is to be permitted for certain business and educational purposes, and the final decision regarding permits is to be left to the responsible Army Generals of the respective districts.

GREECE.—The *Financial News* records that the Greek National Assembly has rejected the proposed agreement with the Marconi Co. concerning the establishment of radio stations in Greece.

IRELAND.—The Marconi radio-telegraph station at Clifden is to be *dismantled, and has been sold to Messrs. Thomas W. Ward, Ltd., of Sheffield,* for that purpose. This station has played a leading part in the development of commercial radio communication; it was the first station to have regular communication with America, on a wavelength of 7,000 metres. The erection of the high steel masts was considered a notable engineering feat at the time; the plant and equipment has now become out of date.

LONDON.—On June 11, the House of Lords Standing Committee passed a provision in the Public Health Bill which gives local authorities power to prevent danger or obstruction to persons using the streets caused by radio aerials or other apparatus that might be liable to fall on them. This measure will enable local authorities to acquire the right, which they have not hitherto had, of prohibiting the use of aerials over streets and any "public place."

NEWFOUNDLAND.—A wireless station for sale! The British Admiralty has offered for sale by public auction the large radio station near St. Johns, built during the war at a cost of £50,000 for assisting and directing the movements of the Allied warships in the western sections of the North Atlantic. Rapid development has rendered the equipment more or less obsolete, and for the past three or four years it has not been working at all. On the information given by the *Daily Mail*, it is stated that the Admiralty two years ago offered it to the Newfoundland Government, but the offer was declined, as the Government found that it could not be made commercially available *without very heavy outlay, and now it is to be sold either as a whole or* piecemeal! Advertisements have been circulated in the United States and Canada with a view to attracting the attention of possible buyers, and a wider publicity is given to the offer through these columns in case any of the readers of our far-flung circulation should be among likely bidders!

PANAMA.—*The Telegraph and Telephone Age* reports that in order to facilitate the dispatch of vessels through the Panama Canal, a printing system of nine sets of Kleinschmidt telegraph typewriters has been installed at Balboa and Cristobal and at the Gatun, Pedro Miguel, and Miraflores locks. Prior to the installation of these machines, orders governing the dispatch of ships and messages relating to their various requirements were transmitted by telephone.

ROUMANIA.—A Bucharest correspondent states that the Roumanian law authorising the introduction of a wireless service will come into operation in September, the law providing for the formation of a company with Roumanian capital. It is proposed to permit the importation of wireless apparatus and constituent parts to any desired extent, and the idea is to import from Germany, France, Italy, and Austria.

SOUTH AMERICA.—One of the obstacles to commercial organisation in isolated parts of the world is the absence of developed telegraph and telephone systems, giving facilities for rapid communication upon which frequently depends the success of a business venture. To overcome this difficulty, an increasing number of firms in various parts of the world are installing radio apparatus *to keep their branches in remote places in touch with head-*quarters. One of the latest commercial concerns to employ such means of communication is the Royal Dutch Shell Group, which has installed Marconi equipment to enable its outlying properties in South America to maintain telephonic communication with the local headquarters. The transmitters in use have a power of ½-kW; the receivers, of the type RP 7 have five valves and are self-contained in a teak box, which forms a travelling case should the receivers be required for portable purposes.

SPAIN.—King Alfonso broadcast a speech at the official inauguration of the Union Radio Co.'s broadcasting station in Madrid, on a wavelength of 440 metres. The station's call sign is EAJ20 and its power 6 kW.

SWITZERLAND.—Since the Geneva, Lausanne, and Zurich broadcasting stations began their service, the number of receiving sets in Switzerland has increased by nearly 16,000. According to the *Times*, there were only three registered receiving sets in 1911. In 1923 the number rose to 980, and at the end of last year to 16,964, exclusive of private sets which have not been registered. The Swiss Federal Post and Telegraph Office controls private receiving sets, and theoretically no individual is allowed to have a set unless it is registered. Moreover, individuals sign a promise to the effect that they will permit the Federal controllers to inspect their sets at any time.

TURKEY.—After the decision of Greece with their rejection of the agreement for the establishment of radio stations comes the following story and comments of the *Morning Post* on the situation in Turkey on the same matter. Says that authoritative newspaper: "The second tenders for erecting a high-power wireless station at Angora capable of communicating with all world stations will be dealt with almost immediately. The first adjudication was annulled about five months ago by the Turks for administrative reasons. The specification for the Angora station will run into figures for which Turkey's budgetary resources are unprepared. The scheme would possibly even absorb two years' complete credits for posts and telegraphs, but the contract is being fought for by the German companies, though they will have to give the Turkish Government an engagement that they are not infringing any patent rights. The French and British companies may be last in the field, but it would not be surprising to see the scheme held up again for a time when the Turks realise what it involves!

UNITED STATES.—*The Electrical Review* informs us that America is making use of radio apparatus for a new commercial purpose. A large receiving station has been erected on Manhattan Island solely to trap atmospherics caused by approaching thunderstorms, say Press reports, and distant flashes of lightning are made to ring an alarm bell automatically, the frequency of the ringing corresponding to the nearness of the storm. By this means electric light companies are enabled to gauge the approach of storms several hours before they arrive. Usually they get about six hours' notice, ample time for the engineers in the power houses to meet increased demands for electricity owing to darkness caused by the storm. Since this system has been in operation, the inconvenience caused by thunderstorms in New York to power companies and their customers has been greatly reduced.

A glance at the front page of this issue may possibly give the impression to readers of these columns that the time—at least of my *official* funeral—must surely be approaching, and thus though it lend colour to the rumour I can find nothing more apt this month for my closing couplet than a slightly altered version of *Titus Andronicus*:—

"Lo at this tomb thy tributary tears
Thou renderest for thy brother's obsequies."

J. J. T.

SUBSCRIBERS' VISITS TO EXCHANGES.

BY J. G. MACKAY (*Asst. Traffic Supt., Glasgow*).

With the general adoption of the message rate and consequent disputes as to the number of calls passed, increased interest has been taken by subscribers in the working of the telephone exchanges. This, together with the fact that they are encouraged to do so, has resulted in many of the public visiting our exchanges.

It, of course, is advocated that a large exchange should be chosen, so that as good an impression as possible of the magnitude and intricacy of the system should be created.

Experience has, however, indicated that it was not convincing enough to show a subscriber a spare position and to describe the various signals, or even to explain the conditions at a working position. A simple device therefore has been adopted at the Glasgow Central Exchange with a view to overcoming this handicap, e.g. the demonstration arrangement consists of (1) two spare lines connected to a spare "A" position and (2) two 750ω lamp glow testing plugs with which to operate the signals on these lines.

The procedure adopted is as follows:—

The subscriber is given a general idea of the exchange, A. and B. positions, arrangement of the subscribers' multiple, junction multiple, the meaning of the various multiple markings and so on. With the aid of the two 750ω pegs the visitor is then shown:—

(1) *A local call.* One of the 750ω plugs is inserted in the relative multiple jack to operate the calling signal and after answering this by demonstration—taking the number required, plugging into the multiple jack and ringing—the other 750ω plug is placed in the multiple jack of the called number in order to extinguish the supervisory signal. Alternatively, of course, the call may, if required, be completed on the visiting subscriber's own line.

(2) *A junction or engaged call.* Subscribers frequently state they ask for a number—get the intermittent B.B. buzz—they put up their receiver and assume the call is registered as effective. At this point, therefore, a supervisor at the distant exchange is asked to connect the junction in use to the busyback, the 750ω plug is withdrawn from the calling subscriber's line, and the visitor is shown that, although he puts up his receiver, the telephonist has definite evidence that his call has been ineffective and registers accordingly.

(3) The operation of the recalling or supervisory signal is shown by the withdrawal and re-insertion of the 750ω peg in the calling subscriber's multiple jack.

That a subscriber cannot have an incoming call registered against him is demonstrated by showing that the metering power is only connected to the answering cord, and that the one cord must always be used, is shown by indicating that the ringing power is connected only to the calling cord.

The effect of a "cut off" is shown by making a connection to one of the phantom subscribers' lines at a position some distance away, and putting a 750ω plug in the multiple jack of the same line at the demonstration position. It is then explained to the subscriber that there is a call on this subscriber's line at another position and that inadvertently the telephonist cuts it off. The connexion is then taken down at the distant position and the calling signal is consequently received at the demonstration position. This illustrates why, when a cut off occurs, the operator comes into circuit with "Number, please."

The subscriber is specially shown that, once a telephonist plugs into his line, his calling lamp has no further part in the call, and that all signals are then received on the supervisory lamps.

As an illustration of the improbability of the alleged excessive overcharging it is often pointed out that if the subscriber was making 10 calls per day, and that if at the end of the quarter his record was less by 100 than the department's, it would represent only one call per day not recorded at his office. If on the other hand the error was at the exchange, as ten calls is only approximately a sixtieth part of the telephonist's daily load, she would be working at the rate of 60 errors per day in recording from the beginning to the end of the quarter, to make a discrepancy of one in ten.

The subscriber usually appreciates that although the operator may make errors it cannot materially affect any one subscriber so far as charging is concerned.

Many subscribers are of course impervious to any sort of reason, and it is unfortunate that their main desire is apparently to get "away with it" as cheaply as possible without due regard to their legitimate debts. Unfortunately many consider this good business. In most cases, however, possibly in 99%, a visit removes the atmosphere of doubt, and the subscriber goes away not only satisfied, but with a new idea and better appreciation of the telephone service.

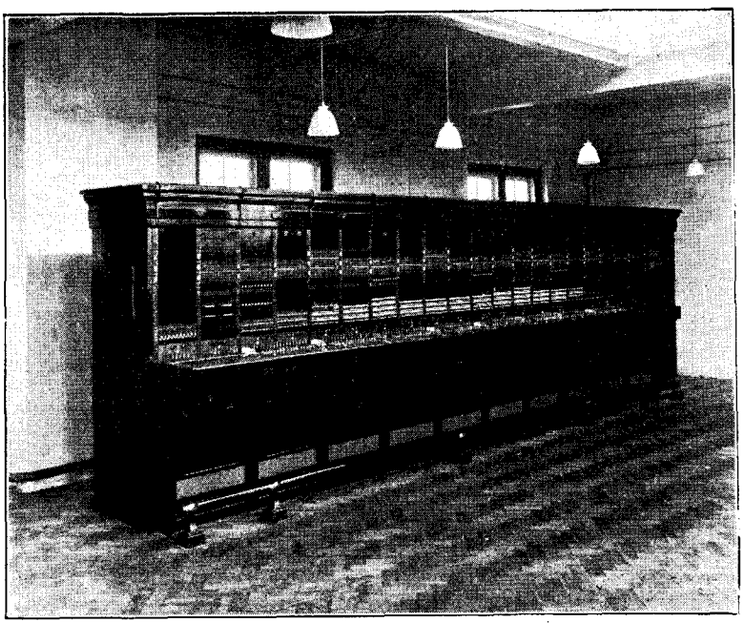
This latter consummation, so devoutly to be desired, is being worked for energetically, and every opportunity is being taken, not only to deal with the subscribers who wish to see the exchanges, but to encourage all subscribers, more particularly perhaps the "doubting Thomases."

The method outlined above, or other equally efficient, may, of course, be in use in other districts. There is no doubt, however, that a simple and inexpensive arrangement such as described has an effect which, though it cannot be measured, must nevertheless be considerable.

WESTON-SUPER-MARE'S NEW TELEPHONE EXCHANGE.

ALTHOUGH but a small fishing village in 1805, Weston-super-Mare has since developed into a highly popular watering place, chiefly by virtue of its equable climate and beautiful environs. Although the population of this urban district seaport town was 31,643 at the 1921 census, it has not attained a sufficient telephone density to warrant its inclusion at present on the Post Office Engineer-in-Chief's programme for conversion to Strowger Automatic working.

At the same time telephone requirements in the district necessitated expansion, and there has just been completed, and cut into service at Weston, a new central battery manual telephone switchboard. This equipment, which is of the No. 10 type, has been manufactured and installed for the Post Office by Automatic Telephone Manufacturing Co., Ltd., Liverpool, and has a present capacity of 800 subscribers' lines, with accommodation for an ultimate growth to 1,880 subscribers.



FRONT VIEW OF NEW MANUAL C.B. SWITCHBOARD.

The switchboard itself is a subscribers' multiple "A" and "B" board, with 4-panel multiple. The order and number of sections, viewed from the front of the switchboard and from right to left are :—

One cable-turning section with meter panel.
One 2-panel section unequipped.
Two 2-panel sections equipped with jack ended junctions.
Six 2-panel subscribers' sections.
One 2-panel supervisory position and plugging-up lines.

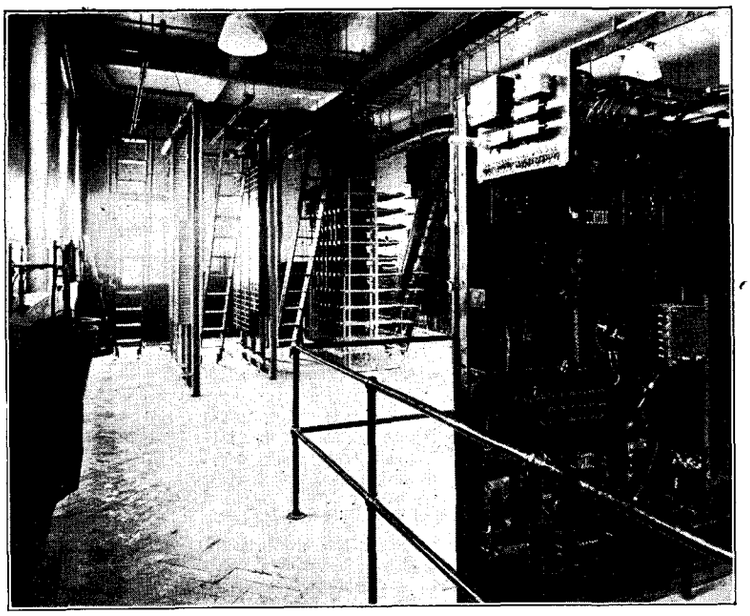
The two outgoing junction positions are each equipped with 17 cord circuits, whilst the six subscribers' positions are equipped with 16 cord circuits.

Dialling-in equipment is fitted to the keyshelf at each operator's position to facilitate the direct dialling of subscribers associated with near-by automatic exchanges, e.g. Newport, Hereford, and Gloucester, the conversion of the last named to Strowger Automatic operation being already in progress.

Other auxiliary equipment of the new Weston telephone exchange includes M.D.F., I.D.F., relay and meter racks, special apparatus rack, repeating coil and condenser rack, fuse board, a 1-position test desk and a 2-position supervisor's and monitor's desk, together with the necessary power plant and batteries for supplying current both to the exchange and to the subscribers' telephones.

The switchroom is on the second floor of the Head Post Office, and is immediately above the apparatus room on the first floor. The battery room adjoins the latter.

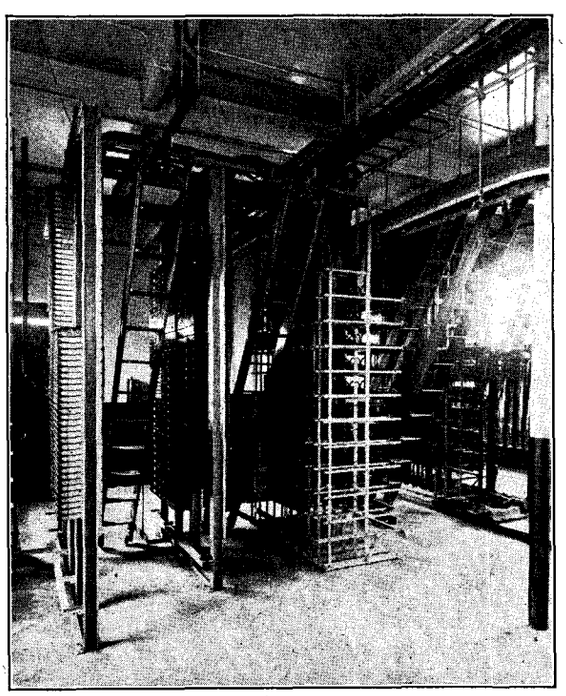
The power plant comprises a charging motor generator set having an output of 65 amperes at 28 volts. It consists of a protected type shunt wound motor designed for operating on 460 volts D.C. supply, direct-coupled to, and mounted on the same bedplates as a shunt wound dynamo, with voltage regulation between 24 and 32 volts, the speed being 1,000 r.p.m. There is a 2-panel enamelled slate power board, the left-hand panel carrying battery fuses for the manual circuits, whilst on the right-hand panel are



BACK VIEW OF POWER BOARD, RACKS IN BACKGROUND.

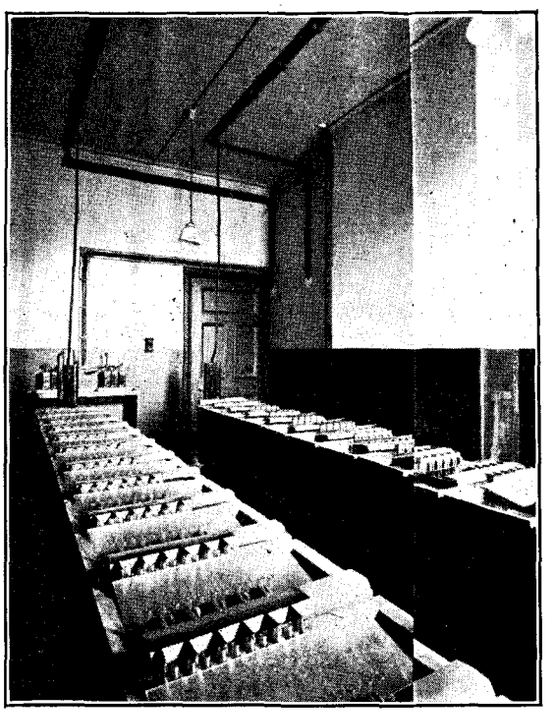
mounted the ringing machines, with control switches and fuses. These ringing machines, in duplicate, are designed to work off the exchange main battery.

On the right-hand panel of the power board there are also mounted a meter battery control switch ; ammeter and voltmeter, with multi-way switches ; generator field rheostat ; S.P. circuit breaker ; together with charge and discharge switches for the main batteries. One 75 amp. enclosed type fuse is included in the negative lead of each main battery. The main batteries, which supply the whole of the current for operating the Weston-super-Mare telephone network, comprise two sets of 12 L.P. 11 type Tudor elements in lead-lined boxes. Each battery has a present capacity of 282 ampere hours when discharged at the nine hour rate, and the existing boxes are large enough to accommodate extra plates to bring the capacity of the battery up to 452 ampere hours when extensions of the system require it. This extra space is at present cut off from the main acid compartment by lead partitions in the individual cells. The normal charging rate for the present capacity of the batteries is 50 amperes, and the ultimate maximum charging rate, 80 amperes. The additional voltage necessary for operating subscribers'



METER AND RELAY RACKS, M.D.F. AND I.D.F.

meters is furnished by a small auxiliary battery of th cells, also in duplicate, and either of which may be placed in series with the main battery in service at the time. The main batteries are supported on steel racks.



MAIN BATTERIES.

Now that Weston-super-Mare telephone users have been furnished with the most up-to-date manual switching equipment remains for them to boost the service and popularise the use of the telephone by all classes to such an extent within the next decade as to justify a subsequent conversion to Strowger Automatic working when the present switchboard is approaching the end of its useful and economic life.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE total number of telephone stations working at the end of May was 1,292,577, 18,979 new stations being added which, after allowing for 8,190 cessations, gives a net increase of 10,789 over the April figures.

Statistics of the growth in telephones, call offices, rural circuits, etc., for the month of May are summarised in the following table :—

	London.	Provinces.
Telephone Stations—		
Total at 31st May	455,397	837,180
Net Increase	3,062	7,727
Residence Rate Installations—		
Total	64,645	143,294
Net Increase	1,309	2,094
Exchanges—		
Total	105	3,727
Net Increase	—	16
Call Office Stations—		
Total	4,232	14,817
Net Increase	26	97
Kiosks—		
Total	121	1,068
Net Increase	4	56
New Exchanges opened under Rural Development Scheme of 1922—		
Total	—	703
Net Increase	—	14
Rural Party Line Stations—		
Total	—	9,454
Net Increase	—	34
Rural Railway Stations connected with Exchange System—		
Total	—	620
Net Increase	—	7

A brief review of Trunk statistics for the year 1924/25 may be of interest.

The total number of inland calls dealt with was 77,288,439, an increase of more than 7½ millions, or 11% over, the traffic for the previous year.

The number of trunk calls originating from London exchanges during the past year was 9,773,380, of which 6,919,239, or 71%, passed through the London Trunk and Toll exchanges.

A comparison of the Inland Trunk statistics for the two past financial years is given below :—

	1923/24	1924/25	Increase	%
No. of Trunk Calls...	69,607,880	77,288,439	7,680,559	11%
No. of exchange lines (mean for year) ...	690,852	769,456	78,604	11%
Average No. of Trunk calls made per exchange line	101	102	1	1%
No. of Trunk circuits at end of year ...	10,290	11,636	1,346	13%
Average No. of Trunk calls made per working day ...	224,542	250,124	25,582	11%

During the past year 202,379 calls were made to the Continent, of which 10,567 were contract calls. During 1924/25 ten further circuits to the Continent were added, three to Paris and seven to Holland, making a total of 38 circuits working at the end of March, 1925.

The following is an analysis of the growth in the Anglo-Continental traffic :—

	1924/25	Increase over last year	Percentage increase
To France	115,354	17,666	18%
„ Belgium	36,693	4,226	13%
„ Holland	47,724	16,995	55%
„ Switzerland	2,608	273	11%
Total	202,379	39,160	24%

Of the bothway traffic for the year, *i.e.* to and from the Continent, 47% of the French calls originated in this country, 42% of the Belgian, 50% of the Dutch and 55% of the Swiss.

Further progress was made during the month of June with the development of the local exchange system. New Exchanges opened included the following :—

PROVINCES—Leek, Didsbury, Cwmbran, Kirkcaldy, Risca } Automatic

and among the more important exchanges extended were :—

LONDON—Langham, Ravensbourne, Reigate.

PROVINCES—Aberdeen, Bournemouth, Buxton, Canterbury, Chorlton-cum-Hardy, Guildford, King's Norton, Leicester, Slough.

During the month the following additions to the main underground system were completed and brought into use :—

Glasgow—Motherwell—Hamilton—Wishaw—Carluke.

Uxbridge—Slough.

Cardiff—Newport (section of Gloucester—Newport—Cardiff cable.)

Newport—Risca.

London—Sutton.

Wigan—Atherton.

Preston—Ormskirk.

while 67 new overhead trunk circuits were completed, and 66 additional circuits were provided by means of spare wires in underground cables.

The
Telegraph and Telephone Journal.

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NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

VOL. XI. AUGUST, 1925. No. 125.

TELEPHONE DEVELOPMENT OF CITIES.

THE article which we publish in another column dealing with the telephone development of British cities raises the vexed question of comparing like with like in statistical arguments. Our correspondent endeavours to show the number of telephones existing within the municipal and town boundaries of the places dealt with in his article so that they may afford a fair basis of comparison with foreign city telephone systems which in most cases include only the telephones within the city boundary.

Last month paragraphs appeared in several papers stating that amongst the cities and large towns of the world *excluding America*, Paris was thirty-first in the list and London thirty-ninth. We have not the faintest conception what the compilers of this list may consider as a "large city" and so bring both Paris and London so low in the list, but we do know that in a fair comparison between London and suburbs with Paris and suburbs, or London proper with Paris proper, London stands above Paris. Moreover, it should be borne in mind that what we are calling "London proper," i.e. the County Council area, includes a large number of suburbs such as Greenwich, Woolwich, Sydenham, Streatham, Putney, Fulham, Hammersmith, Hampstead, &c.

If moreover, we take cities of a million inhabitants and upwards, *excluding America*, we shall find London is only surpassed in telephone density by Berlin and Hamburg. If we take cities which with their suburbs boast over half-a-million inhabitants (again excluding America), the order of merit will be somewhat as follows :—

	Inhabitants per telephone.
Copenhagen and suburbs	7
Berlin and suburbs	10
Hamburg and suburbs	10
Munich	11
Leipzig	11.5
Cologne	12.3
London (L.C.C. area)	12.7 (13.6 in 1923)
Sydney and suburbs (1923)	13
Dresden	13
Melbourne and suburbs (1923)	13.9
Paris city (1923)	14
Breslau	15
London and suburbs	16.8 (17.6 in 1923)
Vienna	18
Paris and suburbs (1923)	19

The French and Australian figures for 1924 are not yet to hand, and it is possible that Melbourne or Sydney may now surpass London in development. In any case, London's place is about seventh or eighth amongst really large cities of the Eastern hemisphere, it is only separated from the places immediately above and below it by an insignificant difference. A long list of great towns on the wrong side of the 20 could be added. Perhaps eighteen cities in the Eastern hemisphere with a population of upwards of 250,000 may surpass London's figure of 12.7, but lower down the scale than a quarter of a million we need not go.

Those interested in fantastic or purely non-utilitarian and ornamental statistics may care to know that in the ancient City of London there are over six telephones to every "inhabitant." This arresting and solemn fact may perplex foreigners but will be easily understood by a Londoner.

HIC ET UBIQUE.

Will Telephones make M.P.'s lose their jobs ? asks an American telephone journal, and goes on to say :—

"Because they have telephones in their homes, certain members of the British House of Parliament learned recently that there was danger of their being deprived of their seats. The British telephone service is owned by the government and is an adjunct of the Post Office service.

According to an act of George III's parliament, any person undertaking a contract with a government department shall not be entitled to sit in the Houses of Parliament, and as the telephone is owned and operated by the government, the question has come up as to whether or not the law is being violated."

We think American papers may well be excused for being puzzled since, according to our own impression, it was some ingenious English journalist who first started this March hare, and contrived to confound the process of accepting a contract to do work for the government and that of entering into an agreement with the government to perform something for them.

Mr. Norman Angell comparing, in the *Spectator*, an English town of 279,000 inhabitants (disguised as "Birchampton") with an American "Birchampton" of 30,000 inhabitants, concluded his observations as follows :—

It will be said that all these things are external and trivial; that bath-rooms and running water, telephones, habitable hotel rooms, decent restaurants and elaborate mechanical conveniences do not make up civilization or "the good life." I am not urging that they do. I am merely calling attention to the fact that the good life for a country in the position of Great Britain, dependent to the extent of half its population on a highly organized industry and commerce, cannot be achieved without them. They are not all-sufficient, but they are indispensable. For good or ill, the prompt and efficient management of life in the western world of to-day demands an infinite number of adjustments for which an apparatus of post and telegraphs and railways, telephones, typewriters, labour-saving devices are necessary. The country's daily business—its industry, commerce, government, instruction—is made up of that multitude of arrangements and adjustments to which all this apparatus is necessary.

In this short period of thirty years the English city, from being much in advance of the American, has fallen much behind. The ease and efficiency of English life is hampered by the absence of those things in which we were the pioneers and about which we used to boast, so that to-day the English worker who lives by industry uses less than two-thirds of the mechanical power which the American worker manages to direct. In an age of machinery that difference is fatal.

What is the cause of it? And what the remedy?

We concur in writer's main argument. The importance of telephones and other labour saving devices can hardly be over estimated, although as we have before pointed out in these pages, they are not the ultimate test of civilisation. For instance, Tennessee possesses about eight telephones per hundred inhabitants, and Belgium less than 2%. But we need not labour our point.

The Telegraph Administration has, according to *Swedish Export*, contracted with the L. M. Ericsson Co. for the erection of a new automatic station in Stockholm with a capacity of 20,000 subscribers. The Vasa station, which was coupled in some time ago, has been increased from 5,000 to 8,000 lines, and the Kungsholmen station for 12,000 lines is under construction. The station just ordered is expected to be ready in 1928.

The laying of long-distance underground telephone cables between Tokio and Okayama, says *Eastern Engineering*, will cost 30,000,000 yen. The distance is over 467 miles. The Tokio-Osaka line will be completed in 1927, and the Osaka-Okayama line in 1929, while the Nagoya-Kyoto line will be connected in July, and Nagoya-Osaka line in September this year. From these trunk cables will be extended to Kyushu in the west and Hokkaido in the north in the future.

Honour to whom honour is due, says the *Manchester Evening Times*—especially when the object in question is invariably maligned.

People may joke about our telephone system as much as they like, but only this week I came across the case of a Manchester man who, on asking for a telephone had it installed, complete and working within three days.

At a rather serious fire at Ramsgate recently, eight people, finding themselves cut off in the top of a building early in the morning, resorted to the telephone to call the Fire Brigade and were rescued by the fire escape. The direct exchange line fitted in one of the top flats undoubtedly saved their lives.

Poor England! Not only, according to Sir Hugo Hirst, are we the worst telephoned, but also apparently the most ill-lighted of the nations.

Sir Hugo, quoting as official figures that the lamps used per head of population in U.S.A. are 1.74, in Switzerland 1.62, Germany .88, France .72, and in the United Kingdom only .42.

> New lamps for old! Ah, we must not make light
> Of Light statistics, but each spot make light,
> Until in England's green and pleasant land
> Bright bulbs each mansion and each cot make light.

REVIEWS.

"*St. Martins Le Grand*" is always readable from cover to cover, but Part III, Vol. xxxv, the number for the present quarter, is particularly so at least from a Telegraph point of view. Our contemporary opens with "The Spirit of The Post Office," by Mr. John Lee, who gives a new view of the individual character of Post Office work, with its more sympathetic and helpful attitude towards the public now made possible by a wider visioned administration than the shining lights of other days. Then there is The Post Office Exhibit at Wembley with its special references to both the Telegraph and Telephone, followed quite closely with "Post-prandies" by A. A. J., who has never yet been severed from the telegraphs either in peace or war, and at the foot of this same article, "The Inn at Bryncynan" meets one's eye and catches one's fancy. Those who have had the pleasure of meeting and *knowing* the delightful personality of Edward Ernest Baugh, of Lowestoft, Nevin and other telegraph repeater offices, will recognise in the following verse the lilt and flair of E.E.B. at his best:—

> The inn at Bryncynan was gateway to France,
> For victory's glory or battle's mischance,
> Its walls have known merriment mixed with a tear,
> And stores of strategy flavour the beer!"

Last but certainly not least in "The Shadow of a Screech-Owl's Wing," by Nancy Belderson, the bearer of a well-known name, whose mother was a telegraphist and whose father is still in the service as a postmaster, makes her debut as a writer in this beautiful, well-sustained story, touched with the true spirit of poetry and fancy, and saturated with a love of nature in field and lane and flower and bird and tree and all the elfin legend which only a nature lover could interpret as admirably as is undoubtedly the case with the daughter of our colleague. If S. W. B. is always excellent in his Rural Notes, then N. B. is certainly something even better, and S. W. B. will probably be quite satisfied to learn that this is the critic's opinion.

J. J. T.

"*An Outline of Automatic Telephony*," *by William Aitken, M.I.E.E., Assoc.A.I.E.E.* (*London: Ernest Benn, Ltd.*) 143 pp. *5s. nett.*

This little book, the Author of which states that its purpose "is to give, within small compass and at a reasonable price, a succinct yet comprehensive description of the telephone systems at work in the world to-day," fulfils its object.

The book should be of considerable use, not only to the engineering student, but to those who require to know the fundamental principles of the various automatic systems in use to-day. It seems a pity, however, that a description of the fundamental principles of the Relay Automatic Telephone Company's system is not included.

The reference on page 19 to the lettering on the dial for the London Automatic System is apt to lead readers to believe that the Dial Front, Fig. 5 on page 18, is the one that will be adopted, a conclusion which is not in accordance with fact.

On page 117, line 14, apparently "relay R2" *should read* "relay GR2."

The Author is to be congratulated in getting such useful fundamental information into a small well-indexed volume.

J. M.

MR. DONALD MURRAY.

Our readers will observe from our advertisement pages that Messrs. Creed & Company, Limited, have acquired the manufacturing business of Mr. Donald Murray. While all telegraph men will welcome an extension of the activities of Messrs. Creed & Company, it is to be hoped that this development does not signal the approaching retirement of Mr. Murray from the telegraph field. The telegraph world owes too much to Mr. Murray for his passing to be regarded with anything but the very greatest regret.

THE POST OFFICE AND AUTOMATIC TELEPHONES.*

BY COLONEL T. F. PURVES, O.B.E., M.I.E.E.

(*Continued from page* 200.)

In a field in which invention has been so rich as in that of automatic telephony, it is impossible to choose and standardize a single system without a certain measure of regret that features of great interest and utility associated with other systems have necessarily to be sacrificed. The facilities for large group selection which are inherent in the panel system were not given up without reluctance, although it is believed that an excellent substitute for them is provided in association with the step-by-step system by the methods of grading smaller groups of outlets and, if necessary, interpolating additional trunk-hunting switches, as already referred to. The "rotary" system of the Western Electric Co. also includes many attractive features which are not applicable to the selected system. The same applies to the striking machine-driven system recently introduced by Messrs. Ericsson of Stockholm and now installed at Rotterdam and elsewhere. The 500-point selector switches of this system and the method of constructing its multiple fields are of great interest to telephone engineers. The Relay Automatic Telephone Co.'s system had also shown itself to be a convenient and economical system, at least for the smaller exchanges. But these systems all differ fundamentally from the system chosen and could only be made to intercommunicate with it by the addition of costly and complex special devices for interchanging traffic. The inherent complexity of even a perfectly uniform automatic system serving a large area is necessarily such that any deliberate policy of including in it exchanges of radically different type would be almost criminal!

I am far from asserting that the London system will, in 20 years' time, necessarily stand as a model for the world to copy, but I am confident that the adoption of the step-by-step system, with the notable addition of the automatic "director" and other technical developments as worked out for London, represents the most practically suitable and effective way in which the telephonic needs of the next generation can be met in that great and important area.

It is understood that it has now been decided to install a step-by-step automatic system in Berlin, and that the same applies to the system of reconstructed exchanges which will replace those recently destroyed by the earthquake in Tokio.

(10) THE AUTOMATIC ELECTRIC COMPANY'S "DIRECTOR" SYSTEM.

It has already been mentioned that the addition of the "director" to the long-established Strowger automatic system has endowed that system with facilities which enable any required connexion to be set up by means of trains of controlling impulses having no necessary relationship with the impulses sent in from the calling dial of the originating subscriber.

The function of the director is to receive and store the call in its original form, and to proceed to send it out into the exchange switching mechanism, translated into any trains of impulses which may be required by the existing layout of junction routes and switching centres, to steer the call through, link by link, to the line of the required subscriber. As soon as the required connexion has been established, the director disconnects itself from the line and becomes available for other calls.

The London subscriber's calling dial will carry a combination of letters and digits similar to that already referred to in connexion with the panel system, and the arrangement of exchange names and numbers in the telephone directory will also be identical with that adopted for the panel system.

It should be noted here that the translation effected by the director applies not only to the number of impulses in a train but also to the number of trains sent. The subscriber will be required to signal 3 letters and 4 digits for each call, but the director can transform these 7 impulse trains into any number of directive trains from 5 to 10. This attainable maximum provides more than adequately for any possible future requirement of the London system, or any other system.

The director consists of 9 switches with associated relays and a cross-connecting field. Two switches are of the usual Strowger type having vertical and horizontal movements; these are designated the "A" switch and "BC" switch respectively. Two switches are of the pre-selector type and are designated the "sending switch" and the "sending control switch." Five switches, designated "minor switches," are practically small Strowger switches with rotary movements only. Four of these switches are used as digit-storing registers and one as an impulse distributor.

The "A" digit switches are grouped on separate racks and do not form part of the assembly of an individual director, which includes all the other pieces of apparatus mentioned, mounted on a rectangular frame measuring about 24 in. by 18 in. (see Fig. 16).

The "A" digit switch receives the first train of impulses dialled by the subscribers, which corresponds to the first code letter of the exchange required. Each level of the "A" switch is associated with a separate group of directors set apart for effecting connexions with exchanges having names commencing with the same, or an equivalent, letter, and the "A" switch, having been dialled to a particular lever, searches to find the "BC" switch of a free director on that level.

The second and third trains of dialled impulses are received by the "BC" switch; the second train lifts the switch brushes to one of the 10 levels, and the third train rotates the brushes to a particular set of contacts on that level. The "BC" switch is equipped with 6 brushes and 6 separate sets of bank contacts. Thus the dialling of the second and third of the three initial or "code" letters of the required exchange has set the "BC" switch of a director in a particular group to 6 particular multiplied contacts, and has closed 6 circuits which will always be closed by any subscriber who dials that exchange code. The 6 circuits thus set up, when suitably cross-connected, enable the switches of the director to send out any desired number of trains of impulses from 1 to 6 (each train consisting of any number of impulses from 1 to 10) and so steer the call by its prescribed route to any required exchange, where the direct operation of the final 4 trains, representing the numerical digits of the dialled number, will reach the line of the called subscriber.

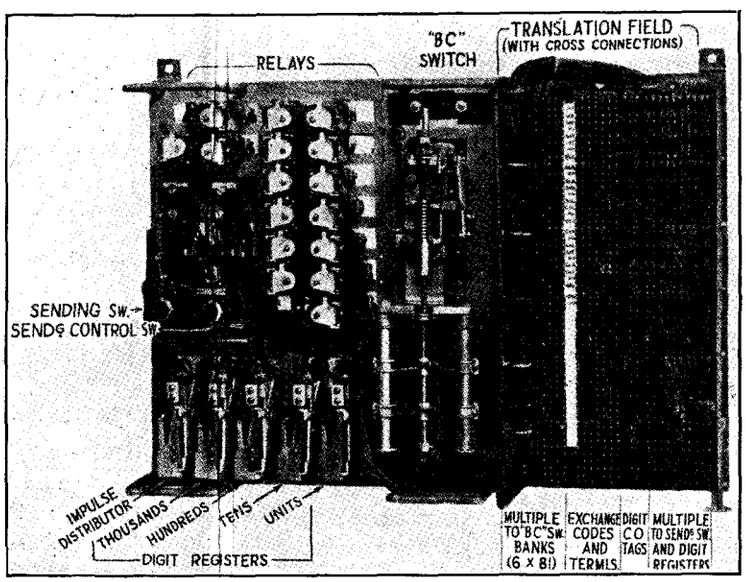


FIG. 16.—View of Director Assembly.

It will be noticed that the initial letter of the exchange code—absorbed in the "A" digit switch—does not pass into the director and is not subjected to translation. It is found that the total quantity of apparatus required can be reduced by confining translation to the second and third code digits, and setting apart a group of directors to handle calls for the exchanges having initial letters with the same numerical equivalent. The first train of impulses is therefore used to select the level of the "A" switch which gives access to the appropriate group (ABC = level 2; DEF = level 3, &c.).

The directors of each group are capable of serving 81 exchanges, and as 8 group levels are available on the "A" switch the total number of exchanges which could be served without mechanical modification of the directors is 648. This is so far above the number of exchanges ultimately required in London that the cross-connexion field has been designed to serve 35 exchanges in each director group, or a total of 280. Even with this reduced number abundant spare space can be left, on the directors appropriated to each three initial letters, to avoid any restriction in the choice of exchange names on that account, although such restriction could easily be applied if necessary.

Under average conditions a director to which properly graded access is provided will carry about 72 calls in the busy hour and will be occupied with each for about 20 seconds. To serve a busy city exchange the installation of from 150 to 180 directors is necessary.

The operation of the director can be examined in more detail with the aid of Fig. 17. The subscriber on lifting his receiver obtains, via the bank of his rotary line switch, a first code switch in the ordinary exchange system, and at the same time the "A" switch-finder hunts to find a free "A" switch from which the subscriber receives the "dial" tone informing him that he may proceed to turn in the call. Suppose the subscriber wants the "Avenue" exchange and dials AVE 2468, which corresponds to 283 2468. The A is received by the "A" switch, the brushes of which are lifted to the second (or ABC) level and a free "BC" switch in the group of directors associated with that level is found.

*Paper read before the Post Office Telephone and Telegraph Society of London.

The train of 8 impulses corresponding to V is dialled into the vertical magnet of the " BC " switch, via the impulse distributor, the two brushes of which are standing on the first pair of contacts. At the end of this train the impulse distributor takes one step, and the train of 3 impulses, corresponding to E, are received by the horizontal magnet of the " BC " switch. The six brushes of the " BC " switch are now set on the third contact of the eighth level in each bank. The impulse distributor brushes now step to its third pair of contacts.

Dialling proceeds and the trains of dialled impulses representing the called subscriber's number are successively routed by the impulse distributor to the four digit registers which are set in the positions 2 on the thousands register, 4 on the hundreds register, 6 on the tens register and 8 on the units register. The call has now been received and stored in the director, but before this operation is complete the process of sending it forward in its transformed shape has already been begun.

It may be assumed that direct junctions to the Avenue Exchange can be reached through two ranks of code switches at the originating exchange and that the translation in the director required to set up these switches is to be " 2, 6." That is to say, only two trains of impulses are required, out of the possible six trains provided for, via the brush circuits of the " BC " switch. If additional ranks of code switches at an intermediate switching centre had been involved, a correspondingly greater number of trains would have been necessary. The translation is effected by cross-connecting the first of the particular six bank contacts of the " BC " switch to contact No. 2 of the " sending switch " bank, and the second bank contact of the " BC " switch to contact No. 6 of the sending switch. The superfluous bank contacts (Nos. 3, 4, 5 and 6) of the " BC " switch will be connected to the " sending control switch," via the terminal marked " D.C.O." (digit cut-off), in order to step that switch to the correct position for discharging the digit registers at the proper moment.

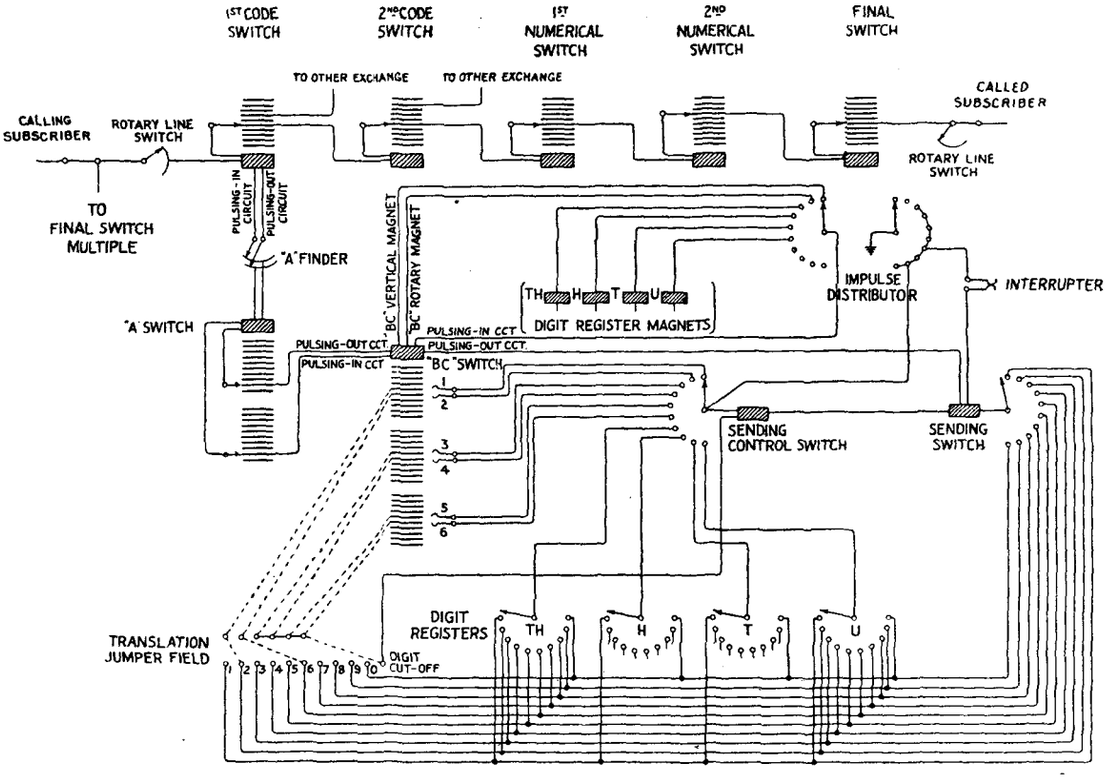


FIG. 17.—Principles of the Director System.

After the three code letters have been dialled in, the impulse distributor brushes will have moved to the third pair of contacts and the sending control switch will be standing on its first contact. The earth-connected brush of the impulse distributor will therefore complete a circuit, via brush 1 of the " BC " switch and the cross-connexion, to contact No. 2 of the " sending switch," which will thus be earthed. At the same moment the earth-connected brush completes a circuit, permitting impulses from the interrupter springs of a continuously running impulse machine to be directed to the sending switch magnet, and the switch begins to step over its contacts. At each step an impulse is sent to the first code switch over the " pulsing-out " circuit indicated in the figure. When the sending switch brush reaches its second contact, which has been " marked " by the sending control switch, it encounters the earth connexion and a relay is operated which prevents further impulses from being sent to the first code switch. The sending control switch now steps forward to the second " BC " brush circuit and the sending switch returns to normal. Meantime the first code switch brushes have entered the second level of its bank contacts and found an outlet to a free second code switch.

The sending control switch brush, now standing on its second contact, makes an earth connexion, via brush circuit No. 2 of the " BC " switch, with contact No. 6 of the sending switch. The sending switch again steps forward and now sends 6 impulses to the second code switch before its impulses are stopped by the earth on its contact No. 6. The second code switch brushes are stepped to level No. 6 and find a free line to the Avenue Exchange, whilst the sending switch again returns to normal and the sending control switch steps to position No. 3. From this position it finds a circuit in turn, via brushes Nos. 3, 4, 5 and 6 of the " BC " switch, which represent superfluous translation circuits and have all been joined, by a cross-connecting wire, to the " digit cut-off " terminal. The brushes of the sending control switch are therefore carried straight forward to position No. 7. Positions 7, 8, 9 and 10 connect with the four " digit registers " on which the Avenue number of the called subscriber has been stored. From these positions the switch will now successively control the sending of the thousands, hundreds, tens, and units digits. As these do not require translation the banks of the digit registers are multiplied directly to the sending switch. The impulses for these digits are sent out over the junction line to Avenue and set up the numerical switches at that exchange. Immediately after the units digit has been sent out from the director the latter is released from the first code switch, all its parts return to normal, and the calling subscriber is connected through to the final numerical switch at Avenue, from which the required subscriber is being rung.

The " pulsing-in " circuit over which the subscriber's impulses pass into the director remains entirely separated, at the first code switch, from the " pulsing-out " circuit over which the director passes forward the call through the code and numerical switches until the connexion has been completely set up and the director has been dropped. Pulsing-out commences as soon as the exchange code portion of the number has been dialled in, i.e. as soon as the impulse distributor reaches its third contact and connects earth to the sending control switch and to the interrupter of the impulse machine. The periods of storing the call and of sending it forward thus overlap each other and the actual delay in establishing connexion with the called subscriber is, on the average, only about 2 seconds greater than it would be if the call were dialled straight into the switches.

As a theoretical example of a more complex case of routing, involving the use of intermediate switching centres and the utilization of all the six available translation channels, it might be assumed that a call, say, from Ealing to Ilford, would be dealt with as follows :—The exchange code ILF (453) would have its second and third digits translated in the director to 234567. Digits 2 and 3 would operate first and second code selectors in Ealing, and gain access via an outgoing junction to a tandem selector in Holborn. Digits 4 and 5 would operate first and second tandem selectors in Holborn and reach a tandem selector in Maryland. Digits 6 and 7 would operate first and

second tandem selectors in Maryland and reach a first numerical selector in Ilford. The four untranslated numerical digits of the subscriber's number would then follow and effect connexion with the called line via the first and second numerical selector, and a final selector, at Ilford.

The actual circuit arrangement of the director system is necessarily somewhat complex, and a discussion of it in any detail is not within the scope of this paper. (Mention should, however, be made of an innovation as regards the position of the battery feed to the calling subscribers. Hitherto on the Automatic Telephone Manufacturing Co.'s system this has always been located either at the final numerical switch or on the outgoing junction repeater. In the director system as adopted by the Post Office it will be located at the first code switch, thereby rendering outgoing junction repeaters unnecessary, except on tandem routes, and effecting a very appreciable economy in London and other large areas where the percentage of junction traffic is large.)

The terminals marked "CO" are used for clearing the director when it is required to route a call by code translation only, without numerical digits. Certain service calls will be dealt with in this manner.

The terminals marked "Oper" are used to route a call to an operator after the dialling of digit 0 by the subscriber. Such a call will find a director but will not operate the "BC" switch. A special relay, operated on 0 level calls only, is introduced into the director and sets up connexions similar to a setting of the "BC" switch brushes, giving at once the desired translation. Arrangements are such that any predetermined director in any group can be reached from the 0 level of the "A" digit switch for this service.

The various cross-connexions used to give the different services required may be briefly summed up as follows:—

(1) *Subscriber to subscriber calls* (subscriber dials 3 code and 4 numerical symbols).

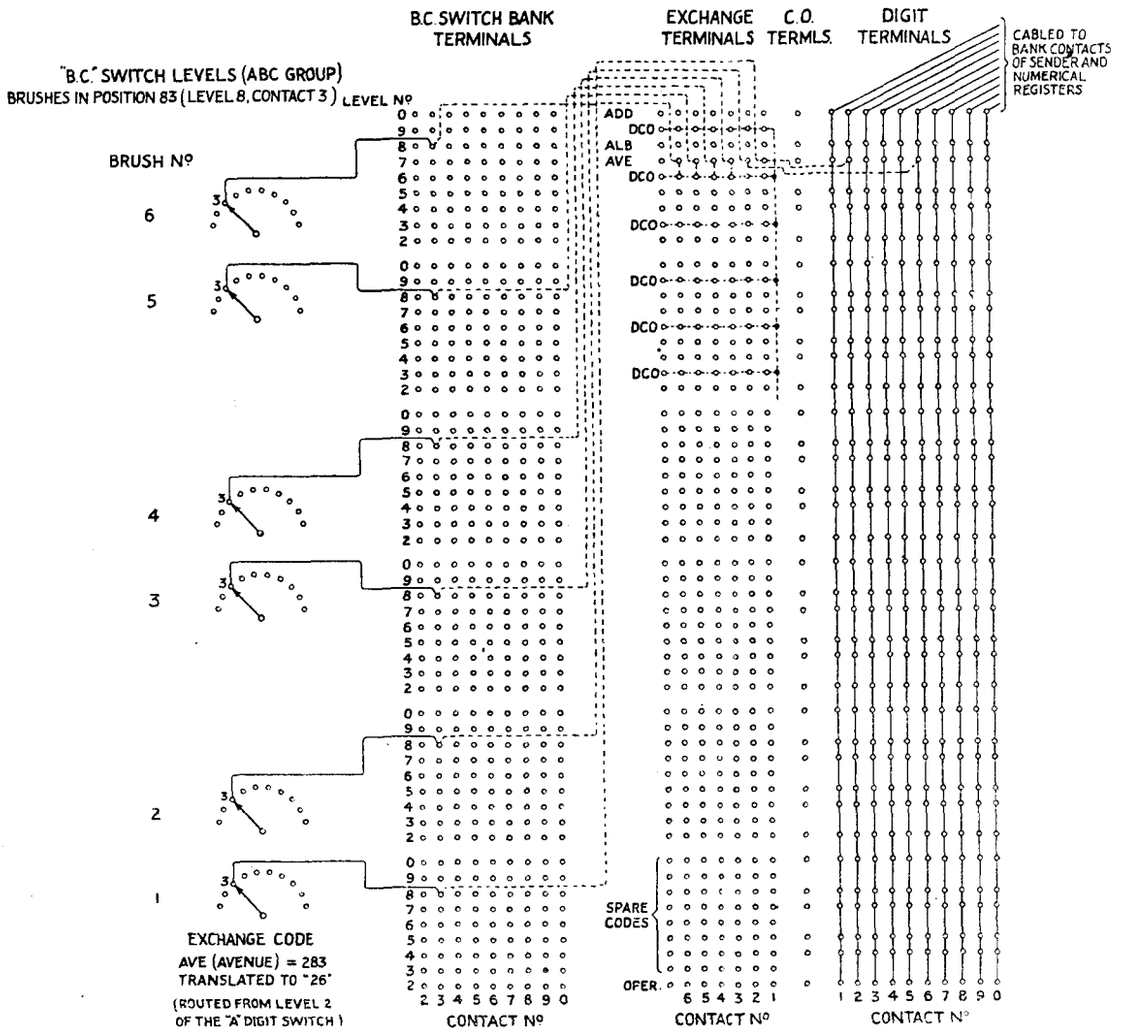


FIG. 18.—Diagram showing arrangement of translation jumper field of director in 200 (ABC) group.

DIRECTOR TRANSLATIONS.

Fig. 18 is a sketch of the arrangement of the translation jumper field. On the left of the drawing six sets of bank contacts each connected to a set of 81 terminals are indicated. Each of these six sets of terminals reproduces the bank contacts of the "BC" switch corresponding to each of the six brushes and is wired out to these terminals as indicated by the brush, or "wiper," numbers.

Levels 2 to 0 and contacts 2 to 0 on each level only are so wired out, level 1 and contact 1 being omitted since there are no letters equivalent to digit 1 on the lettered dial. At the centre of the assembly there are 35 sets of six exchange terminals, each set being labelled with an exchange name and wired to the tags representing the positions on which the six brushes rest when the code of that exchange has been dialled into the "BC" switch. Between every two sets of exchange terminals one set of D.C.O. (digit cut-off) terminals is fitted. On the right-hand side are 36 sets of digit terminals numbered 1 to 0, each vertical row of which represents one of the 10 bank contacts on the sending switch and digit registers.

Cross-connexions are made between the six exchange terminals and the 10-digit terminals as required to give the desired translation.

(a) *Translated to 1 code selection, followed by 4 numericals*, e.g. if the subscriber dials "AVE" 1234, the "AVE" exchange terminals will be connected as follows:—

Terminal 1 will be jumpered to the digit terminal corresponding to the pulses required to be sent to the code selectors.

Terminals 2, 3, 4, 5 and 6 will be connected to the nearest "D.C.O." terminals.

The numerical digits will be repeated as dialled into the digit registers by the calling subscriber.

(b) *Translated to 2, 3, 4, or 5 code selections, followed by 4 numericals.*—The same method is followed as under (a), i.e. exchange code terminals are jumpered to the digit terminals required. The unused exchange terminals are always connected to the nearest "D.C.O." terminals.

The numerical digits are repeated as dialled.

(c) *Translated to 6 code selections, followed by 4 numericals.*—The same method is followed as under (a), i.e. exchange code terminals are jumpered to the digit terminals required. As all the exchange

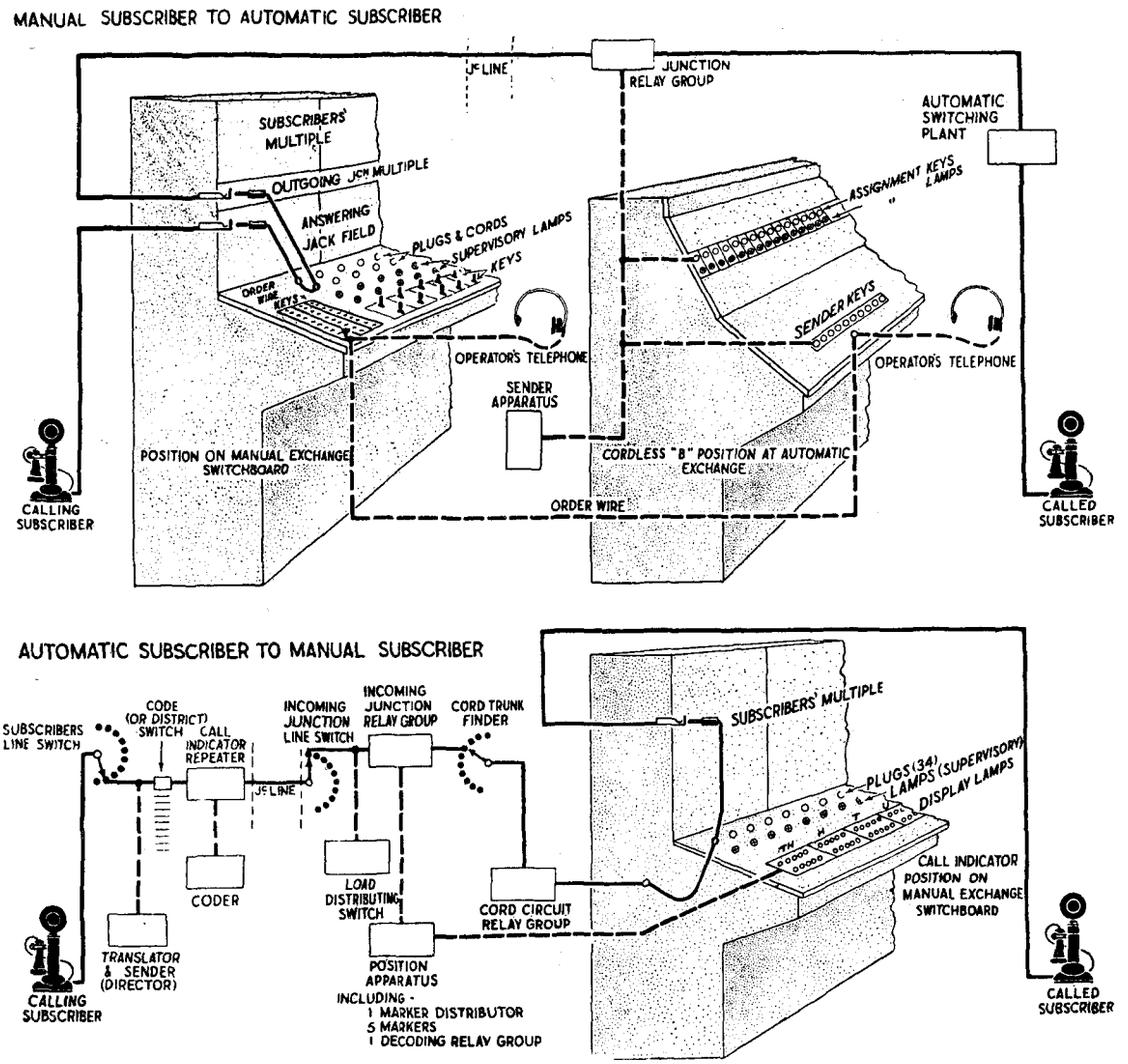


FIG. 19.—Diagram of call indicator transfer method.

terminals are thus used, no connexion to the "D.C.O." terminals is required.

(2) *Special service calls.*

(*a*) *Subscriber dials special service 3-letter code,* not followed by numericals, e.g. TOL. The same method is followed as under 1 (*a*) or 1 (*b*), i.e. the exchange code terminals are jumpered to the digit terminals necessary to route the call to the destination required. The first unused exchange terminal is jumpered to the nearest "C.O." terminal instead of the "D.C.O." terminal, and the remaining terminals are left disconnected.

(*b*) *Calls to operator (subscriber dials* "0").—The exchange terminals designated "OPER" are jumpered as described under 2 (*a*) above.

(3) *Vacant exchange codes.*

All vacant exchange code terminals associated with "Wiper 1" (only) are commoned and jumpered to the nearest "SC," i.e. "spare code" terminal. The dialling of one of these dead exchange codes causes the director to be released immediately the third code digit is dialled, and the subscriber receives the "number unobtainable" tone signal.

CALL INDICATOR WORKING.

Until the conversion of London to automatic working is fully completed, which may occupy a period of from 15 to 20 years, manual working will exist side by side with automatic working and arrangements are necessary to ensure smooth operation between the two systems during the interim period.

Traffic from automatic to manual exchanges will be handled by means of "call indicator" positions at the manual exchange, as illustrated in Fig. 19. The automatic subscriber will manipulate his calling dial in an identical manner for all calls. If the call be for a manual exchange the operation of the three initial letters of the exchange name will steer the call through to an available incoming junction operator's position at that exchange, and the further operation of the four numerical digits will cause the required subscriber's number to appear visually on a "call indicator" in front of the junction operator. This operator will, without speaking to the calling subscriber, connect the circuit manually to the required subscriber's line. She may use any one of her plugs and cords for this purpose; the act of plugging into the subscriber's line jack brings into operation a "cord trunk finder" which

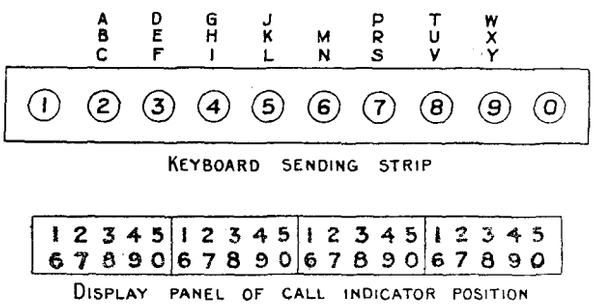


FIG. 20.—Key sender and call indicator.

connects the plug and cord to the junction upon which the displayed number has been pulsed.

In the converse case for a subscriber connected to an exchange not yet converted to automatic working, two methods are available by which the manual exchange operator may deal with the call if connection with a subscriber on an automatic exchange has been asked for. The first method (see Fig. 19) provides that she shall pass forward the call verbally, by order wire, to an incoming junction operator at a special "B"

switchboard in the automatic exchange. The latter operator will assign a junction circuit, by pressing an assignment key, and will set up the call by means of a set of plunger keys known as a key sender. The automatic plant does the rest and clears the key sender for further use as soon as the call has been steered through to its destination.

In the second method the operator who answers the call from the subscriber at the manual exchange is herself provided with sets of key senders, on one of which she can set up the call and so direct it forward through the automatic plant at the distant exchange to the required subscriber's line, without the co-operation of a junction operator. The adoption of one or the other method depends upon the local conditions at the exchanges in the area, but the first method, which avoids the need for special equipment at the answering operators' positions, is generally to be preferred and has been adopted for London. Fig. 20 shows the arrangement of keys on the key senders, and illustrates the manner in which the called number is displayed visually on the call indicator.

(To be continued.)

TELEPHONE DEVELOPMENT OF CITIES AND URBAN DISTRICTS WITH UPWARDS OF 1,000 TELEPHONES, AT DEC. 31, 1924.

BY W. H. GUNSTON.

IN computing the telephone development of British towns the geographical unit formerly employed was the Trunk area. The adoption of this unit—although an arbitrary one, associating in some cases large towns with distant smaller ones which could in no sense be counted as suburbs—had at least the advantage of considering as a whole the telephone network served by the chief exchange in a large town and by its satellite exchanges. It is always possible that an exchange situated within a municipal boundary may partially serve a district outside that boundary; it is equally possible that an exchange situate outside the boundary may serve a district within. In other words the boundary of the "sphere of influence" of exchange and the geographical boundary of the district after which that exchange is named are unlikely to be coterminous. The boundary of a telephone trunk area, however, covered the whole district surrounding a town, and it was easy to compute the population of such an area by a scrutiny of the census returns.

With the abolition of the trunk areas some few years ago, a new unit had to be found for estimating the development of a city and its suburbs. The unit chosen was a radius of 5 miles round the majority of towns and of 7 miles in the case of Manchester, Birmingham, Liverpool, and Glasgow, and in the case of London, either a 10-mile radius or the London telephone district. The disadvantage of the radial boundary was that it was inelastic, and in the case of Manchester, for example, excluded Bolton and Rochdale from the area whilst including Stockport and Oldham—all 4 of them independent towns and each as much and as little suburbs of Manchester as the other. It also had the disadvantage that in South Lancashire and South Staffordshire, these radial areas would overlap, and a district might be included as a "suburb" both of Birmingham and Wolverhampton, of Manchester and Bolton, and so on.

The telephonic density of a town is always likely to be much greater than that of its suburbs, and this entails a considerable disadvantage when we adopt a large radial area as a unit of comparison with foreign towns. The development of most foreign cities is calculated in relation to the population of the city itself—although Berlin, Hamburg, Copenhagen and several American cities are exceptions, and include large suburban districts in their telephone areas. The following is therefore presented as an attempt to show the actual telephonic development of British cities and towns as at Dec. 31, 1924, within their proper limits. Despite what has been said, it may be taken that in most cases a telephone exchange within a town serves chiefly inhabitants resident or having offices within that town; and, although it may serve a small district outside the boundary, this is often counterbalanced in the case of larger towns by the fact that an exchange situated outside the town may serve part of a district within it. In fact, it may be taken that in general, these overlappings are negligible, and that the ratio of development would be so little affected by them that the local scrutiny necessary to adjust them would not be justified.

The table shows every city, town or urban district which has upwards of 1,000 telephones within its boundary, and has reached a development of 1 telephone to 40 inhabitants. A few boroughs and urban districts (practically suburbs) adjoining great towns have been excluded owing to the impracticability of ascertaining the number of telephones proper to them. In such places, for instance, as Croydon, Richmond, Ealing, and Hendon, the areas served by the exchanges so named either exceed or fall short of the areas of those towns. Some suburbs of Manchester, Liverpool, Newcastle and Birmingham have been omitted for similar reasons.

As an example of the difference between the telephone development of a great city with or without its suburbs may be cited: London 1 to 17 with, 1 to 12.7 without; Newcastle 1 to 36 with, 1 to 22.6 without; Manchester 1 to 27 with, 1 to 22 without. It has not been possible to ascertain the number of telephones within the Hull Corporation boundary, but the ratio of telephones to inhabitants within the Hull telephone area is 1 to 23. For purposes of comparison the development of some of the principal Post Office radial areas (7 and 5 miles) are shown :—

	Telephones.	Population Thousands.	Inhabitants per Telephone.
London telephone area ...	439,223	7,406	16.8
Cardiff (5-mile radius)...	12,390	240	19
Bournemouth („ „)...	6,887	145	21
Edinburgh („ „)...	19,350	420	21.7
Hull telephone area	14,426	327.5	23
Bradford (5-mile radius)...	15,717	375	24
Liverpool („ „)...	45,571	1,190	26
Glasgow („ „)...	47,460	1,260	26.5
Manchester („ „)...	58,756	1,591	27

The Hull Corporation area which was recently third on the list is now fifth.

CITIES, BOROUGHS AND URBAN DISTRICTS WITH UPWARDS OF 1,000 TELEPHONES CONNECTED WITH EXCHANGES WITHIN THEIR BOUNDARIES.

	Telephones.	Population (Thousands).	Inhabitants per Telephone.
London	353,865	4,483	12.7
Maidenhead	1,113	16.7	15.0
Harrogate	2,493	38.9	15.6
Guildford	1,578	24.9	15.8
Bournemouth	5,561	91	16.5
Chester	2,284	40.8	17.9
Cardiff	10,718	200	18.7
Southport	3,955	76.6	19.4
Tunbridge Wells ...	1,811	35.5	19.6
Edinburgh	19,350	420	21.7
Manchester and Salford ...	43,704	965	22.1
Eastbourne	2,761	62	22.5
Newcastle-on-Tyne	12,163	274.9	22.6
Woking	1,172	26.4	22.6
Aldershot	1,232	28.7	23.3
Glasgow	44,242	1,034	23.4
Torquay	1,679	39.4	23.4
St. Albans	1,113	25.5	23.5
Liverpool	34,182	803	23.5
Ashton under Lyne ...	1,814	43.3	23.9
Shipley	1,208	29	24
Cambridge	2,440	59	24.2

	Telephones.	Population (Thousands).	Inhabitants. per Telephone.
Bradford	11,698	286	24.4
Brighton and Hove ...	7,699	189	24.5
Nottingham	10,486	262	25
Worthing	1,349	35	26
Ayr	1,362	35.7	26.2
Perth	1,253	33	26.3
Watford	1,710	45.9	26.8
Gravesend	1,136	31	27.3
Huddersfield	3,988	110	27.6
Aberdeen	5,709	159	27.8
Folkestone	1,351	37.5	27.8
Scarborough	1,663	46	27.7
Shrewsbury	1,147	31	27.9
Birmingham	32,118	919.4	28.6
Leamington	1,011	28.9	28.6
Bedford	1,391	40	28.7
Luton	1,954	57	29.2
Oxford	1,927	57	29.6
Maidstone	1,234	37.4	30.3
Cheltenham	3,015	92	30.5
Newport (Mon.) ...	1,615	48	30
Exeter	1,919	59.6	31.1
Bath	2,199	68.6	31.2
Bootle	2,433	76.5	31.4
Bristol	11,821	377	31.9
Grimsby	2,547	82	32.2
Leicester	9,100	295	32.4
Birkenhead	4,403	145.6	33
Norwich	3,524	120.6	34.2
Accrington	1,273	43.6	34.2
Halifax	2,884	99	34.3
Keighley...	1,200	41.9	34.9
Wakefield	1,511	53	35.1
Dundee	4,730	168	35.5
Hastings	1,869	66.5	35.5
Reading	2,514	92	36.6
Bury	1,501	56	37.3
Margate	1,301	46.4	35.7
Coventry...	3,580	128.2	35.8
Dewsbury	1,495	54	36.1
Northampton	2,500	90.9	36.4
Leeds	12,711	458.3	36
Wolverhampton ...	2,836	102	36
Gloucester	1,391	51	36.7
Sheffield	13,324	490.7	36.8
Blackburn	3,439	126.6	36.8
Blackpool	2,667	99.6	37.3
Nelson	1,059	39.8	38
Southend	2,786	106	38
Swansea	4,076	157	38.5
Preston	3,005	117	38.9
Oldham	3,647	145	39.7
Ipswich	1,982	79	40

THE MAKING OF A TELEPHONIST.

BY MISS M. A. ROACH, BRADFORD.

How well some of us remember our first few days in a telephone exchange. We arrived at the office feeling more or less excited, and with little if any idea of what we were really going to do. Some of us were, no doubt, a little bit scared when we saw the switchboard for the first time, it looked so weird to our unaccustomed eyes.

In those days training schools were almost unheard of, and a new girl (she was not even called a learner) was taken to the switchroom as soon as she arrived. She was given an instrument, of which she could not have told you the name of one part correctly, and was then placed between two operators, and depended on them for most of the instruction she was likely to receive.

Probably a few of us can remember too, the very day on which an enterprising operator, *usually* a senior, managed to give the unsuspecting beginner a shock, by quietly manipulating a ringing key, whilst she was tightly grasping a cord in the wrong way. And what a blank expression the operator showed, when the new girl, who of course, did not know just what had happened, gave a muffled squeal! But that was one lesson well learned, and it made a lasting impression too, the cord being picked up properly ever after.

At the end of her first week, the poor thing had been told so many times to "push a cord in here" or "take one out there" and to say this, that or the other, not quite understanding why, that she was really in a fog. Incidentally, she had also been asked a few times, all about her relations, where they worked, what they did or did'nt do, how many sisters and brothers she had, until she must often have thought that she had got to a private enquiry office. (*Sometimes she got her own back.*) However, that too, like the shock, was just another little portion of the system of "breaking in a beginner" in those remote days when "telephonists" were merely "operators."

We were *told* many things by the girls on either side of us, but we cannot say that we were really *taught* anything. Considering that some of us are *still* here, it is safe to assume that we picked up a few good points from those whom we watched, yet on the other hand, we probably copied all their faults. It must be admitted, too, that when we did learn anything which was of value, it was usually through making mistakes, generally at the subscriber's expense. But on the whole, we were rather indifferently treated and very little interest was taken in our progress, until the day came, sooner or later, as it *always* did come, *when* we committed some fairly serious irregularity in our operating, and worse still, got found out!

(Perhaps some of you remember what you did.)

Then we either became more nervous than hitherto, and rather discouraged and gave up in despair, or else we struggled on, wondering if life was worth living, or if we should ever do anything right again. For us who remained, that irregularity had, however, one good result, for it brought us into the supervisor's line of vision rather prominently, and you will agree, this was just where we ought to have been all the time.

It has often been said by telephonists and supervisors, (and I rather think is still said) that *they* were never trained in a telephone school, (and don't they say it with pride) and yet *they* can operate as well as anyone else, and always could do so.

Well, perhaps they are right, but could anyone come as a beginner and do it now? I think not! Until recently those who occasionally passed this kind of remark, really thought the old system quite good enough, probably because they knew so little of the more up-to-date methods. The old way had perhaps, some advantages. The growth of exchanges in those days was slow and vacancies did not occur with such rapidity as they do now.

It was customary, I believe, in most exchanges of moderate size for two or three girls to be employed in the early months of the year, with a view to being used as holiday substitutes, and there was sometimes a possibility of one being retained when the leave was over. Naturally the best would be chosen, and for this reason alone, competition was far more keen between beginners than it ever is now.

Another advantage was that a new girl soon realised that if she wanted to make good, she must help herself because everyone else was either too busy or too indifferent to bother with her. Therefore she became fairly self-reliant.

But we must, I think, all realise that in these days when the telephone is so much in demand *and* so much criticised that the tremendous amount of information which a telephonist must possess now cannot possibly be obtained by sitting between even experienced operators and listening to or watching them.

The object of the school training, therefore, is, to put it briefly, *not* to turn a girl out of the school and expect her to compete with those who have three or even two years' experience, but to enable her to commence practical work on the switchboard without placing too great a drag on the service.

And this is how we try to do it. The school is supplied with a small (a very small) dummy switchboard, a blackboard and three charts. The first and probably the most useful of the charts shows a complete section of an "A" switchboard in a common battery exchange and on each position, there are local and junction calls connected, and in various stages of completion. The second chart represents a portion of the "B" switchboard, and shows a plug ended ringing junction position with manual ringing, and two incoming split order wire positions, one with manual and one with keyless ringing. As both charts are photographs taken in an actual switchroom, and painted to show the correct colouring of everything on the switchboard, it will be seen that a present-day learner cannot have that uncomfortable feeling of strangeness, when she first sees the actual switchboard, which was experienced by most girls in bygone days.

The third chart which is helpful at a later period, is a black and white diagram, showing the entire operation of a call from one subscriber to another, connected by means of a straight order-wire junction. Both subscribers' telephones are shown and how they are joined up to their own exchanges, also the "A" and "B" positions on which the connections are established. The telephones used by the operators who handle the call are also shown, joined to the respective positions.

The first few days of a learner's career are spent in explaining and studying various rules and regulations (not in connection with operating), but such items as punctuality, sick leave, the need for secrecy, the use of fire drills, and what to do if father develops the measles. When these are understood, we follow on to that most interesting and well-worn topic of "Articulation and Voice Expression."

A great deal must be said on this subject to make sure that the best results will be obtained. Not only must attention be drawn to the necessity

for clear and distinct articulation, but the effect of loud speaking, or on the other hand, of an indifferent or drawling voice, must be pointed out. The *tone* of voice always receives special attention, for we are all no doubt, familiar with the subscriber who complains that, "It wasn't so much *what* she said that I objected to, as *how* she said it."

Most of us know that the tone *can* be, and sometimes is, made to convey far more to a critical and perhaps angry subscriber than the actual words, and a learner is therefore taught at an early stage of her career that a pleasant courteous tone is a necessity if she wishes to create a favourable impression on her subscribers, and supervisors too.

Next we explain how the public become subscribers and what is more important how each learner will, when she becomes a fully fledged telephonist, have a certain amount of influence over her subscribers' daily work and calls. The subscriber's telephone is described at the same time as the telephonist's, so that now-a-days one does not hear a learner talk about the spout when she means the mouthpiece.

Attention is next drawn to the most essential qualifications for the making of a good telephonist, i.e. courtesy, accuracy, and speed, and it is explained both how these may be acquired, and also what the effect on the service will be if they are lost sight of, even for a short time.

The organisation of the district is explained, so far as the service and maintenance is concerned, and the service observation results are touched upon, but only briefly. This is a subject which can be dealt with more explicity and followed with greater interest when the learner understands more of the work she is going to do.

As we cannot teach a learner to operate calls until she knows what sort of tools she is going to handle, we commence what we may term our first lesson with a description of the "A" switchboard. The calling signals, cords, keys, lamps, &c., are all explained in detail, and notes are taken so that the learner who has, of course, certain times allowed for studying, is able to memorise what these things are, and how they work. The lesson is an easy one, but not quickly learned, and a student must concentrate all her thoughts on it, otherwise she may find herself describing a switchboard as a "Flexible strand of plugs with cords attached" or something to that effect.

The colour scheme of the cords is explained, and the order of selection and at the same time the necessity for using both hands. That may sound rather unnecessary, but it is amazing how rarely the left hand is used when a learner first comes to the switchboard.

A talk on "Team Work," what it really is, and the effect it has on both the subscriber's service and the telephonists' work, fits in very well at this point, as we explain how essential it is for telephonists to be constantly on the alert for calling *and* clearing signals. Team work at the quieter periods must be emphasized for as most of us know, it is at such times that an operator is perhaps tempted to relax.

When these points have all been assimilated, we pass on to the use of the exchange codes and we learn just a few at a time. The learner arranges her notes on codes in a way which will enable her not only to memorise the codes, but the primary and secondary routes at the same time. This lesson is kept up during the whole course, various ways and means being adopted in an endeavour to help those whose memories are not too good.

Some learners pick codes up almost by instinct, others need assistance. The majority could no doubt, learn them as a child does a poem, but the result would not be satisfactory. As a rule 15 minutes study in the morning and 15 minutes haphazard questioning later in the day, is sufficient time to spend on this lesson. Paper and pencil are resorted to by some learners, and this method also serves another purpose, that of practising letters and figures, a point which usually requires a lot of attention.

Next we proceed on our way to a fuller understanding of the working of the supervisory signals. The learners can already define what a supervisory signal *is*, but the various actions of the signals must be explained. The necessity for careful attention to them must be *drilled* in, special mention being made of the flashing signal which as we all know, *may* and often does mean trouble with a capital T.

Promptness in disconnecting must also be dealt with, and in each case it is essential that "The Reason Why" is made clear. Most learners think, and it is quite a natural thought too, that the calling signals must be of far more importance than the supervisory signals, but if the lesson which they have already had on "Team Work" is revised at this point, they will soon realise why the calling signal must not be considered the *Be-All* and *End-All* of a subscriber's connexion.

Now we come to the locating of numbers in the multiple. The learner understands so far that the multiple is a termination of subscribers' lines, arranged in numerical order, but to choose one number out of 6 or 7,000 looks rather a task. But she soon manages it in this way. A paper schedule representing a portion of the multiple is supplied to each learner, who is shown how the multiple is divided into panels by means of stile strips, and the panels divided into blocks of one hundred, each block being again divided into rows of twenty jacks.

A short list of numbers is called out, the student finds the jack which represents the called number and enters a tick. The same numbers are called out a second time, each student checking her neighbours work. The speed at which the numbers are found increases with daily practice.

A variation is sometimes made by allowing the learners to take turn in calling out the numbers, thus helping their articulation.

We are now ready for our first call, which is a local one.

The definition is first learned, and then step by step the call is explained until it becomes familiar before we demonstrate it on the switchboard. The length of ring, the time taken to report "No reply," and the necessary supervision, must be made quite clear and memorised. From this point we get along a little quicker, junction calls being taken next.

The lessons on junctions and junction calls spread over a fairly long period. We commence by learning, in stages, what the junctions are, the various ways they work, how they are arranged on the switchboard, the difference between incoming, outgoing and both-way lines, why they are graded light, medium, and heavy, and so on.

A little later we see what an order wire is, and why it is essential to have them, also the difference between the various types. To a learner, an order wire is a complication of which she is rather suspicious, and therefore we have to go warily at first.

When all the respective definitions are learned, we pass on to the operating of the calls, taking first the straight-forward calls, over ringing and quto-calling junctions. These as a rule do not present much difficulty, but when we arrive at the split and tandem order wire calls, it is necessary to put on our thinking caps a little more closely.

A simple diagram on the blackboard showing circles for exchanges, joined together by thin lines for junctions, and heavier lines for the order wires, is helpful, as a call can then be visualised in so far as the connexions in the exchange are concerned. The numerous points to be remembered in order wire working must be explained, and these usually take more studying than the operation of the actual call.

There are so many details to grasp regarding the various tones, the changing of junctions, and the supervision of the calls that much thought and time must be expended on this lesson, before we can pass on.

The necessity for "Standard Expressions" forms the subject of the next lesson, and at this stage our first talk on "Articulation" must be revised. It is pointed out that standard expressions are of no value unless we put into the actual words the *sense* of what we wish to convey. The learner is told that continuous effort in the *correct* use of the expressions will prevent them from becoming mechanical and will also help to train the subscriber in the way he should go (or rather talk).

Service pegs are now explained and the method of treatment for the different classes of peg is noted. Special mention must be made of the lines which are "Temporarily out of service" and how the calls must be dealt with when the subscriber is not satisfied with the reply to his request for a T.O.S. number.

Explanations in connexion with rates of service, lamp caps and indicator markings, now follow before we are ready to pass on to what are, perhaps, the most interesting and puzzling lessons of the whole course, those on ticket recording and registration.

These to some of us may not appear difficult lessons, because we have gradually become acquainted with all the rules and regulations governing the ticket recording necessary in most exchanges.

But that knowledge does not come so gradually to the learner, in fact, she has to swallow it in rather large doses. I think I can safely say that most learners breathe a sigh of relief when they arrive at that stage in ticket work where practical experience only is required.

There are so many details which must be fully understood that several lessons are necessary, and one cannot spend too much time in explaining the various points.

Tickets relating to subscribers' local, junction and trunk calls are taken in turn, in each case the straightforward effective call being dealt with and understood before we pass on to those which for various reasons may be ineffective. The same calls are then taken from coin box lines and party lines and last of all from call offices. This is where we wish that kiosks had *never* been thought of, and also that attendants were either a thing of the past or of the *very* distant future. Even the amount of revenue they earn does not console us!

The class of call allowed from the unattended call office, the various ways in which an attendant may book a trunk call, the little differences on each ticket, and the special expressions in connexion with the time limits, must all be understood before we attempt to go any further. Fortunately for the learner, all lessons on ticket recording are followed by practice which is kept up daily until the end of the school course.

Calls for telegrams, express letters, imperial cables, &c., are dealt with about this stage.

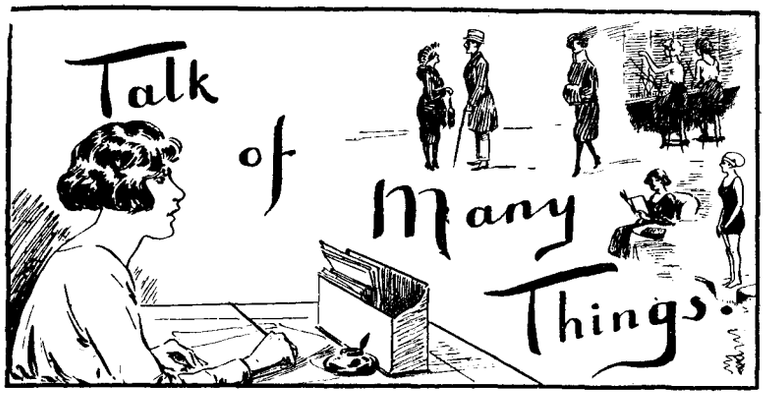
When every class of call can be recorded without any hesitation, we pass on to a series of lessons, which though short, cover a lot of ground. These include lessons on service calls, emergency calls, special test calls, fixed time calls, requests for time, and so on.

The work of the supervisor and the monitor, too, is explained so that the learner will understand how the discipline is maintained, and also what happens to those troublesome calls which must of necessity pass beyond the telephonist's control.

The methods in dealing with the calls just mentioned are varied, and though they may appear trivial points to an experienced telephonist, a learner is apt to confuse them if they are not made quite clear. One must not lose sight of the fact that she is accumulating fresh knowledge every day, and has little if any opportunity of carrying into practice all she has learned. She is of course questioned daily and is also encouraged to ask questions herself.

(To be continued.)

WE TELEPHONISTS



Labels and Libels.

DESPITE the large number of 'buses now on the road, or perhaps because of it, I have on occasion to spend enforced leisure waiting for my 'bus. Each of us has, I suppose, a different method of occupying himself during these moments. Some pace up and down or tap the kerb with a stick or umbrella with ill-concealed impatience; some stand motionless and gaze fixedly into vacancy and others lean limply against a lamp-post. On a recent occasion I found myself gazing into the window of a draper's shop. My unseeing eye roved over the display until I became conscious at last of the neat little tickets with which drapers love to garnish their wares. I read some of them, and while admiring the skill exhibited in their design and execution I felt mildly amused at their phrasing. Once aboard the 'bus I reflected that each trade seems to have its own characteristic show-cards which appear to range from illuminated manuscripts to horrid coarse enamelled discs, and I wondered if, for example, a draper's show-cards were planted in a butcher's shop, whether I should still remain a meat-eater. I thought that I should not. The artistry and cursive neatness of the cards would ill-accord with a relatively gross and indelicate display of meat, and the euphemism of phrasing would mock plain and matter of fact fare. Imagine raw red beef with its attendant galaxy of blue-bottles labelled "Quite New" or tripe marked "Double Width—Unshrinkable." I might perhaps sustain the shock of seeing "Tres chic" on a lamb chop, but I should feel suspicious of sausages marked "Reduced Price: Must be cleared." Fancy a sheep's heart labelled "Durable," or minced beef promised as of "Fast Colour." No! I could not stand it—I should turn to beans and spaghetti. No doubt I should be foolish in this, for of course the fundamental goodness of the meat would be unaffected by the label it bore.

Perhaps, however, I should only be following a natural tendency. It is comparatively easy for most of us to believe when we are told that a colleague is, say, a bumptious fellow. It is rather harder to agree as to his virtues, particularly if we are secretly conscious of deficiencies in our own character. We can all confess that our valuation of another has often been dependent upon the labels we have seen hung on him, and when in quieter moments we have taken off the labels we find we have disposed also of the libels.

So when next the Editress overlooks the legend "Exceptional Value" which is inscribed on my own window ticket and descends to call me such things as Editresses do call their humble contributors, I shall feel secure in the knowledge that in a playful mood she has only been mixing labels.

PERCY FLAGE.

The Telephone.

From "*The Telephone Review*."

The Telephone's a fearful thing,
I like it.
At night it wakes me with its ring,
I like it.
It brings me labor night and day,
It has its own persistent way,
It brings me in my weekly pay,
I like it.

and

Your Telephone.

By H. D. P.

Your telephone! That cross between a candlestick and a foghorn which stands at your elbow in your office, or which is put out in the hall in your home as though it were someone else's servant.

It isn't your telephone at all; it is only lent to you—for a consideration, of course. It has a number; that isn't yours either. Occasionally the kindhearted folk who really own things take away your number and lend you another; in case, I suppose, someone may get jealous of your "nice round number" or your "easily remembered sequence."

There are other things about this talking box which don't belong to you.

The calls you receive in the middle of the night from some belated roysterer who wants to tell mother he is still working late.

Very often the number you get does not belong to the fellow you want; it has been lent (temporarily) to another fellow whom you don't know, don't want, and did not ask for.

The girl you ring up and invite to tea and a matinée; she isn't yours; the number you got wasn't "Hers."

And of course half the calls on your account are not yours—so you say. Then again the owner of that soft, seductive voice who gets you *all* your wrong numbers, she is not yours. She is only partly loaned to you. You are only one of 150 who all want her. Really, of course, she is some other fellow's, and when he thinks he has got her for good he is wrong. *He* is *hers*.

In fact you can't be sure your temper is safe; it is a thousand pounds to a penny you will lose it, and as nobody wants it, it comes home well multiplied.

There is only one thing about it which is yours—the cheque you sign to pay for the——thing. That *is* yours when it comes back with your pass book.

H.D.P.

When the Sun Shone.

"*Good morning*—isn't the weather shocking; do let me come in quickly, out of the rain—it is enough to make one want to run away from this dreadful climate."

Such a remark, and many similar, could have been heard to fall from the lips of early morning travellers—or late ones, for that matter—unfortunate beings who were forced to be stirring abroad in such inclement weather. Men and women there were, in great numbers, jostling one another along the thoroughfares of their suburban homes towards the omnibuses, tramcars, and trains, which would convey them to the great city, wherein lay the object of their journeyings—the day's work.

The rain had begun to fall, although not very heavily at first, at an early morning hour, but had been steadily increasing to a steady downpour until the time when the workers of the busy Metropolis had begun to stir in their beds, at the sound of the shrill noise of numerous alarm clocks. So the outlook upon this day—somewhere in the middle of August—had been rather depressing from the beginning, and now the close atmosphere and dull sky threatened to annihilate the sun, should that very essence of light suddenly decide to shed forth his brightening rays. Therefore, after having endured many defeats at the hands of curt 'bus conductors, and having finally succeeded, inasmuch as being granted standing room inside a crowded vehicle from which issued forth the odour of wet mackintoshes, umbrellas and the like—small wonder it was that the business girl could remark to her companion—"It's not a bit like August, is it?"

The summer had been a kindly one, and a number of holiday-makers had enjoyed the sunny days during which they had made merry—but that was long ago—the sun had now forgotten to shine, and instead came rain, rain, rain! Oh dear!—what a "beautiful" place was London at such a time! The ever-moving vehicles patiently pursued their way towards many and various destinations, and the weary pedestrians, amid growing discomfort, trudged along the City streets as best they might—some slowly, others quickly—intent upon getting to the office or workshop in time, no matter how.

"Theirs not to reason why,
Theirs but to do—or die,
Noble Town-workers."

Then quite suddenly the rain ceased, the sun peeped out from his hiding place, the sky cleared—and lo! where a short time ago had been dreariness and darkness, Hope, in the hearts of men, revived—for the day was going to be fine, after all! What a difference the sun made to the feelings of the workers, to be sure! The toil seemed light as compared with its previous heaviness, and everything went with a swing. It was good to be alive, now that the sun was shining! That evening, the homeward journey of the City toilers, tired though they were, seemed joyous and bright, the walk through streets and over bridges, under which the river lazily flowed, was quite enjoyable—and the gay colours of the girls and boys were good to look upon. The new buildings were conspicuous in their whiteness, and the towers and spires lent an air of calm peacefulness to the atmosphere. A number of the men and women as they emerged from offices, banks, and Government seats of commerce, with a "springy" step—could be seen guarding tennis racquets, thus showing to the world how precious is that great gift to all—Hope. For were they not expecting a great deal of the sun?—the pessimists still were whispering—"The ground will be too wet." These remarks, however, did not daunt the hopeful players, because, might it not be possible, when the

sun should go down behind the courts—for them to be able to say, with Shakespeare :—

"The moon shines bright ; in such a night as this,
When the sweet wind did gently kiss the trees
And they did make no noise—in such a night,
Troilus methinks mounted the Troyan walls,
And sighed his soul towards the Grecian tents,
Where Cressid lay that night."

A. G. TURNER.

London Wall.

On Friday, May 29th, a very successful Sale of Work was held in the Rest Room. It was organised by the staff, its object being to help swell the funds of the Blue Triangle Forward movement.

Miss Morgan kindly officiated at the opening, in the absence through illness of Miss Johnstone. Throughout, the sale went splendidly, the side-shows causing great amusement. By the end of the evening, through the combined efforts of all, we were able to hand over the sum of £25 and also 15*s.* collected on the stamp collecting cards.

M. SMITH,
Local Representative, Blue Triangle.

We thank a contributor for the following limericks, at the same time expressing the hope that this new and abominable form will soon disappear :—

There was a young Cabinet Minister
Who grew most remarkably thinister.
He worried becaws,
He was making new laws,
And he didn't know where to beginister.

There was once a man on the telephone,
Who never could manage to spellephone.
He said "With my sight
I can never write right,
So I talk, and it does just as wellephone."

By an oversight, the initials of two contributors were omitted from our column last month. The article, "Mes Vacances," was written by "E.A." and "Getting Back into Harness" by "L.R."

The *Telephone Review again* :—

The Retort Courteous.

A stout old gentleman, having trouble with the telephone, could hear nothing but a confusing jumble of sound, and finally became so exasperated that he shouted into the transmitter, "Is there a blithering idiot at the end of the line ?" "Not at this end," answered a cool feminine voice.

Farmer : "An' 'ow be Lawyer Barnes doin', doctor ?"

Doctor : "Poor fellow, he's lying at death's door."

Farmer : "There's grit for 'ee, at death's door, and still lyin'."

Contributions to this column should be addressed : THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North), London, E.C.

SWISS ORDER FOR BRITISH FIRM.

Last year, the Director General of Telegraphs, Berne, Switzerland, installed as an experiment a small automatic telephone exchange, called the Relay Satellite Exchange, for linking up the people in one of the rural areas in Switzerland. This small exchange, which is made by the Relay Automatic Telephone Co., Ltd., at Streatham Hill, London, S.W., gives the facilities of telephonic communication to dwellers in the country, who, prior to its installation, were phoneless, owing to the expense incurred in operating the ordinary telephone system. So favourably impressed are the Swiss telephone authorities, that, after a year's experience, they have now ordered a further twenty Relay Exchanges for installation in various places in Switzerland.—(*Communicated.*)

TELEPHONE NOTES.

Rural Telephone Development.

"The tardy development of the telephone in the United Kingdom has been, and is still, a matter of frequent comment," writes E. S. Byng in *Electrical Communication*. "Many reasons have been advanced for this," he continues, but "A study of telephone statistics for some of the more highly developed European countries—for example Scandinavia and particularly Denmark—shows that considerable attention has been devoted for many years to the establishment of a satisfactory rural telephone service." Then follows an admirable analysis of the difficulties of providing rural service and a review of the efforts we have made to overcome them. In summing up he concludes "*Vigorous and sustained educational and propaganda work, combined with* a progressive policy, would do much to overcome the conservatism and prejudice so often displayed towards the telephone by the residents in rural districts in Great Britain." From the comments of *Telephony*, on its receipt of the news "concerning England's Unique Campaign for Telephone Development," it appears safe to assume that that part of Mr. Byng's prescription which suggests educational and propaganda work need not worry us, for the T.D.A. "is accomplishing successfully" this "most important work." It only remains then for some, or the same, friendly power to tell us what a "progressive policy" is. It is quite true that Britishers consider anything in the nature of a subsidy as unprogressive and that from this point of view the Post Office policy in regard to rural telephone development may be regarded as unprogressive. Nevertheless it would be surprising to find that this British sentiment explains this American's innuendo.

The *Literary Digest*, in the following extract from one of its advertisements emphasising the significance of the telephone to advertisers, unwittingly gets nearer to the root of this matter of telephone development. "Consider two families living side by side in the same street—the Joneses and the Browns. The Joneses is a little better built and a little better kept up. The grocer's car, the milk wagon, and the postman stop a little oftener at the Joneses than at the Browns. The Joneses' home is better furnished. There are more of the luxuries which have become necessities— a phonograph, a radio, a car. You will find if you look up the tax records, that the Joneses own their house, while the Browns rent theirs." The difference between these homes is "symbolised by the telephone wires running to the Joneses house and not to the Browns house." The symbol means "that when the Jones family had risen to where life was sufficiently full of contacts and interests and needs and wants to make the telephone a labor saving device in the business of living, the telephone was installed." "The telephone means greater social activity, greater buying power and a scale of living in which the telephone rent is negligible beside the help it affords—and reveals a desire to keep in touch, a wish to know, the community." It follows then that if the ratio of Joneses to Browns in America is eight times as big as the ratio of these two typical people in England, then America will have eight times as many telephones as England.

Shorter Notes and Comments.

"Lew Hussey, chairman of the newly appointed Kansas Public Service Commission, is finding the telephone business in Kansas a most interesting one," says *Telephony*. He says : "Some of the mix-ups are awful to unscramble. A patron complains of service. When we chase it down, it develops that the wires—perhaps strung along fence posts and lying on the ground—belongs to one party, the telephone instrument to another, and still another is furnishing the service. *And they want us to untangle that to everyone's satisfaction.*"

The annual report of the New York Telephone and Telegraph Company for the year 1924, shows that although the preferred stock dividend was earned nine times over, the net income for 1924 fell short by $3,038,168.95 of meeting the dividend requirements of the common stock. The deficit was made up by an appropriation from surplus.

"The only economic revolution in the world that amounts to a hill of beans is taking place in this country right now"—so Prof. T. N. Carver, head of economics at Harvard, is reported by the daily press to have referred to the rapid increase in the number of stockholders in American Public Utility enterprises. The same tendency to invest in this class of security is very marked too in England. In the one case, however, it is looked upon as a step towards "true public ownership" while in the other it is regarded as the outcome of a preference for "private enterprise."

LONDON TELEPHONE SERVICE NOTES.

Ten Millions.

An event worthy of being placed on record is the passing of the ten million mark for one week's total of calls originated from telephones in the London area. The figure during the week which ended on May 30th was actually 10,129,596. This was the week before Whitsun and it is characteristic of telephone traffic for the peaks of pressure to occur immediately before the Easter, Whitsun and Christmas Holidays. It is evident that the business community puts in a spurt to compensate for the days of enforced rest.

Telephone traffic, always sensitive in responding to business and social activities, has been affected by the long spell of fine weather on the social side and by the Budget announcements and the Rubber Market on the business side.

It is curious to note the effect of an event such as the boom in rubber. Telephone users appear to change their habits. The busy hour traffic at the exchange most affected is very jerky. It wanders from its proper place in the time table, and offices are occupied up to a late hour at night. This is one of the charms of dealing with telephone traffic, it is never hum-drum.

* * * *

To Holiday Makers.

Members of the London Telephonists' Society about to take their holidays are reminded of the photographic competition arranged for their benefit and entertainment. There will be prizes for the two best series of three pictures, and if the entries are as good as they are expected to be there will probably be an exhibition of the best at one of the Society's meetings during the winter.

* * * *

New Exchanges.

Two new exchange names have been added to the already lengthy list of 104. The first, Sloane, serves the aristocratic quarters surrounding Sloane Street. The exchange building abuts on to the church of Holy Trinity, Sloane Street. The other exchange is Albert Dock. There is nothing fashionable nor aristocratic about the name, and the peal of church bells rung to celebrate a society wedding will certainly not fall on the ears of the Albert Dock staff. Commerce is their business, but yet east and west will assuredly meet through the medium of the telephone.

* * * *

Contracts versus Traffic.

The two Branches met in rivalry on the cricket field at East Finchley on Monday evening, 13th July. Contracts won the toss and batted first. They attacked the bowling with vigour and declared the innings closed when they had scored 162 runs for 6 wickets. The best scores were Tubb 56 including 11 boundary hits, and Wright 38 not out. The Traffic side replied with 90 for 8 wickets, and the match was therefore drawn, but the play was very much in favour of the Contracts. This is the first occasion on which the two Branches have met at cricket and an enjoyable game resulted.

The scores sheet is reproduced :

CONTRACTS.

Staples, bowled Shepherd	10
Tubb, bowled Shepherd	56
FitzGerald, l.b.w. Pounds	11
Cowdray, bowled Shepherd	3
Wright, not out	38
Esdaile, bowled Shepherd	4
Culpin, bowled Berry	33
Extras	7
Total (6 wickets dec.)	162

Oliver, Nichols, Riley and Culley did not bat.

TRAFFIC.

Mears, bowled Cowdray	2
Tanner, bowled Cowdray	8
Shepherd, bowled Wright	5
Meyer, bowled Tubb	10
Berry, bowled Tubb	29
Beck, caught Wright b. Oliver	2
Gray, bowled Oliver	10
Webb, not out	6
Gregory, bowled Culpin	6
Pounds, not out	1
Extras	11
Total (8 wickets)	90

Marland did not bat.

PERSONALIA.

LONDON TRAFFIC STAFF.

Resignations on account of marriage :—

Miss E. PHILLIPS, Assistant Supervisor, Class II of Bishopsgate Exchange.
Miss C. M. WAKELIN, Assistant Supervisor, Class II of Avenue Exchange.
Miss I. G. MOGGRIDGE, Telephonist, of Barnet Exchange.
Miss E. A. CANNON, Telephonist, of Edgware Exchange.
Miss K. E. EVANS, Telephonist, of Putney Exchange.
Miss L. J. HEMPEL, Telephonist, of Central Exchange.
Miss V. BUTCHER, Telephonist, of Central Exchange.
Miss E. M. BROCK, Telephonist, of Central Exchange.
Miss E. H. HYMNS, Telephonist, of Central Exchange.
Miss L. P. M. MOORE, Telephonist, of Central Exchange.
Miss E. M. BENDLE, Telephonist, of Central Exchange.
Miss R. L. K. BULL, Telephonist, of Victoria Exchange.
Miss M. A. BILLING, Telephonist, of Victoria Exchange.
Miss V. E. DEVEREUX, Telephonist, of Victoria Exchange.
Miss F. M. HADDOCK, Telephonist, of Victoria Exchange.
Miss M. A. STAIG, Telephonist of Victoria Exchange.
Miss D. J. BELL, Telephonist, of Mountview Exchange.
Miss D. TYLER, Telephonist, of London Wall.
Miss J. LEWIS, Telephonist, of Trunk Exchange.
Miss E. E. CHILDS, Telephonist, of Trunk Exchange.
Miss M. E. GRIFFITHS, Telephonist, of Trunk Exchange.
Miss O. E. WHITTINGTON, Telephonist, of Gerrard Exchange.
Miss C. M. J. WEBB, Telephonist, of Gerrard Exchange.
Miss M. J. CATT, Telephonist, of Gerrard Exchange.
Miss G. MCKENZIE, Telephonist, of Paddington Exchange.
Miss L. E. BLACK, Telephonist, of Park Exchange.
Miss M. CUTLER, Telephonist, of City Exchange.
Miss E. BILLINGHAM, Telephonist, of City Exchange.
Miss W. L. MELLOWS, Telephonist of Holborn Exchange.
Miss J. K. M. ANDREWS, Telephonist, of Central Exchange.
Miss M. BROWN, Telephonist, of Victoria Exchange.
Miss H. E. MURRELL, Telephonist, of Victoria Exchange.
Miss E. W. WHITE, Telephonist, of Victoria Exchange.
Miss M. G. BONNER, Telephonist, of Trunk Exchange.

Promotions to Assist. Supervisor, Class I. :—

Miss U. G. POND, Toll Exchange.
Miss D. M. OVERED, Royal Exchange.
Miss E. C CLANFIELD, Wimbledon Exchange
Miss M. MACDONALD, Hampstead Exchange.
Miss E. R. EVERARD, Avenue Exchange.
Miss D. F. AMY, Hop Exchange.
Miss E. K. PENNETT, Palmers Green Exchange.
Miss G. C. PFEIFFER, Chancery Exchange.

Promotions to Asst. Supervisor, Class II :—

Miss F. G. JONES, Avenue Exchange.
Miss F. H. PATCH, Victoria Exchange.
Miss S. J. KILLEEN, Holborn Exchange.
Miss M. CROWLEY, Clissold Exchange.
Miss A. G. TURNER, Toll Exchange.
Miss M. M. BROTCHIE, City Exchange.
Miss E. M. MAILES, Langham Exchange.
Miss EMILY M. JACOB, Regent Exchange.
Miss E. L. WHITING, North Exchange.
Miss M. M. PARSONS, Regent Exchange.
Miss G. T. M. MARTIN, Victoria Exchange.
Miss A. M. D. GARDINER, Clissold Exchange.
Miss H. M. HICKS, Kensington Exchange.
Miss E. M. SPINKS, Avenue Exchange.
Miss M. E. ALLSOP, Museum Exchange.
Miss E. M. LANKSHEAR, Regent Exchange.
Miss D. E. UNWIN, Trunks Exchange.
Miss A. M. BENNETT, Park Exchange.

CENTRAL TELEGRAPH OFFICE.

The following promotions have been made :—

Mr. W. H. S. MARSHALL, Overseer to Assistant Superintendent.
Mr. P. G. CURNEW, Telegraphist to Overseer.
Mr. L. F. ELLISDON, Telegraphist to Overseer.

CABLE ROOM.

The following promotions have been made :—

Mr. C. R. GLADMAN, Assistant Superintendent to Superintendent.
Mr. W. H. F. WEBB, Overseer to Assistant Superintendent.
Mr. R. J. GILLIES, Telegraphist to Overseer.

THE

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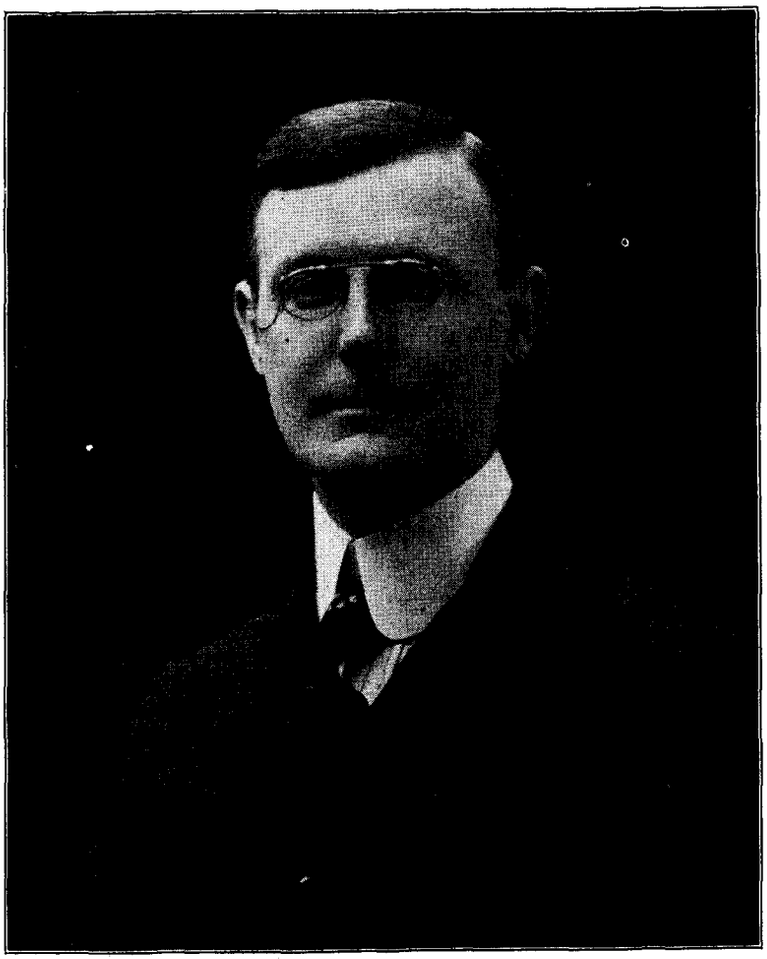
TELEGRAPH AND TELEPHONE MEN AND WOMEN.

XX.—

MR. F. H. S. GRANT.

THE subject of our notice this month, Francis Henry Symons Grant, is one of the Principals of the Telephone Branch of the Secretary's Office.

Mr. Grant was educated at Westminster City School and at St. John's College, Cambridge. On leaving the University he entered the Higher Division of the Civil Service, and was assigned to the Post Office in January, 1907. He had a wide experience in various branches of the Secretary's Office before taking up his present position in the Telephone Branch some years ago.



Photograph by Valentine, Heath St., Hampstead.

To a detached observer, Mr. Grant's chief traits are a remarkable capacity for work and a sound judgment based on acute reasoning powers. He is unfailing in courtesy and consideration in his dealings with the staff with which he is associated.

Mr. Grant was one of the British representatives at the recent series of special conferences of the International Consultative Committee, and is one of the British delegates at the International Telegraph Conference in Paris.

THE HISTORY OF TRANSIT AND TERMINAL INTERNATIONAL TELEGRAPH RATES.

By J. J. T.

(*Concluded from page* 212.)

A further convention was signed at Friedrichshafen in October 1858, and came into force on May 1, 1859. This brought matters a little further on the road, and a supplementary conference was held at Bregenz in 1863 in which Switzerland, Austria, Bavaria, Baden, and Wurtemberg, were concerned. This gathering endeavoured to apply the findings of the Friedrichshafen convention and the modification introduced in the tariffs with special reference to Switzerland, which was becoming a transit centre. The modifications were very numerous. Says the historian of the Bureau Centrale Télégraphique, at Berne :—"It would be fastidious to mention them all."

There were certain modifications in the counting of words and figure groups. The charges were considerably reduced. The zones were extended. Zone 1 remained as 100 km., but zones 2 and 3 were merged, and zone No. 3 now became 450 to 1,000 km., while the rates per zone were themselves reduced to 1, 2, and 3 francs for the three newly arranged sections, respectively.

Arising from these reductions, the transit charges through Switzerland became chargeable as that of No. 1 zone in any direction, and thus became a uniform transit charge of one franc.

This probably marks the actual commencement of a uniform transit charge throughout any particular country.

The zone system, in fact, did not work well internationally. Telegraph development became hampered by the multitude of accountancy documents which had to be prepared, checked, and registered. Gradually both Unions began to realise this fact and the small convention of Bregenz was one of the turning points. This convention came into force Jan. 1, 1864.

Details could be given of the niggling particulars that had to be recorded, but can be easily imagined.

In the meantime France had introduced (in 1862) an important reform by reducing and simplifying the whole of her own telegraph tariff. The cost of a telegram of 20 words or under, now became 1 franc between any two towns of the same department, and 2 francs between any two towns in different departments. The benefit of these reductions was offered to all limitrophic countries. In 1863 also—probably as a result of the French move and of the knowledge of the findings of the Bregenz conference—the system of zones was abolished between France and Belgium, and the charge fixed at 3 francs for 20 words between the two countries, France taking two francs—because of the larger area served by her system—and Belgium one franc. In the same year a similar arrangement was agreed upon between France and Luxemburg.

During the year 1864, similar agreements were also concluded between France and all her neighbours, a uniform terminal charge being applied to each of them including Portugal.

On Aug. 1, Italy and Switzerland brought into force the same principle, telegrams of 20 words between the two countries being fixed at 3 francs. This tariff was equally exchanged between Switzerland and the two telegraph sections of Milan and Turin, including Lombardy, Piemont and Ligurie, but in the case of traffic exchanged between Switzerland and other parts of Italy, the Swiss government only claimed one-third, the Italian government taking the remainder.

The Paris Conference of 1865 was without doubt up to that date the most representative telegraph conference of Europe, as it then was, which had yet been held, twenty countries or states being represented, viz. :—Austria, Baden, Bavaria, Belgium, Denmark, Spain, France, Greece, The Free City of Hamburg, Hanover, Italy, Holland, Portugal and Algarves, Prussia, Russia in Europe, Saxony, Norway and Sweden, Switzerland, Turkey and Wurtemberg, and to read the signatures appended to this convention, with its emperors, kings and dukes, is to set one moralising on European history and its faded glories.

Great Britain was unrepresented, not having been invited apparently, owing to the fact that the telegraph systems of these islands were still entirely in the hands of private companies.

The Conference of 1865, however, made some very real endeavours to find a basis for an international rate. Spain made the suggestion of 10 words for 1 franc as the unit, multiplying this by the number of States through which the telegram passed to arrive at the total cost of transit traffic. Another suggestion was to establish a rate fixed upon the average distance travelled by telegrams through any particular State or country, but despite the representative nature of the conference the "Observation" column of the Tariff Annexe to the Convention of 1865, still showed differentiations which were partly racial. It still appeared to be necessary when fixing rates to mention "States of the Austro-Germanique Union," as against "others," showing that the complete and real international nature of these conferences had not yet been fully realised.

The zone system had, however, almost disappeared; Russia, owing to the immense size of her territory, and Prussia, because of her geographical configuration, were permitted to depart from the idea of treating each state as the territorial unit, and therefore divided their respective countries into two sections. Thus Article 30 :—

> "The High Contracting Parties declare the adoption of the following bases for the formation of international rates :—
>
> "The charges applicable to all correspondence exchanged by the same route, between the offices of any two States, shall be uniform. The same State may, however, be subdivided for the application of the uniform charge, into two or more large territorial divisions. The Contracting States reserve to themselves all liberty of action regarding their possessions or of their colonies outside Europe.
>
> "The minimum charge is applicable to a message of which the length does not exceed twenty words. The charge applicable to a message of over twenty words increases by half for each indivisible series of six words above twenty.
>
> "The franc is recognised as the monetary unit which serves as the base of international charges and accounting. The tariff of correspondences exchanged between any two points of Contracting States shall be so built up that the charge of a telegram of 20 words may always be a multiple of half a franc. Tariffs may be fixed between Terminal States, after agreement with the intermediaries, but must be based upon tables prepared and passed by the Conference."

The Convention of Vienna 1868 was officially known as the Revision of the Paris Convention of 1865. Again Great Britain was not represented, although Persia, Serbia, Greece, and Luxemburg all sent delegates. Great Britain, however, appears to have given adherence to the decision of the Convention, on behalf of her possessions outside Europe, as did Russia and Turkey, as did France for Algeria and Tunis. The unit message was still fixed at 20 words and the franc as the monetary unit, but Extra-European offices were authorised to accept messages of 10 words, the transit rate through European countries being that of a European telegram of twenty words. The Grand Duchy of Baden had already adopted 10 words for the unit message with an extra charge for each additional word. Italy suggested a unit telegram of 15 words with a reduction of the charge, but to increase the charge for every additional five words above the minimum. These suggestions were rejected as being inapplicable for international use.

The cause of the permissible reduction in the unit telegram from 20 to 10 words for Extra-European telegrams was a curious one. The North German and Russian governments had accorded a concession to a private company (the Indo-European) for a telegraph wire from England to India, and in so doing had permitted the company to fix the unit telegram at ten words. Had it not been for this incident it is very questionable whether the distinction between Europe and Extra-European would ever have been so decided. It was argued successfully at the Vienna conference that the counting of words by the number of letters was a source of error and led to delays, and seven syllables were still to be reckoned as the limit of one word, and the syllabic counting was therefore retained instead of the suggested maximum of fifteen letters. Letters and figures were to be reckoned as five to the word. Article 34 laid down very distinctly the principle that although the Contracting States could arrange a reduction of rates between themselves, they should do nothing to promote competition. All such changes made should have as their sole object the opening to the public at equal rates of as many routes as possible.

The counting of words by syllables and not by letters was maintained.

This Convention also allowed the use of code language in private telegrams.

The general principle for bringing international telegraph traffic to account was also laid down as follows :—

> Each State shall credit a limitrophic State with the amount of the charges of all telegrams transmitted to that State for transmission forward, such charges to be calculated from the Frontier of the two States to the destination of such telegrams.
>
> Terminal charges could also be liquidated direct between two terminal States by mutual understanding, and the concurrence of the intermediary State or States concerned.

The quarterly settlement of international telegraph accounts were to be paid to the creditor State in "effective francs."

States which refused to reduce their charges sufficiently were refused adhesion to the Convention and thus were not entitled to the benefits of the international agreements.

Here, for the first time, Great Britain appears in the tariff annexe, with the minimum charge between France and England, and Belgium and England of 3 francs for twenty words over the cables of the Submarine Telegraph Company, and between London and Ceylon over the lines of the Indo-European Company at a minimum rate of 49.50 ; also between England (London) and Holland by means of the Electric & International Telegraph Company, between London and North Germany, at a minimum charge made by Reuter's cable of 4.50, and between England and Sweden at 3 francs, in each case per unit message.

The transit rates were laid down in this convention with some strictness as regards the non-competitive clause. Thus there were seven routes to the Gulf of Persia from England, and the total cost of these in each case was 61.50, whether they passed through four or six States. Here are three examples :—

	Fr.
England via Reuter cable	4.50
Northern Germany	2.50
Russia	16.00
Persia	13.50
Gulf of Persia cable	25.00
	Fr. 61.50

	Fr.
England via Electric & International Co. to Holland	4.00
Austro-Germanic Union	5.00
Turkey	17.50
Gulf of Persia cable	35.00
	Fr. 61.50

	Fr.
England & Submarine Co.'s cable	3.00
France	2.50
Switzerland	0.50
Austria and Hungary	3.00
Turkey	17.50
Gulf of Persia cable	35.00
	Fr. 61.50

It was at this conference that definite arrangements were made for the establishment of the now well-established Central Telegraph Bureau at Berne.

The International Conference held in Rome at the close of 1871, resulted in the Convention known as Rome 1872, and was the first convention to be signed by Great Britain. The latter power, however, had given her adhesion to the Paris Convention, of which that of 1872 was a slight revision.

The political changes in Europe were signalled by the presence of a delegate from the German Empire and the disappearance of some of those from one or two of the minor States.

The foreign telegraph rates of Great Britain, both terminal and transit, now begin to loom larger in the Rate Annexes fixed in accordance with Article 34. As an example of these it may be mentioned that the charge for a telegram between England (London only) and Germany was 4 francs (other English towns 5 francs), between England (London only) and Belgium 3 francs (other English towns 5 francs). The rate between England and France was on the same terms as that for Belgium. The rate England (London only) to India in 1867 was 125 francs for 10 words, and telegrams sometimes took 20 days in transit, owing to the many interruptions of both cable and land-lines.

It was at this Conference that a rather wordy battle took place between the Indo-European Telegraph Company's delegate, who complained of the bad condition of the Turkish telegraph wires, and the Turkish delegate, Yanco Effendi.

One of the most interesting debates was that around the question of again admitting *urgent* private telegrams. The British delegate, Mr. Alan E. Chambre, opposed an urgent service emphasising the fact that an urgent service in the eyes of the British people would be understood as a species of *unequal* treatment. The seven Submarine Cable Companies also opposed the proposal, and the government of India did likewise.

It was at this gathering too that M. Vinchent, a Belgium delegate, gave, perhaps, the neatest and probably the first definition of code which he described as "words incomprehensible to the offices in correspondence."

Within the next three years another gathering was convened at St. Petersburg, in 1875.

This International Treaty as settled at St. Petersburg took the form of a convention, which has remained unchanged to the present day, and of Detailed Regulations, annexed thereto, which have been revised at subsequent conferences.

At this conference it was decided to divide the world's telegraph areas into two regimes, the European and the Extra-European. The former included all Europe, including England, Russia, Persia, and Turkey in Asia.

The Extra-European regime included the relations between France and Algeria and Egypt, Aden, Gulf of Persia, British India, Dutch Indies, Indo-China, Cochin China, China, Japan, and Australia.

The unit word was now determined by number of letters, 15 for European and 10 for Extra-European telegrams.

"Urgent" private telegrams were now permissible.

Private telegrams could also be exchanged in secret language (code) but only between States which agreed to that procedure, but in the case where this involved the transit through other countries, the latter would permit them to pass without question.

The franc remained the monetary unit for international accounts.

The St. Petersburg Convention seems to have marked the turning point of international and long-distance telegraphy. The timid—naturally so, no doubt, at that early stage of development—outlook and prophecy of private companies that reduction of rates would spell financial disaster, and that the limit had been reached of users of Eastern and Far Eastern communications (some 30 to 40 telegrams per day on one particular system in the middle sixties) had disappeared, added to which the war of 1870 had to some minds *settled* matters in Western Europe and cleared the air for future developments. In any case, international telegraphy had by this time made itself an every-day twenty-four hours necessity.

Since the conference of St. Petersburg was held, conferences at which the Regulations have been revised took place in London (1879), Berlin (1885), Paris (1890), Budapest (1896), London (1903), and Lisbon (1908).

One or two changes were made at these conferences which may specially interest the traffic specialist. That of 1885 authorised the counting of all destinations irrespective of length as one word, provided they were written as they appeared in the International List of Telegraph Offices. At the same conference it was authorised that both in the European and Extra-European regimes the length of a code word was restricted to ten letters.

Budapest, 1896, adopted Fifteen letters as the limit for one word in plain language telegrams in both regimes.

The Conference at Lisbon brought matters up to that date. Although there was very little change in the letter or spirit of the *Articles*, the *Regulations* were extensively added to and altered. Semaphore telegrams had been arranged for in previous conventions, but the Telegraph Convention of 1908 added the Radiotelegram with its special treatment of line charges, coast charges, and ship's charges, while international Telephony was also dealt with at the same conference.

This conference permitted the omission of a signature from a telegram, and also the text. The delegates represented no less than fifty States or countries and were over seventy in number. This conference reduced the elementary terminal rate to 9 centimes, and the elementary transit rate to 7 centimes.

These were reduced for certain European States to 6½ and 4 respectively; while Russia and Turkey were permitted to apply terminal and transit rates of 30 and 24 centimes.

A special transit rate was permissible for the submarine cable sections of any route.

If the Transit and Terminal rates were complicated when the Paris and Rome Conventions were held, the intricacies and niceties of the charges, as set forth in the Convention of 1908, were of a nature that would have startled the first members either of The Austro-Germanic Union, or the Union of the Western Countries of Europe. Thus there were transit rates, such as those through Austria, between Hungary and North America, at .045 francs per word, or between Austria and Hungary on the one hand and North America on the other, via the Emden-Azores cable at 0.15 francs, with 0.20 francs for all other messages. This was again varied by a reduction of 0.16 per word for telegrams exchanged over the direct Rome–Berlin wire, originating in Italy on the one side and destined for Asiatic countries and Australia on the other (when transmitted through Russia and the Indo-European line and marked "Via Berlin-Indo") and so on, and so on, with interesting variations for 130 pages of tabulated charges, at cutting prices. If the international competition was keen then, it will be keener in the future, with wireless developments to challenge cable improvements, and both to increase the message carrying capacity of the world's communications. Work enough, too, for an international Accountant, and work in plenty for the members of the now much-overdue Conference at present sitting in the Sorbonne, Paris.

THE POST OFFICE AND AUTOMATIC TELEPHONES.*

BY COLONEL T. F. PURVES, O.B.E., M.I.E.E.

(*Continued from page 224.*)

In its operating principles the system of "call indicator" working adopted for London is similar to that invented for use in connection with the panel system, but the London system contains several novel features which warrant a further brief reference. It is termed by the Automatic Telephone Manufacturing Co. a "coder call indicator system," and its object is to minimise the number of automatic switches necessary to display a call at a manual exchange, and to provide facilities for even traffic distribution of calls from all exchanges among the operators. Its operation is briefly as follows:—

At the originating automatic exchange the director impulses, instead of passing directly to line and to the distant exchange from the outgoing switch, are stored in the relays of an equipment assembly termed a "coder," which is at the same time connected to the junction line. At the manual exchange the connection of the coder to the line at the distant end routes the line to a set of incoming "de-coder" relays by means of a "marker" controlled by a "marker" distributor. Five markers and one marker distributor are provided for each call indicator position. When the junction line has been routed to the de-coder of the call indicator position the coder at the originating end is permitted to discharge. The decimal settings of the code relays are translated and transmitted over the line as coded impulses of positive, light negative, and heavy negative currents, and stored in the de-coder relays. As soon as the display lamps are freed from the previous call this setting is transferred to a group of numerical relays which cause the called number to be displayed by the lamps in the display panel in the usual way. The arrangements are such that while one call is on display at each position, an indefinite number may be stored on coders at the automatic exchange. Whilst one call is being displayed, five markers per position will be connected to junction lines associated with an equal number of waiting coders, and the traffic will thus be kept in order of priority.

The discharge of the coders into the de-coding relays occupies 1 second, and transference from the de-coder to the display panel is immediate.

At the manual exchange, traffic reaches the positions in cyclic disengaged order in quantities that correspond to the operators' abilities, and in queue formation at each position. Positions at which either all receiving relay sets or markers are engaged are treated as busy and passed by the marker distributor. A call displayed on the display panel is not directly associated with any one cord circuit on the position. The plugging-in of any idle cord to the multiple jack of the required number immediately starts a finder switch, which hunts for the calling line, connects the cord to it, and switches out the lamps on the display panel.

The cords are not normally used for the completion of service calls. Such calls are operated by the depression of a service key which causes a finder switch to hunt for the calling line and connect it to a service operator's position. Busy calls receive the engaged tone by the operation of a key in a similar manner. This reduces the number of calls required, and is a factor of value in some cases where the cord capacity of manual exchange "B" positions is restricted.

Each call indicator position is equipped with 36 cord circuits and it is expected that each operator will handle 450 calls during the busy hour. This is probably a conservative estimate.

It will be appreciated that before the first equipped automatic exchange can be brought into use the whole of the existing manual exchanges in London must be equipped for call indicator working. It follows, therefore, that during the initial stages of automatic working over 90 % of the automatically originated inter-exchange traffic in London will be handled at call indicator positions. This percentage will gradually decrease as more automatic exchanges are brought into use, and will finally be extinguished. An automatic subscriber, however, apart from any local knowledge which he may possess, will be quite in ignorance as to whether his call is going to another automatic exchange or to a manual exchange. His operations will be alike in both cases—he will dial three code letters and four digits, and in both cases he will receive the same tones, etc., to indicate to him the progress of his call. When complete conversion to automatic working has been effected, the whole of the call indicator equipment will have disappeared, together with all coder equipments at the automatic exchanges themselves.

It may be urged that this method of tackling the problem is wasteful, inasmuch as call indicator equipments will be progressively thrown out of service during the period of transition. An obvious alternative would be to

* Paper read before the Post Office Telephone and Telegraph Society of London.

install automatic equipment at each manual exchange, of a capacity sufficient to deal with the incoming junction traffic and having the subscribers' lines multipled on the final selectors in parallel with the multiple on the manual board. Then when the time arrives to convert the manual exchange to full automatic working the automatic plant already installed could be worked into the full scheme at that or another exchange and little wastage of plant would result. The possibilities of this scheme were fully considered, but serious objections to its adoption revealed themselves. These arose mainly from the lack of adequate building accommodation for the interim automatic plant, from the extensive changes to subscribers' numbers to provide for automatic private-branch exchange service which would be immediately necessary, and from the need for expensive additions to the manual exchange power plant in order to permit the use of standard 50-volt automatic switches. Considerable difficulty has, in fact, been experienced in many cases in finding adequate accommodation for the plant required at manual exchanges for the call indicator equipment, although the space required in much less than that needed for the alternative scheme.

Moreover, the wastage of call indicator apparatus will be minimised by the use in other large areas such as Manchester, Birmingham and Liverpool, of equipment recovered from London exchanges, and probably much of it will remain in service during the greater part of its economic life.

CORDLESS "B" POSITIONS.

Traffic originated at a manual exchange for an automatic exchange can be handled in two different ways, as already indicated. In the method adopted, each automatic exchange is equipped with special manual "B" positions and demands are passed, by order wire, to these positions from the "A" operators at the originating manual exchange. The operating procedure at the "A" positions is identical with the procedure to manual exchange "B" positions. The "B" operator at the automatic exchange sets up the call on the automatic switches by means of key sending equipment. As this operator is not required to handle any other class of traffic, key sending equipment is used in preference to dials, since quicker and more efficient operating is obtained thereby.

The other of these alternate methods would require that all manual exchange "A" positions in London should be equipped with dials and dial keys, and, since it would not be possible in many cases to dial from the manual exchange cord circuits directly into the automatic switches, it would be necessary to equip most of the incoming junction lines with "dialling-in" repeaters at the automatic exchange. Further, the increased amount of operating per call at the "A" positions would so increase the operators' load that a large number of additional "A" positions would be required in London to handle the volume of traffic during the busy hour. The cost of adopting this alternative, without serious interruption to service, would be so great, as compared with the cost of the method adopted, that the latter was preferred without hesitation.

In order to cater for traffic from manual exchanges, each automatic exchange will therefore be equipped at the outset with a suite of cordless "B" positions equipped with key senders (see Fig. 19). The key sending equipment consists of a strip of digit keys which is associated with four "sender finder switches" via a "sender finder outlet switch" that routes the digit keys to a free sender finder. The registers which are wired to the bank contacts of the sender finder consist of four groups of four relays, one group for each digit. These relays are operated by the digit keys either singly or in combination of twos or threes to obtain all digits from 1 to 0. The setting of the relays determines the "marking" of a contact on the sender switch by means of which impulses are sent out to the exchange numerical switches in a manner very similar to the method used for sending out the numerical impulses from the director.

The junctions from the manual exchange are brought through the cordless "B" position and carried on to a first numerical switch on which they terminate. At the position each junction is associated with a group of relays, and an assignment key and lamp for each junction are fitted as part of the face equipment of the position. The operating procedure is simple and is as follows:—

The "A" operator at the manual exchange passes a demand by order wire to the cordless "B" operator. The latter allots a junction and immediately depresses the assignment key of the allotted line. This causes the allotted junction and the operator's digit keys to be connected to a free sender with associated registers. The operator then depresses in proper sequence the four digit keys corresponding to the four figures of the called subscriber's number. These four figures are routed by means of a control switch to the four groups of register relays, which are operated and locked in the proper combination simultaneously with the depression of the digit keys. (After the depression of the last key—the fourth—the set is at once available for another call.) The bank contacts of the sender switch are thereby marked and impulses are sent out to the numerical switches. Sending cannot commence, however, until the operator at the manual exchange has taken the allotted junction line. When all sending is finished the sending and registers are disconnected from the junction line and the latter is switched through, via the numerical switches, to the called line.

A supervisory lamp is associated with each junction line at the cordless "B" position. After depression of the assignment key on an allotted junction the operator must not proceed with the setting up of the required number on her digit key strip until a signal is received on this lamp to indicate that a free sender has been found. The provision of senders is on such a basis that no delay is likely to occur at this stage. The supervisory lamp will flash until the originating "A" operator takes the allotted line, after which it will grow continuously until the "A" operator clears at the end of a conversation.

Should the "A" operator connect to a line other than that allotted, the supervisory lamp on that line will flicker rapidly to indicate to the "B" operator that a wrong connection has been set up.

CENTRALISATION OF MANUAL BOARDS.

When sufficient automatic exchanges in London are in use the cordless "B" positions and special "A" positions for operator service, etc., instead of being equipped in each automatic exchange, will be centralised, the centres being so chosen, to serve a group of adjacent exchanges, that economical use of line plant is achieved. There will be a number of such manual centres in London when the automatic traffic in the individual areas has reached a certain density. Great advantages in the design and cost of automatic exchange buildings will result from the centralisation of manual board traffic, since these buildings will not be required to accommodate the manual switch-room and operators' quarters.

THE MECHANICAL TANDEM EXCHANGE.

In the London area there are a large number of comparatively small exchanges with small groups of junction lines to and from each of the larger exchanges.

As a result of the traffic inefficiency of small groups, and of the fact that order-wire working is ruled out, the busy-hour loads carried by these junctions are very low and their operation is uneconomical. Frequent consideration has therefore been given to the introduction of one or more tandem junction exchanges, at which all the junctions to and from each small exchange could be concentrated and thus form a group suitable for order-wire working. Such a scheme could not, however, be shown to possess any economic advantage, on account of the cost of introducing a third operator on each tandem connection. The development of the automatic call indicator scheme increased the possible speed of operating and so favoured the introduction of tandem junction working, and the advantage of introducing automatic tandem switching plant was, naturally, considerably increased by the decision to adopt the automatic system at London local exchanges. The installation of a mechanical tandem exchange has therefore been pressed forward, in advance of the completion of the first local automatic exchanges.

The mechanical tandem exchange is now being installed in the same building as the Holborn automatic exchange. In it will be concentrated the outgoing and incoming junctions from the smaller exchanges as well as a number of junctions to practically all the other London exchanges.

At the beginning of its life, and for the period which will elapse before conversion to automatic working in London is completed, the mechanical tandem exchange will be required to route traffic as follows:—

From manual exchange to manual exchange.
From manual exchange to automatic exchange.
From automatic exchange to automatic exchange.
From automatic exchange to manual exchange.

The method of handling this traffic is indicated by Fig. 21. Traffic from the "A" positions of a manual exchange will be dealt with in a similar manner to the traffic incoming to a cordless "B" position at an automatic exchange. The "A" operator will "order wire" the call to the cordless "B" operator at the tandem exchange, who will set up the call to the automatic switches via her key sender. In this case, however, since the exchange code must be set up in addition to the subscriber's number, the sender is associated with a translating unit, similar in principle to the director, and with a coder. If the call is for a manual exchange it will be directed to a call indicator position at that exchange, and the numerical portion of the required number—transformed into the correct impulses by the coder at the mechanical tandem exchange—will effect the required display on the lamp panel at the call indicator position. If, however, the call is for an automatic exchange the cross-connections in the translator jumper field will be such as to suppress the operation of the coder, and the numerical digits will go out to the switches at the automatic exchange in the regular manner.

Traffic originated in an automatic exchange will be carried direct from the levels of the outgoing switches to the first tandem switches at the mechanical tandem exchange. In the case of a call for a manual exchange a coder—interposed between the manual levels on the first tandem switches and the second tandem switches—will come into operation as soon as the second tandem switch has been operated, and the numerical portion of the required number will be stored in the coder and converted, as already described, for display at the call indicator position. A call for another automatic exchange will pass out via levels on the first tandem switches which are not equipped with coders, and the call will be routed straight through the switches as determined by the impulses from the director at the originating automatic exchange.

As the conversion of London to automatic working proceeds, the traffic incoming to the mechanical tandem exchange from manual exchanges, and the traffic outgoing to call indicator positions, will decrease and will ultimately fall to zero. The whole of the traffic will then be purely automatic and will be routed direct through the switches, as at other main switching centres in the London system. The cordless "B" positions and their equipment will no longer be required for their original purpose, and it will probably be desirable

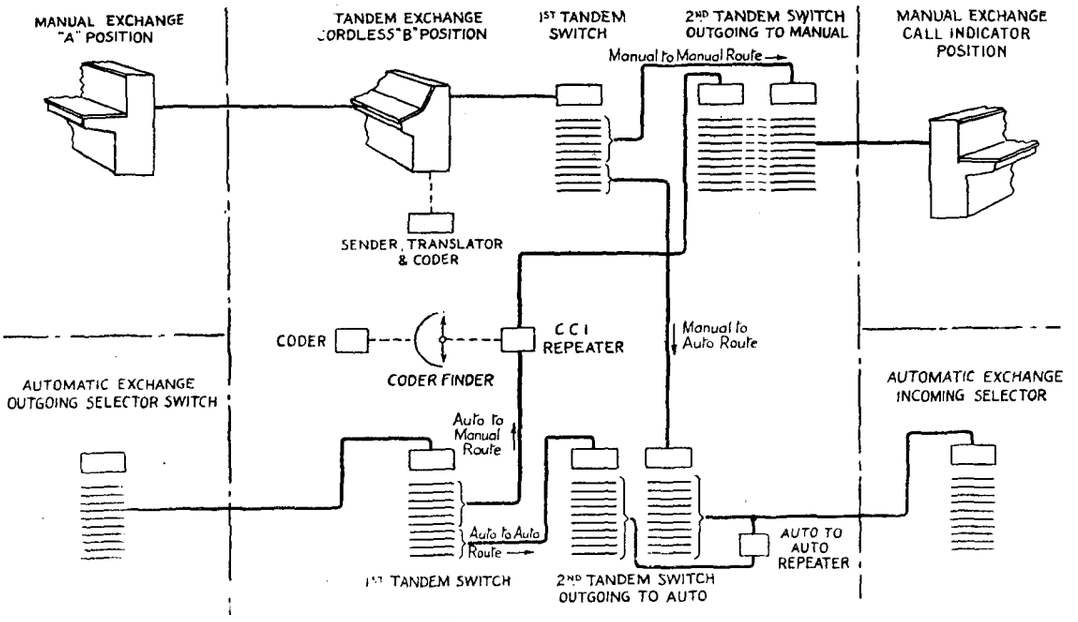


FIG. 21.—Mechanical tandem routing scheme.

to utilise them for passing traffic from towns in the London toll area into the automatic system. This question will be considered in due course, as the cordless "B" positions at the mechanical tandem exchange are freed from local traffic.

POWER CONSUMPTION.

At a city exchange of approximately 10,000 lines, and at the mechanical tandem exchange, the operating current at peak load will exceed 2,500 amperes. Two sets of 50-volt storage batteries, each having a capacity of 10,000 ampere-hours, are provided. During busy hours the load on the batteries is eased by running the charging machines in parallel with them.

VARIOUS CLASSES OF SERVICES PROVIDED.

The subscribers connected to an automatic exchange will be divided into two groups (*a*) those to whom trunk calls are permitted and (*b*) those to whom trunk calls are barred. The distinction is of course of the subscriber's own seeking, but it is necessary that the department should guard itself against improper use of the trunk lines by those subscribers who are not entitled to this service. A subscriber who requires a trunk connection will dial TRU if on a director exchange. (The letter "O" is used for this purpose at non-director exchanges in the provinces). In the group where trunk calls are permitted the call will be routed to a record operator, but in the group where such calls are barred the call, if made, will be routed to a special operator and dealt with accordingly.

Subject to this restriction the following classes of service will be provided :

Subscriber to subscriber—direct.
Subscriber to subscriber—over junction circuits.
Subscriber to subscriber—over trunk lines ("revertive" calls).
Subscriber to subscriber—over toll lines ("no delay" calls).

Coin-box stations and call offices to and from all other subscribers in the system direct, or over junction, trunk, or toll lines.

Private branch exchange traffic with night traffic on selected lines in each group of exchange lines.

Inquiry, information, and directory services.

Dictating messages for onward transmission as telegrams, express letters, or letters.

Receiving telegrams in lieu of delivery by messenger.

Calling for services of express messengers.

TONE SIGNALS.

A system of tone signals designed to give a calling subscriber knowledge of the progress of his call has been standardised for use both in London and the provinces. Before commencing to operate his calling dial the subscriber should listen for a "dial signal tone," which indicates that a free selector in the first rank—or, in London, an "A" digit switch—is available to receive the dialled impulses. Dialling must not commence until this tone—which is continuous at a frequency of 33 per second—has been received.

If the called subscriber's line is engaged, or if, at any stage of the call, all outlets from a selector switch level are busy, a "busy tone" will be sent out. This tone has a frequency of 400 per second and is applied for "off and on" periods of 0.75 sec. The tone is associated with a flashing signal on the supervisory lamp of an operator's cord circuit in the case of a call from a manual exchange subscriber.

When dialling is completed the subscriber will immediately receive "ringing tone" to indicate that the required subscriber is being rung, or "busy tone" to indicate that he is already engaged. The ringing tone is provided by means of a leak from the ringing circuit through a condenser of small capacity on which current pulses at a frequency of 133 per second are superposed. This tone is applied to the line with the same interruptions as the ringing current itself, i.e. a double beat of 1 second with a 2-seconds interval. The double beat consists of two rings of 0.4 second duration separated by an interval of 0.2 second.

In areas where the director is not used a further tone known as the "number unobtainable tone" is employed to indicate to the subscriber that he has dialled a ceased or unallotted number. In London this tone will be used to indicate to a subscriber that he has in completely dialled the required number. Calls for ceased or unallotted numbers will be routed to an operator.

ALARMS AND GUARDING DEVICES.

A complete system of alarm and guard devices is provided to facilitate supervision of the working of the exchange and to call immediate attention to any irregularity in the operation of the switches. The alarms are given by a lamp associated with a bell or buzzer and are divided into the following categories :—

(1) Individual switch alarms.
(2) Individual panel or shelf alarms.
(3) Individual rack alarms.
(4) Group alarms.

The alarms are operated in trains.

A fault or irregular condition which brings in an individual switch or panel alarm will also bring in the appropriate rack and group alarms. The maintenance officer will thus be guided from the group alarm to the rack alarm and then to the panel or switch on which the fault or irregular condition has occurred.

Switch alarms are provided on those switches which are normally connected with a subscriber's line by the act of lifting his receiver, without dialling. Such switches are the first group selectors in non-director areas and the first code switches in director areas, the alarm lamp will indicate in this case a loop on a subscriber's line, and, should this loop persist for 3 minutes without impulses being dialled, a clock-controlled relay set will come into operation and cause the rack and group alarms to operate.

Individual switch lamps are also provided on the final selectors in non-director areas to call attention to the condition where a called subscriber's line is held after the termination of a conversation by the failure of the calling subscriber to restore his receiver. In director exchanges the corresponding lamp is provided at the first code selector.

On other ranks of switches the alarm lamps are provided on the basis of one lamp per panel or shelf of 20 switches. The most probable irregularity in the use of switches in these ranks is that they may be improperly held by a subscriber leaving his receiver off after incomplete dialling of the required number; this happens so rarely that alarms on the basis of one per switch would not be justified.

In addition to the foregoing supervisory alarms, signals are provided to call immediate attention to fuse failures and to "release" failures on switches of all ranks.

PRIVATE BRANCH EXCHANGE LINES.

Most private branch exchanges have more than one line to the exchange and it is of course necessary to arrange that, if a call be received when the particular line representing the exchange number of the private branch exchange (PBX) is engaged, the calling subscriber shall not receive the "busy" signal unless all the lines to the PBX have been searched and also found to be engaged.

It is therefore necessary to arrange that the group of lines to a PBX shall be connected to consecutive positions on the bank multiple of the final switches and to provide all switches on which such groups of lines terminate with means for continuing their rotary motion as a hunting operation throughout the group—after the impulses of the units train have carried their brushes to the first line of the group—until an idle line is found, or the whole group has been searched without success.

Switches provided with this facility are known as "rotary final switches" or "rotary connectors." In the case of PBX groups or two or three lines no special difficulty arises, apart from the fact that all the lines must appear on one level of the switch and that a few spare positions for future growth must also be left upon that level. This tends to a certain amount of plant wastage, and also generally involves changing the exchange numbers of a proportion of the subscribers in order to get them properly grouped on the levels of the switches when a transfer to the automatic system is made.

(To be continued.)

THE MAKING OF A TELEPHONIST.

BY MISS M. A. ROACH, *Bradford.*

(Concluded from page 226.)

Although it has been necessary to omit many of the details included in the "A" working it will perhaps be seen by now that a learner can theoretically operate every class of call from an "A" position before she passes on to the "B" work, which represents calls coming from other exchanges. These are dealt with on either ringing and auto-calling junction, or order wire positions.

The work at first appears much easier than on the "A" positions, but when the learner realises what a lot depends on a "B" telephonist, well, the absence of tickets and registration is not such an attraction after all. There is practically no team work either, and this rather alarms her when she thinks of the speed at which she will have to operate some day.

The difference between the two types of junctions, plug and jack ended, is explained before we learn to operate a call from each class. This is a fairly easy lesson, and we are soon ready to pass on to the calls on the incoming order wires. As in the outgoing work, we take first the straightforward call and see how it is applied for by the "A" telephonist, how the connexion is made, and most important of all, the necessity for assigning and clearing promptly. Unfortunately, all incoming calls are not straightforward connexions, which just require putting on and taking off. We often wish they were!

The scoutboys' motto "Be prepared" is a very appropriate one for a "B" telephonist, who has at all times to be prepared for *many* things. For instance, not only must the learner be taught what to do when asked to ring on a junction where a connexion *is* established, but also where there is no connexion, or sometimes on a junction which does not even exist, or when asked for a number not on her own exchange, or for a pegged number, a number out of order, and so on.

The differences in the treatment of or the expression used in these cases are not great, but on an order wire, particularly if it be a split one, there is no time for thinking, and requests must be dealt with instantly if one wishes to retain one's mental balance.

The misgivings experienced by a learner the first time she takes an incoming order wire position can I think, only be compared with one's first visit to the dentist (there's a trembley feeling, inside). But as a rule, she soon overcomes that and rather enjoys it, until the moment arrives when some distant "A" telephonist interrupts! I imagine if she is at this point capable of thinking (usually she is'nt) her thoughts will be on rule 33, T 1003. At the same moment she will realise too why she received so much instruction on the necessity for concentration. But a little daily practice at the quietest time, a "listening-in" at a busier time, and our learner is *almost* ready for the fray.

Before concluding, perhaps I may be allowed to say a few words regarding the relationship of the learner to the supervisor and to the experienced telephonist. One cannot train learners without realising that no two girls are quite alike, but every effort is made to bring out the best in *each* learner whilst *she* is in the school. To a certain extent, learners can be divided into there types.

First, the good ones. Little need be said about these. They are easy to teach, anxious to get on, amenable to discipline, and one can almost foresee their future.

Second, the poor ones. By this I mean those who are slow, perhaps a bit careless (we often are at sixteen) and not always given to thinking for themselves. They may be as anxious as the others to get on, but somehow or other they cannot just manage it. They need lessons repeating several times, and in various ways too, consequently they take up more time than the others, but as a rule one need not despair. It is not unusual for a learner of this type to turn out a very good telephonist in the end, for if she can be trained to be thorough and careful, she has a decided advantage over the quick learner, who may become slipshod if not carefully watched.

The third type is the indifferent girl, who is usually a problem. Like the others, she has some good points, if one can only find them, but she is spoilt. She belongs, I suppose, to the rising generation and her sense of responsibility has apparently not been developed. It is not an easy task to win her confidence and at times one appears to be wasting time and energy.

Although she is indifferent, she is usually intelligent, therefore it is worth while to remember that patience and tact often work wonders, and if there is a possibility of her making good when she settles down and realise that she is not the *only* person in the world, well, one's efforts will be rewarded on the day when another good telephonist is added to the exchange.

To my mind it is a regrettable fact, but I am afraid, only too true, that in some cases, too much is expected from a telephonist in her first few weeks or even months of service. Surely we should all remember that the girl has had to accumulate a lot of knowledge in a short time, and therefore when she commences practical work she is apt to be a little bit overwhelmed. To take the attitude that new girls are a nuisance is a reflection on the capability of a supervisor who surely does not always expect to be supplied with experienced senior telephonists. Even if the girl does make a mistake now and again, well, I suppose we all do somethimes. Think of those lines which say:—

"Oh, would'nt the days be dreary and long,
If all went right and nothing went wrong!"

To the telephonist, I would just like to say "Are you a really good telephonist"? If so, be thankful and by your example, help the next learner, who may sit beside you, to become the same.

CORRESPONDENCE.

BALDWIN'S TELEPHONE HISTORY.

TO THE EDITOR OF "THE TELEGRAPH AND TELEPHONE JOURNAL."

SIR,—*I find that Mr. Cotterell's query in your May issue as to the first* Telephone Exchange in Glasgow may be answered definitely from the back files of the *Electrician*, a fact I was not aware of when I wrote you on the subject in June.

On Dec. 20, 1879, the *Electrician* said, "Glasgow has now three rival Telephone Exchange Companies—Scottish Telephonic Exchange Co., Edison Co., and the Telephone Co. (Bell's). Besides these Mr. Graham, a telegraph engineer of the City, is prepared to establish private lines."

This proves that Graham had no Exchange up to the end of 1879, and confirms my surmise as to his possessing private lines.

Again, on Oct. 8, 1880, the *Electrician* reported "Messrs D. and G. Graham have come rapidly to the front in Glasgow within the last few years. They have now three Telephone Exchanges in full operation in powerful rivalry to the United Telephone Company working the Bell and Edison instruments. These Exchanges consist in one for doctors, one for lawyers, and one for commerce; but all three exchanges are together, and a client of any one can correspond with a client of any other. The instruments employed are a microphone transmitter, similar to Crossley's, and the Gower-Bell telephones."

Graham's system had therefore become operative during 1880, as I have said. Incidentally the paragraph also confirms my further statements that Graham's three exchanges were really all in one, and that his Exchange instrument was the Gower-Bell.

We can now be sure that the Glasgow Exchanges were opened in the sequence (1) Bell; (2) Edison; (3) Graham. The Scottish Telephonic Exchange Co. mentioned in the first *Electrician* quotation never got to work seriously. That Company established itself in Edinburgh and Dundee, but failed to do so in Glasgow.—I am, Sir, Yours, &c.

A. R. BENNETT.

Guernsey,
July 24, 1925.

The
Telegraph and Telephone Journal.

PUBLISHED MONTHLY IN THE INTERESTS OF THE TELEGRAPH AND TELEPHONE SERVICE, UNDER THE PATRONAGE OF THE POSTMASTER-GENERAL.

Editing and Organising Committee - - - J. STUART JONES. JOHN LEE. J. J. TYRRELL. W. A. VALENTINE. J. W. WISSENDEN.

Managing Editor - - W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

VOL. XI. SEPTEMBER, 1925. No. 126.

TELEPHONE PROGRESS IN EUROPE.

As good Europeans we watch with interest the progress of the telephone on that Continent, and from the returns for the year 1924 so far to hand, we are glad to see that Europe is making steady progress in a direction in which it has so much to overtake. Germany added 142,845 telephones to its system (an increase of 6½%), Great Britain 115,929 (an increase of 10%), Belgium 22,137 (an increase of 18%). Denmark and Sweden each added over 15,000 (increases of 5½ and 4% respectively), and Austria and Holland over 9,000 each. We have not yet seen the figures showing the French development, which is usually at a rate in the neighbourhood of 10%.

The returns available show a total increase for Europe of 356,000 telephones, and when the statistics from France, Poland, Czecho-Slovakia, Italy, Finland and Russia are received, there is little doubt the figure will reach 460,000, an increase of over 7% on last year's total. The rate of increase in highly developed North America is between 5 and 6%, which is higher than that of the Scandinavian countries and Switzerland, but notably lower, as might be expected, than that of those European countries which have considerable leeway to make up. Latvia, for example, increased last year at the rate of 40% and Esthonia at over 18%.

We conclude these preliminary remarks on the telephone position of Europe in 1924, which will be dealt with more fully at the end of the year, by informing those who are interested that the principal telephone-owning countries in the world were the following:—United States with 16,159,550 telephones, Germany with 2,385,177, Great Britain 1,264,024, Canada 1,083,964, followed by France and Japan. Then come Sweden with 418,303 telephones, Denmark with 303,754 and Holland with 204,676. No other country possesses 200,000 telephones, except Australia, whose position in the list would be between Sweden and Denmark.

HIC ET UBIQUE.

We have received the Annual Report for 1924 of the Post and Telegraphs Department of the Federated Malay States. It shows a slight decrease in telegraph traffic, which is attributed to the rapid development of the telephone service. Ten new exchanges were opened during the year, and 226 new subscribers added. The total number of telephones, extensions, &c., is now 3,685.

The following delegates are representing the Post Office at the International Telegraph Conference now being held in Paris: Messrs. John Lee (Controller, Central Telegraph Office), F. W. Phillips, F. H. S. Grant, J. L. Louden, and H. G. Trayfoot (Secretary's Office), F. Strong, Accountant General's Department. Messrs. J. M. Goodman and H. E. Boyce (A.G.D.) and E. E. Street (C.T.O.) are attending as attachés. The delegates have a heavy programme before them.

"I have yet to satisfy my mind," writes a correspondent, of the *Bradford Daily Telegraph*, "on the cause for the persistent advertisement by tradesmen of their telephone numbers. Many of them seem to have the idea that to be able to display a telephone number is the greatest guarantee of stability. I am sure it must be some such notion as that. Otherwise it is inconceivable that they would persist in the practice. Who on earth can possibly remember a telephone number if one catches sight of it on a passing motor-car? And whoever has been seen whipping out a notebook to jot down the number for future reference? Not even the most careful customer, surely."

The writer does not appreciate the merits of publicity. We imagine that this correspondent has now well fixed in his mind the fact that the tradesmen in question are on the telephone. He knows that he will not look for them in the telephone directory in vain.

According to the *Paris New York Herald*, the construction of the world's longest telephone cable has been completed at Toledo (Ohio). With the splicing of a joint at Swanton, 19 miles west of Toledo, a direct wire of 861 miles was completed. The new line furnishes New York and Chicago traffic with a virtually storm-proof link. It is capable of handling 250 telephone calls and 500 telegraph messages simultaneously, and an investment of £5,000,000 is represented.

Mr. Archibald's "Notes on Telegraph Practice" reach an interesting stage in this issue—the routing of telegrams. In the next instalment of the series he explains the zone system and the methods of external circulation at present in vogue.

WIRELESS, THUNDERSTORMS, MURDER, AND QUARRELSOMENESS.

[WE have become accustomed to the theory that the frequency of thunderstorms is due to the multiplication of wireless apparatus. Now a Dublin doctor writes to the *Daily Mail* to the effect that "high tension wireless current spread over the world by the broadcasting stations irritates the nerve centres, causes sleeplessness, depression of spirits, murder and suicide." A lady supplements this by saying that a paralytic victim improved when the aerial was properly earthed, and that families have become more quarrelsome since they have enjoyed listening-in !]

Broadcasting when it first began
Seemed one vast benefit to man ;
It brought unto his very door
Delights he travelled to before.

No longer was he forced to roam
From the charmed circle of his home,
When he by cheap and simple measures
Could listen-in to London's pleasures.

No longer need he wait in queues
To hear rechauffés of Revues,
Nor scuffle in surroundings drab
To win the post-theatre cab.

For sitting in his easy chair
He was regaled with varied fare :
Fantasia and Fugue, and Scherzo,
Or Ballad of the sort that hurts so.

He heard both symphony and song,
"All things in turn and nothing long."
Pierrot and Primate, Premier, Peer,
Professor, Poet, Profiteer.

So might he gain instructive hints
On gardening or aquatints,
On keeping bees or keeping cool,
On hops and crops and snooker-pool.

It reproduced for his delight,
The cuckoo's note on April night,
The susurrations of the crowd,
The Zoo's nocturnal roarings loud.

Alike for him whose brow is high
And him whose tastes more lowly lie,
The horn or head-set shed the boon
Of Bach, or "something with a chune."

Who loved not Bach, he need not list
To that sweet contrapuntalist,
But might luxuriate in the drone
Of the distracting saxophone.

And those of scientific bent
Could juggle to their hearts' content
With heterodynes and oscillators,
Detector-valves and alternators.

Thus all were happy in their way
Until warning voices murmured ; "Stay !
Whence comes the daily thunderstorm—
That deviation from the norm ?

"Who tampers with the ether must
Not wonder if the heavens combust,
And lightning blasts our summer days—
Go to, ye wireless, mend your ways !"

And worse and worse, for after these
Pontific-publicist M.D's
Raise in the Press horrific scares :
Crime and Broadcasting go in pairs !

Stray currents, so one sage observes,
Disastrously affect the nerves ;
Hence family quarrels may betide,
And even murder, suicide.

"Cut down your wires," observes one critic
"And save the threatened paralytic.
Remove your sets, and, as a moral,
Bloodshed will cease and family quarrel."

Oh ye, on listening-in intent,
Who think your joys are innocent,
Pause ere your sport endangers life
—Or else remember : fools are rife.

W. H. GUNSTON.

THE HISTORY OF THE TELEPHONES AND TELEGRAPHS IN URUGUAY.

DR. VICTOR M. BERTHOLD, of the American Telephone and Telegraph Company of New York, continuing his valuable series of histories treating of the development of the telegraph and telephone in Latin America, deals in the book under review with the history of those services in Uruguay. The first telegraph line in the state was that between Monte Video and Buenos Aires (Argentine), 244 miles in length, constructed by an English Company in 1866. For 21 years, during the vicissitudes of sundry civil and foreign wars, this service remained under the control of British capitalists. Francisco Lanza began in 1887 the construction of lines for the State, which gradually assumed the control of all telegraph lines except three furnishing service with Buenos Aires, Brazil and Europe.

Dr. Berthold has expended much labour in research on the beginnings of the telephone, which was introduced into Uruguay by two Americans, Manton and Gower. The concession for the telephone service was, however, transferred in 1881 to an English company, the River Plate Telephone Co., which with its successor, the Monte Video Company, has been the principal telephone authority in the State ever since. The latter company was formed in 1888, and in 1889 had 1,659 telephones working. In 1923 it had 12,229 out of a total of 23,591 in Uruguay. Its chief competitor, the Sociedad Cooperativa had then 4,055 telephones. Negotiations for the nationalisation of the Company's system have been pending since 1922, but no definite decision has yet been reached.

OBITUARY.

ON Aug. 4, after a long and painful illness, Herr Wollin, Oberpostrat of the Telegraphentechnische Reichsamt of Berlin, passed away. Herr Wollin was one of the most capable, as well as one of the most respected, officials of the Berlin technical staff. There is no doubt that over-study, and his unselfish zeal for the efficiency of his department contributed in no small measure to his early death at the age of 49 years. He was buried in the precincts of his native town of Stettin.

TELEGRAPHIC MEMORABILIA.

By the time these lines are published the International Telegraph Conference will have met in Paris and be well in the throes of the discussion of the thousand and one *propositions* which will be laid before that body for its consideration. The expression "thousand and one" is almost literally true, for the total number of these *propositions* runs well into four figures. Whatever may be the cross-currents of opinion in the present assembly it is certain that one of the results emerging from such a conference must of necessity be a distinct and definite trend towards the co-ordination of wire and wireless telegraph practice.

That the two systems should have diverged as widely as they appear to have done, especially as regards point-to-point working, was unfortunate, but was due in no small measure to the conditions obtaining in ship-to-shore, naval, military and aerial services.

The Washington conference of 1921 tended towards solidifying these more or less amalgamated usages, but it is perhaps not too much to say that commercial telegraph experience of half a century has not always seen eye to eye with the findings of that gathering.

Of the development of wireless there is a constant stream, and the latest reports from Italy are not the least interesting. Some remarkable experiments have been carried out recently in the city of Milan by Signor Midali, who has succeeded in picking up by means of wireless reception no less than 50% of the *power* transmitted.

Wireless call signs sometimes produce singular difficulties, thus IC1 is clear enough when printed in block letters, but when referred to in a Service Message, say in French, there is little difficulty in imagining a sentence where *ici* would prove a stumbling block. Quite recently the figure 1 was received in similar circumstances, and for some time appeared quite unintelligible as forming any possible portion of the BQ, until it was suggested that the wireless station "O.N.E." was intended.

It is understood that l'Académie française last year refused to accept *Electrification* and *electrifier* as recognised words for the authorised French dictionary, and has so far persisted in its decision. It, however, appears possible that in reply to the urgent protests from French electrical pressmen, this august body may finally relent. In any case the matter is to be reconsidered.

The cable steamer *Isis* left New Zealand last month on a surveying expedition in connexion with the duplication of the Pacific telegraph cable from Fiji to Vancouver.

Other cable-steamer news is that of the *Faraday* (Messrs. Siemens Bros.), which has recently returned from her voyage to South America, during which she carried out the laying of a submarine telegraph cable, for an Italian telegraph cable company, between Fernando, Noronha (Brazil), and Rio de Janeiro.

One interesting fact concerning the work carried out, was the maintenance of wireless telephonic communication between the vessel and the island throughout the whole of the operations, by the aid of one of Siemens' portable receivers.

We cannot but admire the ingenuity of our telephone engineers who, it is understood, to prevent Lancashire men being overheard by unscrupulous competitors *outside* the call-boxes while the former are phoning fish prices from inside the same—have installed a "buzzer" which immediately operates as soon as the caller closes the door. Needless to say it cannot be heard *inside* the box, but prevents the outsider from overhearing the conversation.

The authorities in Leeds have inaugurated the acceptance of telegrams through ordinary slotmeter telephone call boxes, the user paying the telephone call and telegram fees into the box in pennies. Liverpool followed suit on Aug. 1, and the scheme, which is being tried in Manchester, will be extended if successful.

The *Times* states that the Marconi Company expects to complete the Post Office "Beam" wireless station at North Petherton, near Bridgwater, by the end of the present month.

The station is erected on a site of about 300 acres, and will consist of two sections, one of which will be used for receiving communications from Canada, and the other from South Africa. Each aerial system will be supported by five steel lattice masts, 290 ft. high, 12 ft. square at the base, and 139 ft. apart. Fifteen feet from the top of each will be a cross-arm support, from which will hang the aerial and reflector wires. The transmitting station for the system is in course of erection at Bodmin.

The following few particulars of the new high-power broadcasting station at Daventry, Northamptonshire, though well-known to most of our home readers, may be of special interest to our overseas and more distant foreign subscribers:—The station is situated practically in the geographical centre of England and on the summit of Borough Hill (1½ miles from Daventry), which is 600 ft. above sea level, the two lattice steel masts are 500 ft. high, so that the aerial is about 1,100 ft. above sea level. The call sign remains 5XX and the wave-length 1,600 metres, while the mean input to the plates of the magnifier valves will be 25 kw., which power can be augmented when necessary.

Also somewhat belated, but also of interest to distant colleagues, is the reply of Lord Walmer to Mr. Ammon, who asked whether, in connexion with the development of the Empire wireless chain, the sites had yet been acquired for the erection of the stations for communicating between Great Britain and Australia and India.

To which the Assistant Postmaster-General replied that sites near Grimsby (for the transmitting station) and near Skegness (for the receiving station) had been selected for the beam stations for communication with Australia and India, and it was hoped that the purchase of the various properties concerned would be completed at an early date. The order for the erection of those stations had already been placed with the contractors. Both stations are to be completed by May 8 next.

The latest information, including that from the Bombay *Evening News*, Reuters' Agency, and the London *Daily Telegraph*, is that the Marconi Company's engineers arrived in India about the middle of last month for the purpose of commencing at once the construction of the new beam wireless stations at Poona and Dhond in connexion with the Empire chain. The Bombay Government had already ordered the acquisition of land at Poona and at Dhond, which latter is 45 miles S.E. of the military centre above mentioned. Construction of these two stations is starting concurrently with the construction of the British Post Office station. The Chairman of the Indian Radio Telegraph Company, which has undertaken the work, has just returned to Bombay after studying the wireless systems in America, England, and France. The company is financed by Indian capital, and all the shareholders are Indian. It was granted a licence by the Government some months ago. Both stations are expected to be finished before the end of the year.

AUSTRALIA.—The Postal Department has decided to grant the application of the New South Wales Labour Council for a licence to establish a broadcasting station, and has allotted the proposed station a wave-length of 280 metres. The secretary of the Postal Department, Mr. H. P. Brown, has stated that the Council has undertaken to conduct the station in accordance with the regulations, and not to commit any breach of the Telephone Act by using it for the transmission of information which, legally, can be transferred only by the Postmaster-General.

BELGIUM.—The London *Times* is responsible for the following information. A meeting attended by three Ministers and officials connected with the Belgian Telegraph Administration was held some time ago at Brussels for examining anew the installation of a cable from La Panne, on the Belgian coast, to Herbesthal, on the Belgo-German frontier. This cable is intended to assure direct *telegraph* communication between England and Germany, which is best served by way of Belgium. The present Belgian installations are unable to cope with the traffic, a large part of which is transmitted via Holland. The projected cable is estimated to cost one hundred million francs (about £950,000 at present rates). It was suggested that the best solution would be for the work to be done by Germany under the head of reparations.

[Direct *telegraph* communication between England and Germany by cable has been a fact for about half a century and more. Ed. *T & T. Jl.*]

BRAZIL.—The *Telephone and Telegraph Age* states that the American, English, French, and German Consortium has obtained the approval of Brazilian authorities to construct a large radio-telegraph station at Pernambuco. The Minister of Marine has approved the project, and construction will commence as soon as arrangements can be made with contractors. The station is to have seven towers, each 150 metres high, and will be used primarily as a receiving relay station between the United States and Europe, on the one hand, and Rio de Janeiro and Buenos Aires, on the other, and is regarded as necessary to maintain uninterrupted service, because of poor receiving conditions at Rio. The station will be equipped to communicate directly with both the United States and Europe, and it will take from 18 months to two years to finish.

CZECHO-SLOVAKIA.—According to *Commerce Reports*, an American firm has obtained a contract from the Ministry of Posts and Telegraphs, for constructing a broadcasting station in Prague, to be completed within six months at a cost of 3,000,000 Czech crowns. The new station will be used for broadcasting over the entire Republic; its power will be five kw. and the wave-length 500 metres, which it will be possible to increase to 2,000 metres. It is also planned to erect stations, each of 1 kw., in Brno, Bratislava, and Kosice; they will broadcast on a 500-metre wave-length.

From other sources we learn of Czecho-Slovakian developments in Railway Telephony, thus from Prague it is reported that negotiations are in hand for the installation of the Huth telephone system on one of the express trains of the Czecho-Slovakian railways in order to enable passengers to make telephone calls while travelling.

GERMANY.—The *Times* reports that the new Elberfeld broadcasting station has been completed, and tests on a wave-length of 207 metres have been very successful.

The *Evening News* reports from Munich that the broadcasting station there recently increased its transmitting power from approximately 1 to 10 kw., and that it is practically certain that the other German stations will similarly increase their power in the near future.

Says the Department of Overseas trade:—"The importance of Frankfort as a telegraphic cable centre is increasing. The '*Frankfurter Zeitung*' of July 1 furnishes the following information. To the already existing cable between Berlin and Frankfort is now added that between Frankfort and Basle: the latter is expected to be working by September. The cable line Frankfort-Nurnberg, (with a projected extension to Passau), is in construction.

A cable between Karlsruhe, Stuttgart and Ulm, connecting with the Frankfort-Basle line, is also being constructed. A proposed cable line between Frankfort-Fingen-Cologne and Bingen-Saarbrucken has met with opposition from the Occupying Authorities, but may ultimately be sanctioned. Frankfort will in the near future become the intermediary for the London-Holland Rome, Scandinavia-Rome, Paris-Mid-Germany-Warsaw-Russia, and for the Rhineland-Balkan cable-lines. It is already the cable centre for South Germany."

ITALY.—It is announced that the new direct telegraph cable between Rome and Buenos Aires, via Madeira and St. Vincent, will be inaugurated for business on Oct. 12 next.

It is also stated that the Compania Italo Radio, which is now exploiting the Italian radio-telegraph system, has recently established regular communication between Italy and the United States.

JAPAN.—The *Electrical Review* informs us that Mr. Y. Niwa, chief engineer of the Nippon Electric Co., which is affiliated with the International Western Electric Co., is in New York studying radio matters, and announces that early next autumn Tokio and Osaka will each have a broadcasting station; the former city has hitherto been served by a temporary station.

LONDON.—War Seal-mansions, Walham Green, which were established for the accommodation of disabled ex-Service officers and men and their dependents, have been equipped throughout with wireless receiving apparatus. The mansions contain 138 flats, and each has now a set of four pairs of earphones. Listeners have only to plug in their individual line to the main supply line to receive the broadcast programmes, each flat being separately served from a central receiving set. The service is thus "laid on" on the same principle as water and light, says the *Times*, but there is no charge for it.

Henley's Telegraph Works has obtained an order for cables from the Postal Department of Bucharest.

NEW ZEALAND.—The Christchurch correspondent of the *Daily Mail* reports that the Government and a new broadcasting company have agreed to the erection of modern 500-watt broadcasting stations at Auckland, Wellington, Christchurch, and Dunedin.

POLAND.—The Polish Government is desirous of developing radio broadcasting; the *Daily Mail* reports that new stations are to be built at Krakow, Lwow, Poznani, and Warsaw.

RUMANIA.—The Department of Overseas Trade has sent us a translation of the "Law for the installation and use of Radioelectric Posts and Stations" in Rumania which has been received from the commercial secretary at Bucharest. The regulations were published on July 8, and they provide, *inter alia*, that the right of exploitation of broadcasting in Rumania belongs to the State, and may be carried out either through the General Post Office or through a limited company which will have the sole right of broadcasting. The State will contribute to the company 60% of the capital and will have the majority of votes at the general meeting and on the Council of Administration in proportion to its shareholding; private persons may participate to the extent of 40%. The company will have the right to impose an annual tax for the use of receiving apparatus, fixed by agreement with the Ministries of Finance and Communications and with the approval of the Council of Ministers. Of this tax the General Post Office will take at least 30% of which it will give 10% to the town hall in the place where the apparatus is installed. The Ministries of Education, Worship and Arts, and of Communications will each have a delegate on the Board of Administration, and 50% of the net profits accruing to the State from the company shall form a fund to be used specially for purposes of propaganda and national culture by wireless telephony. The broadcasting company can make agreements with enterprises in the country or abroad for the supply and erection of transmitting and receiving apparatus in models approved by the Rumanian General Post Office. The General Post Office will register and control all apparatus in order to make sure that no system is used which might disturb other posts. All apparatus imported from abroad and that made in Rumania must, before being sold, bear the seal of control of the General Post Office. For certifying the apparatus the Post Office will charge a tax.

RUSSIA.—The *Evening News* recently informed its readers that Russia, through a broadcasting company operating on similar lines to the B.B.C. in this country, is making a bid to become one of the leading European countries using wireless for entertainment purposes. The Russian broadcasting company has nothing to do with the Soviet Government beyond working under a concession which has been granted to it, and at present it has six stations in operation—four in Moscow and one each in Leningrad and Kiev South Russia. Representatives of the company have recently been in England buying apparatus. The principal station in Moscow, where there are 300,000 licensed listeners, was formerly the old Russian Post Office station, and transmits on a wave length of 1,450 metres at a power of 12 kw. Work is already in hand to reconstruct this station and increase its power to 50 kw. in the aerial. This work will be finished by the end of the present month, and during the next week or two four other stations, now nearing completion, are to be opened. Two will transmit at 4 kw. and two at 2 kw. Then before next March no less than 30 other broadcasting stations are to be erected.

SHANGHAI.—What was said to be the first radio exhibition held in China, took place on May 9 and 10. It was promoted by the International Amateur Radio Association of China and was well attended, says *Commerce Reports*. The exhibits included all types of receiving sets from crystal to superheterodyne; transmitting sets were also shown, as well as some short-wave receiving equipment. Although the importation of radio sets into China has been officially reported as falling within the arms embargo, radio sets have filtered into the market from various unknown sources. One station in Shanghai broadcasts daily on a wave-length of 356 metres.

SWITZERLAND.—In a recent note upon the position of broadcasting in Switzerland, *Commerce Reports* states that the completion of the Basle station will give an impetus to the demand in Switzerland for radio apparatus. The local market is stocked at present with radio sets of French and German manufacture, although a limited quantity has been supplied by British firms. So far as is known, no American radio sets are at present in operation in Basle. Receiving sets now on sale in Basle retail at from 200 to 800 Swiss francs. The cheaper sets have not proved very satisfactory.

TURKEY.—The Turkish Post Office, says Reuter's Constantinople agent, has concluded an agreement with a French company for the installation of radio transmission and reception stations at Angora and Constantinople, the work to be completed in one year. To which we might add, if not too facetiously, "wind, weather and other circumstances permitting!"

UNITED STATES.—While European broadcasting authorities are discussing wave-lengths with a view to a proper allocation between various countries, the U.S.A. have evolved a scheme to overcome similar difficulties of their own. The plan according to the *Electrical Review*, is to broaden the present band (300 to 546) to between 150 and 546 metres. The proposal will provide accommodation for 600 stations, allowing room for 40 more in addition to the present number. The idea is to separate the broadcasting stations by grouping the high-and low-power stations in different sections of the band.

The American listener, it seems, will in future not be content with less than two good sets, one for his home and another always ready to take away at short notice. According to the *Evening News*, one firm has fitted up a large motor-boat as a transmitting station for the benefit of campers and cottagers round the shores of the Great Lakes. A party of artistes is carried on board and concerts are given every day and more or less all day to holiday-makers. The boat is using Detroit as its base until the winter, when it will go to Florida.

A NEW CODE OF TIME SIGNALS.—One of the principal objects of the International Service of Wireless Time Signals is to ensure that no ship, in whatever remote seas she may be sailing, shall ever be out of reach of them. The co-ordination of such signals can only be attempted by an international authority, and the International Astronomical Union's *Commission de l'heure* met on July 17 for a critical discussion of the relative merits of the various codes and the times at which they should be transmitted, particularly in Western Europe. The decisions have not yet been officially announced, but *The Times* understands that it has recommended the abolition of the old Paris code as still transmitted from FL at 10.45 a.m. and p.m. and the adoption of the International Code with the difference that, in place of the last three dashes, each of the three minutes shall end with the six dot seconds as transmitted by 2LO. This scheme was brought forward by the British Horological Institution, whose chairman, Mr. Frank Hope-Jones, was responsible for the original suggestion and arrangements for broadcasting the Greenwich dot seconds.

Life.—Be inspired with the belief that life is a great and noble calling; not a mean and grovelling thing that we are to shuffle through as best we can, but an elevated and lofty destiny.—*Gladstone.*

J. J. T.

REVIEW.

"A Text-Book of Wireless Telegraphy and Telephony," by W. Greenwood, B.Sc. (Eng.), Am. I.E.E., A.C.G.I. (University Tutorial Press, 5s. 6d.).

The author of this book thinks that although a large number of books dealing with Wireless Telegraphy and Telephony have already been published, there is one class of reader who may have hitherto been somewhat neglected, namely, the individual who is already acquainted with the fundamental principles of electrical engineering, and maybe the physics student, or the general reader, who possesses a sound knowledge of the elements of magnetism and electricity. His book is intended to fill the gap. It forms quite a comprehensive survey of his subject, and, apparently every endeavour has been made to bring up-to-date the matter in each chapter. Although there is a certain lack of detail in some instances, numerous references to published papers are given for those who may wish to obtain more detailed information.

A chapter on High Frequency Measurements and Principles of Design is included, while the last chapter contains proofs of certain formulas, and mathematical investigations of certain points in the theory of wireless telegraphy and telephony which have been simply quoted or summarised in earlier chapters.

We can recommend this book to the attention of the class of reader for whom it is intended to benefit.

PROGRESS OF THE TELEPHONE AND TELEGRAPH SYSTEMS.

TELEPHONES.

THE increase in the number of telephones for the June quarter, 29,678 or 2.3%, was rather less than that for the two previous quarters.

Operating statistics show that the volume of traffic continues to develop considerably as a result of new subscribers connected, but the calling rate per line shows a tendency to fall. The record taken in May last of one day's calls at exchanges with more than 300 lines showed that, compared with the corresponding record last year, the number of originated unvalued calls increased by 5%, the number of direct lines by 11.4%, whilst the calling rate per line showed a small decrease.

Trunk statistics show that the number of trunk calls made during April was 6,699,876, an increase of 580,917 or 9.5% over the figures for April last year. The average number of calls made per working day was 273,464—the highest result on record.

The number of calls made to the Continent was 18,289.

A summary of telephone statistics as at the end of June is given herewith :—

	London.	Provinces.
Telephone Stations—		
Total at June 30	458,919	844,559
Net increase per month	3,522	7,379
Residence Rate Installation—		
Total	85,952	145,178
Net increase	1,307	1,884
Exchanges—		
Total	105	3,746
Net increase	—	19
Call Office Stations—		
Total	4,283	14,935
Net increase	51	118
Kiosks—		
Total	137	1,110
Net increase	16	42
New exchanges opened under Rural Development Scheme of 1922—		
Total	—	721
Net increase	—	18
Rural Party Line Stations—		
Total	—	9,569
Net increase	...	115
Rural Railway Stations connected with Exchange System—		
Total	—	630
Net increase	—	10

Further progress was made during the month of July with the development of the local exchange system. New exchanges opened included the following :—

LONDON—Enfield.

PROVINCES—Brentwood, Haslemere,

and among the more important exchanges extended were :—

LONDON—Addiscombe, Bexley Heath, Esher, Kensington, Pinner, Stanmore, Thornton Heath.

PROVINCES—Barnsley, Bolton, Chorley, Egham, Leigh (Lancs.), Southport, Staines, West Bromwich.

During the month the following additions to the main underground system were completed and brought into use :—

Birmingham—Coventry cable.
Newcastle-on-Tyne—Blyth cable.
Worcester—Gloucester cable.

while 72 new overhead trunk circuits were completed, and 63 additional circuits were provided by means of spare wires in underground cables.

NOTES ON TELEGRAPH PRACTICE.

BY G. T. ARCHIBALD.

IX—Concerning External Circulation or the Routing of Telegrams.

THE routing of telegrams is a fundamental study, and one which did not apparently receive the attention it deserved in the early days of telegraph development. It seems always to have been the aim of telegraph administrators to provide the best possible service with due regard to economy, but it must be confessed that, in the main, the routing arrangements until quite recently, were not founded upon any scientific basis. This much may be said without in any way reflecting upon the ability, perspicacity and zeal of those who built up the service.

The study of telegraph traffic problems, calling for preparation of a vast amount of statistical data, was rather forced into the background by considerations once thought to be of greater importance, and it was not until the volume of traffic had become more or less stabilised that routing and other related problems came to be regarded as of first class importance.

In the early days of the postal telegraph organisation, direct long distance lines were conspicuous by their absence. Many of the circuits then in use served several important towns ; such circuits were, and are still, known as "omnibus" circuits ; in the United States of America they are called "way" circuits. Under this arrangement the number of re-transmissions per telegram was considerable—it is now 1.14—and heavy delay was, consequently, a common feature.

Development of long "through" communications was slow. Expediency would seem to have been the governing factor in the provision of trunk circuits, and there was, apparently, little or no attempt at organised circulation or routing as we understand it to-day.

The first definite step which appears to have been taken towards the standardisation of telegraph routing was made in 1888—eighteen years after the telegraphs were transferred to the State—when the then surveyor of the North Eastern District arranged a circulation list for each office under his control. This routing was empirical, but it carried considerable weight in the minds of the members of a committee which was later appointed to enquire into the work of telegraphists and their supervisors.

At one time it was thought that the position of London in relation to the rest of the country made it necessary that every town of importance should be in direct communication with the Central Telegraph Office, London. It is feared that local vanity very often proved too much for official common sense, for as Mr. Lee points out in "Telegraph Practice" "London has direct communication with much smaller towns, in respect of population and of commercial importance, than the towns in France which are connected to Paris," it may also be conjectured that the then controller of the Central Telegraph Office was anxious to build up

a larger and still larger Central Telegraph Office, and that he encouraged development on those lines. One of the consequences of the adoption of this principle was that in the course of time the Central Telegraph Office came to be a huge telegraph clearing house; quasi-local telegrams were signalled over long and expensive lines, the telegram mileage being considerable. A typical instance of the circulation in operation at the time is that of telegrams handed in at Bolton, Lancashire, for Scarborough, Yorkshire, which were routed via London.

With the continued growth of traffic after 1885, the Central Telegraph Office arrangements were in danger of breaking down under the volume of transmitted work, and in 1899 it was laid down that transmission at two provincial offices should be regarded as the equivalent of one transmission at the Central Telegraph Office, in order to bring relief to the latter office. The change produced the desired effect as far as the Central Telegraph Office was concerned, but it stimulated another evil, for provincial offices were quick to boom their facilities in order to attract traffic from other offices. Even before 1899 the competitive spirit became so pronounced, and telegraph routing became so involved, that the Committee mentioned in a previous paragraph submitted that :—

(1) It was clear that at nearly every office which came under their observation there was waste of force.

(2) Supervising officers did not appear to realise that persistent efforts to secure economy of force was required of them.

(3) Means of communication provided for busy periods have been unnecessarily used at other times.

(4) Supervising officers in some towns occupying an advantageous position for the transmission of telegrams to and from other towns had endeavoured to attract to their offices telegrams which would otherwise have been naturally transmitted, with efficiency, by other routes. They had done this in the hope that they would eventually so completely fill certain channels as to justify them in recommending the provision of additional wires, which again would require additional force, and add to the importance of the office.

The Committee recommended :—

(*a*) That surveyors should prepare a circulation list for each office provided with more than one telegraph outlet, and that the superintendent of the instrument room should be held personally responsible for a strict adherence to the list, and

(*b*) That no superintending officer of telegraphs should be recommended for promotion if he had not altogether refrained from attempts to divert telegrams from their normal routes.

Little further progress appears to have been made, however, in the direction of organised routing in the next few years, and in 1900 another committee, appointed to enquire into the organisation of the Central Telegraph Office, found,

(*a*) That telegrams are not always circulated by the best available routes, certain routes being overburdened, while on alternative routes there is room for more traffic, and

(*b*) That there is a tendency on the part of some supervising officers to magnify the importance of their offices by attracting traffic for transmission when other offices are already transmitting it with equal and even greater efficiency.

The Committee expressed the opinion that these were important matters which vitally affected the efficiency of the service. They came to the conclusion that the only way to secure proper attention to them was to employ independent practical officers to visit the various offices and systematically inspect the duties. They recommended that two such officers should be appointed in the first instance, that they should be of equal rank, that their reports should be made direct to the Secretary, and that they were to act separately and furnish independent reports.

In the same year the first two telegraph traffic managers were appointed, and amongst their other duties they were "to examine the returns of working from the various offices—returns which are now, under a provisional arrangement, examined by the Controller of the Central Telegraph Office, but which should no longer be referred to that officer." From this point onwards, office routing received careful and constant attention, and in the course of time the work was placed on an orderly, if still empirical basis. The old evil of touting for transmitted traffic was checked if not entirely stamped out, and the number of transmissions per telegram began to decline.

Between 1900 and 1907, a large number of inter-provincial long distance circuits was provided, and in the latter year it was decided that in future no special effort need be made to divert traffic from the Central Telegraph Office, but work should not be diverted to it. The new circuits were arranged as far as possible, so that places having a commercial or social affinity, should be in telegraphic communication with each other, the circuits were also utilised to divert traffic from the Central Telegraph Office in cases where no additional transmissions were involved. Special industries like the fish trade were specially catered for. Grimsby was provided with direct circuits to London, Birmingham, Bristol, Edinburgh, Glasgow, Leeds, Liverpool, Newcastle-on-Tyne and Sheffield. Aberdeen was provided with outlets to London, Edinburgh, Glasgow, Newcastle-on-Tyne, Birmingham, Leeds and Manchester, and Milford Haven was put through to London, Birmingham, Swansea and Cardiff.

Special arrangements were made to deal with traffic during the fruit season, Wisbech was put through to Leeds and Southampton also found the latter office a convenient transmitting office during the strawberry season.

The policy of the traffic managers, was to provide communication between offices where the traffic was of the order of 200 direct telegrams a day, the routes being filled by traffic diverted from other less convenient or overburdened routes. Although the routing of telegrams was arranged in this way, a few circuits were provided with the definite object of relieving the Central Telegraph Office of transmitted work, and not on the basis of direct traffic; thus Manchester was connected with Cambridge and Newmarket, and Birmingham had circuits to Reading and Maidenhead.

At length—in 1906—every office with two or more outlets was provided with a circulation list, and changes in the standard routing could not be made without the concurrence of the traffic managers. In 1913 the question arose, whether with the foregoing circuit arrangements in operation, it would be possible to formulate a definite cross-country circulation, i.e. the routing of telegrams, excluding those to and from London. A simple and what appeared to be an effective scheme was eventually drawn up and put into operation. The scheme was based on three rules :—

(1) That where alternative transmitting offices were available the office nearest to the midway point between the office of origin and the office of destination should be adopted.

(2) That as far as possible the direction of the circuits used should be nearest to an imaginary straight line.

(3) That transmission at two of the largest provincial offices should not be adopted to avoid London, but any one of those offices, together with another transmitting office, should be regarded as not more than the equivalent of a single transmission at the Central Telegraph Office.

Under this scheme a telegram from Edinburgh for Brighton, circulated to Manchester and not to Birmingham or London, a telegram from Southampton to Cork circulated to Bristol and not to Liverpool. Moreover, the scheme provided each office with definite rules to be observed during times of breakdown and pressure, and the diversion of traffic was carried on much more smoothly than had formerly been possible.

From 1918 onwards there had been considerable development in the use of machine telegraph apparatus, and this, as foreshadowed in Mr. Lees' book (page 52), brought its own circulation problems. The cross country scheme broke down and was abandoned in 1919, when the individual circulation list was reverted to temporarily.

It will be recognised that up to this time the routing of telegrams had been based largely on experience and expediency, that there were no general principles underlying it, apart from the one principle that retransmissions should be avoided as far as possible, and that the question had never been scientifically studied. It was not practicable to say definitely which route a long distance telegram should follow. For example a telegram from Aberdeen for Cardiff could be routed via Glasgow, Liverpool, Leeds, or Manchester with only one transmission in each case, but it could not be said with certainty which of the four routes was fundamentally the proper one.

In 1922 it became urgently necessary to set up a new and comprehensive system of routing, and this will be fully dealt with in the succeeding chapter.

(*To be continued.*)

POST OFFICE RELIEF FUND.

A MEETING "open to all persons employed by the Crown on Post Office work or directly employed by the Postmaster General" was held in the Deputation Room, First Floor, General Post Office, North, E.C.1, at 4 p.m. on Tuesday July 14, 1925, for the purpose of electing four persons to serve on the Committee of the Fund for three years from Sept. 1, 1925, in accordance with paragraphs 2 and 4 of the Scheme of Management embodied in the Trust Deed. Mr. Stuart Bunning, as Chairman of the Committee, presided.

Mr. Stuart Bunning addressed the meeting on the recent activities of the fund, and dwelt especially on what had been done in the way of providing Secondary Education and Trade Training for the children of Post Office men who were killed in the War. He referred in detail to the actuarial valuation, and to the appeal for additional funds following that valuation; and further he laid stress on the fact there were always much needed additional benefits which the fund had in view if ever there was a surplus over the sum needed to wipe out the actuarial deficiency.

Mr. Stuart Bunning explained that the fund was administered by a committee of 24 members, appointed in the manner laid down in the Trust Deed. Twenty of the seats were allocated to representatives of specified staff organisations, and the remaining four were to be filled by election at that meeting. Nominations for these four seats were invited, and Messrs. Matthews, O'Shea, O'Gara and Stoddart were then elected to fill the four vacancies.

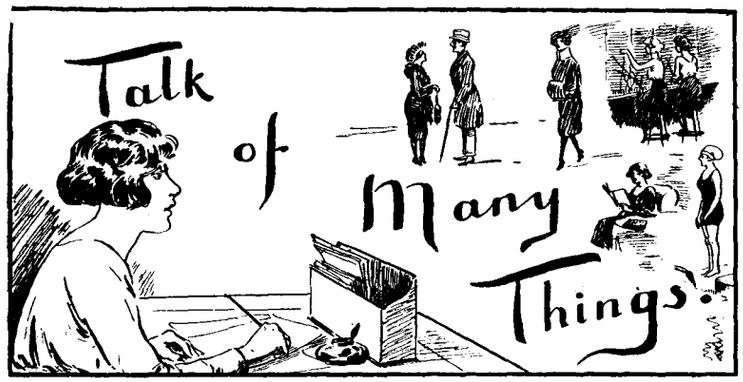
ABERDEEN.

A meeting of the Aberdeen District Office Staff was held on June 13 to present to Mr. R. E. Anderson, Contract Officer, with a silver tea service on the occasion of his approaching marriage.

In the absence of Mr. P. Edmond, District Manager, Mr. Forrester, Traffic Superintendent, took the chair, and in a humorous speech called on Mr. Coulsell, Contract Manager, to make the presentation. Mr. Coulsell congratulated Mr. Anderson on the step he was taking, and wished him and his bride every happiness in their married life.

Appropriate speeches of encouragement and advice were also made by Mr. Clow, Chief Clerk, Mr. Davidson, Assistant Traffic Superintendent, and Mr. Jackson, Contract Department. Mr. Anderson, who is a well-known vocalist, thanked the company very heartily for their kindness, and wound up the proceedings by singing "Take a pair of Sparkling eyes" which was received with loud applause.

WE TELEPHONISTS



Lunch "Relief."

Now that some of us have removed (officially) to the South side of the Thames, it may be possible to explore what was, prior to the removal, the remoter part of the Thames Embankment. We know from our studies that the embanking of the Thames formed a part of Sir Christopher Wren's scheme for rebuilding London after the Great Fire; but that it was not until 1862 that the work was commenced, and the whole embankment was thrown open to the public on July 13, 1870. "It was opened," says Besant, "by the Prince of Wales, accompanied by Her Royal Highness Princess Louise, on behalf of Her Majesty, after whom this noble thoroughfare is named."

All this we know, but of the many curious and interesting features of London's most imperial road, how few are noticed by the wayfarer.

We may not in our luncheon hour (minus a quarter !) have time to call at Somerset House to see, say, the Will of William Shakespeare, John Milton, or Lord Nelson, but we can at least observe with interest what are nearer to our eyes—the curious dolphins, the head or plaque of Neptune, and other symbols which recur on the lamp posts along the parapet; and the smaller dolphins which adorn the lamp posts in the road, and whose curved and dolorous mouths are so laughably reminiscent of a certain official. . . . Even the seats are worthy of attention. Along half the length of the Embankment, each seat has the sphinx twice depicted; and along the other half, each seat has two patient camels, kneeling, with their burdens on their backs. Then there are Boadicea, Queen of the Iceni, Cleopatra's Needle (the gift of Mehemet Ali) and many other interesting buildings and monuments. And, dominating all, the river, with its constantly changing scene; its strings of barges with their queer names—"Rat," "Satrap," "July," "Phoenix," "Lawyer," "Repute." There is a breath of the sea in the wind that blows from the river.

But we cannot stay to dream of Camel and Sphinx, emblems of the inscrutable East. We must return to our desks to face the unromantic problems of Ledgers, Fees and Due Dates. We must continue the dream another day.

"Chorus, Gentlemen."

I heard the other day of a factory where the girls are allowed to sing while they are at work—one plays the piano, and the others sing well-known choruses. Of course, the work is purely mechanical, and does not require too much thought, and, consequently, it probably makes for better work and more of it. I should not dare to suggest, however, that it would answer at an exchange. Just imagine a subscriber ringing up and hearing the following words sung to him over the telephone :—

"I want to be happy
But I can't be happy
Till I've made you happy too."

I am afraid that by the time he had heard so much he might shout at the other end of the line—"Well, get me my number, then, and we'll leave it at that !"

Or the operator might be singing :—

"Show me the way to go home;
I'm tired, and I want to go to bed."

to which one might expect the retort—"Not yet, miss; it's only 2 o'clock." Or :—

"Tea for two and two for tea;
Me for you and you for me."

to which the reply would obviously be—"I say, if it's all the same to you Museum 2000 for me."

Oh no, it would not answer in an exchange, but still we can carry a song in our hearts, even if we may not voice our sentiments out loud. And when a subscriber is particularly trying, there is no harm in *thinking* "Every little while I feel so lonely;" only—don't forget and say it out loud, or else the consequences might be somewhat disastrous ! PUCK.

A Telephone Exchange.

The room was long and broad and wide,
With rows of girls all side by side.
They toyed with plugs of red and gold,
Wrong number trouble ne'er was solved.
Small opals showed with yellow light,
And some were faint and others bright.
The cords were varied, black and cream;
Grey, white and yellow (colour scheme).
Parquet floor of gleaming brown,
Reflecting shoes and dainty gown.
See, seated on each polished chair,
Blonde or brunette with shining hair.
Rich sunlight streamed from windows wide,
Where all the storm clouds quickly glide.
Some maids wore gloves to spare their hands—
Like waters rippling on the sands.
Rich voices, soft and deep and sweet,
Subscribers' wants did quickly meet.
"Number, please?" the maiden said.
A wise old traveller shook his head:
"You're ringing me," he softly sighed;
"Sorry you're troubled," she replied.
"O! Gerrard one," the woman roared
The girl plugged up with faulty cord.
"O, what a noisy line," she moaned,
"I cannot hear a word," she groaned.
"You've cut me off," the lady screamed,
But very brave the girl then seemed,
"Please can you tell me who they were?"
But "no" the sub. could not tell her.
The Busy Back with full force raged,
"Sorry the number is engaged."
"O, call me, will you?" then she said.
With ticket white and blackest lead,
The girl recorded, for to know
Just who had asked for so and so.
"Supervisor," the Unknown yelled,
And had she axe, she would have felled
Every maid, however sweet,
And laid them helpless at her feet.
"What! No reply," the cashier scorned,
"No," the operator mourned.
"What nonsense, just you try again,"
Once more she rang, but all in vain.
"O! Operator," loud, he said,
Mopping the moisture from his head,
"Our lines are crossed for seventh time.
So give me quick another line."
"Controller!" fumed the angry man,
"Controller, quickly as you can,
I've had enough of all your sport,
And all the crowd I'll take to Court."

When, happy maids, the clocks did ring,
Then off their instruments they can fling;
And after labour, well-earned rest,
With tea and casuals they are blest;
Though often in their slumber time,
High up the multiple they climb.

D. M. G. CLIFFORD, Paddington.

Fluency of Speech.

Why can't the Writing Assistants have a neat book of instructions compiled for them similar to that of the operators. I think it is quite time someone rose to the occasion and wrote us a few stock phrases. Just imagine with what facility we could answer those awkward questions that subscribers *will* ask. Not that we are not facile of speech, except at odd times. The trouble is that very often the answer we would like to give is entirely unsuited to the occasion, or else a remark is so suddenly flung at us that we are left gasping, and only find the answer after the sub. has gone. Who ever heard of an operator at a loss for words? That's a result of stock phrases! We too, could be always fluent of speech like they, if we had our book of answers to fall back on. We should very much appreciate a column devoted to "soft answers to turn away wrath and sarcasm" as these are our bitterest foes. The chief difficulty for the author would be that of finding expressions to suit all questions, as they are varied and very often unnecessary. As an example of an unnecessary question take the following—A subscriber who was directed to an office further along the corridor loudly demanded "Will the P.M.G. pay for my bootleather? I've been trailing along these corridors for ¼-hour." What was I to say? Evidently the question needed an answer and that right soon, judging by the fierce aspect of the gentleman. He knew as well as I did that he could not claim payment for bootleather from the P.M.G., yet to have told him that would only serve to make him more wrathful. On the contrary, had I attempted to appease him by saying "Yes," he would probably have reported me for insolence. So discretion being the better part of the valour, I merely sympathised and let him have his own way about it. (Even that didn't seem to satisfy him judging by the way he stamped out.)

Anyway, how could one work out the value of bootleather worn out during a walk of 180 yards. Even if we knew they cost 4*s*. 6*d*. (driped) last month, and his stride is 1 foot length it couldn't be done.

But about that book . . . .

E. A.

A New Competition.

We have often heard "the voice with the smile," and should now like to *see* the smile that accompanies the voice. Three book prizes are offered for the best three snaps depicting laughter. The happiest ones will win. Photographs should be sent in on, or before October 1. Male readers are eligible to compete, both in smiling and "snapping"—if they can achieve this apparently paradoxical feat.

No snaps can be returned, and the Editress reserves the right to print any sent in.

Contributions to this column should be addressed: THE EDITRESS, "Talk of Many Things," Telegraph and Telephone Journal, Secretary's Office, G.P.O. (North) London, E.C.

LONDON TELEPHONE SERVICE NOTES.

Annual Swimming Gala.

THE Sixth Annual Gala of the L.T.S. Amateur Swimming Association has been arranged to take place at the Pitfield Street Baths, Shoreditch, on Friday Oct. 2, commencing at 7 p.m. All entries must be sent to the Hon. Sec., Miss Temme, Trunk Exchange, not later than Sept. 11.

As usual a fine program is promised, and the following trophies will be competed for:—"Pounds" Challenge Cup, Diving Championship Cup, "Prossor" Challenge Cup, Lotos Club Shield.

In addition there will be the finals of handicap races, learners' race and exhibition swimming, the latter event by members of the Beckenham Ladies' Swimming Club. There will also be the usual thrilling display of diving.

The Gala is decidedly one of the outstanding service events of the year, and attracts a large number of competitors and spectators.

* * * *

Cricket Match.

The third annual match between the Traffic Branch and the Night Staff League took place at East Finchley on Saturday July 18. The weather was glorious, and a goodly number of spectators attended. Especially welcome were the Controller, accompanied by Mrs. and Miss Valentine, who drove over during the afternoon. Mr. Pounds won the toss for the Traffic Branch, and elected to take first knock. The Night Staff bowling was very effective, and the Traffic innings closed for 86 runs. There was an adjournment for tea, and then the Night Staff batted. With five wickets down for 37 runs, the Traffic team had visions of their first victory, but the sixth wicket added 31 runs. The bowlers stuck to their task, and when the last man came in four runs were still required by the Night Staff. The bowling and fielding was very keen, and the winning runs were only obtained with difficulty. Play was continued until the last wicket fell, and the Night Staff totalled 93 runs. It was a keen and exciting game, and was thoroughly enjoyed by players and spectators alike. Chief credit for the Night Staff victory was due to Gordon, who played a fine innings of 51 not out and took 4 wickets for 35. For the Traffic team Berry took 5 wickets for 34 runs.

The full scores were:—

Traffic Branch.		*Night Staff League.*	
Pounds, c. and b. Gordon ...	13	Burt, b. Berry	1
Cracknell, b. Gordon	0	Christie, b. Pounds	11
Shepherd, b. Gordon	2	Montague, c. Pounds, b. Berry	0
Meyer, b. Gordon	13	Bailey, b. Pounds	10
Berry, b. Kent	4	Gordon, not out	51
Tanner, b. Kent	0	Tomms, l.b.w., Pounds ...	0
Webb, b. Kent	4	Kent, b. Berry	6
Cowdray, not out	22	Faulkner, c. Tanner, b. Cowdray	0
Beck, b. Kent	0	Whitehouse, c. and b. Cowdray	8
Mears, b. Kent	7	Bush, b. Berry	0
Gregory, b. Quayle	6	Layle, b. Berry	1
Extras ...	15	Extras ...	5
Total ...	86	Total ...	93

MANCHESTER TELEPHONES *V.* BLACKBURN TELEPHONES.

As the outcome of the challenge thrown out by the Blackburn District Office, these teams opposed each other on the prettily appointed ground of the Bolton Cricket Club, Green Lane, on Tuesday July 21. Lee, the Manchester Captain, on winning the toss, elected to bat, and sent out Pugh and McDonald to face the bowling of Taylor and Vaughan.

The latter bowler persistently exploited the off theory, and with the last ball of his first over removed McDonald's off bail, with only 5 runs scored. Vaughan soon met with further success, for Langhorn returned one to the bowler at 21. Lee came out to partner Pugh, and immediately revealed a punishing leg stroke. Pugh was not idle, but at 36 Vaughan again got through the defence and hit the batsman's off stump.

Deaville came next, and soon sent Vaughan to the fine leg rails twice. This punishment brought about a double change of attack, Gregory relieving Taylor, who had bowled well without success, and O'Brien coming on for Vaughan.

Bowling on the leg, Gregory came in for punishment, while O'Brien had the mortification of seeing two catches go abegging in his first over. Gregory effected a separation, however, with the score at 60, Vaughan running at top speed to hold a skier with his left hand—a fine effort. Lee continued to show a punitive bat for anything loose, and some of his cuts sent the ball hurtling to the rails at lightning speed. Owens, McManus and Chadwick pursued the good work in lusty fashion, but Lee's display predominated until with the score at 144 he was taken by a nicely judged catch "in the country" by Gregory.

With his departure, McFadden and Chadwick enjoyed a happy little knock before the closure was applied.

During the tea interval, the Manchester team was photographed by their District Manager, Mr. Archer Smith. Blackburn were also accompanied by their District Manager, Mr. J. T. Whitelaw.

Blackburn's venture opened with Gregory and Hilditch, and 1¾ hours remained for play. Langhorn soon had the batsmen in difficulties, and Hilditch was out to a smart catch at point with only four scored. Riley, a hard hitter, joined Gregory, who, however, was out to a mishit with the score at 19. His had been a correct display. Vaughan came next, and soon showed the left hander's penchant for leg hits by pulling Owens and Langhorn to the rails. Just when he appeared to have settled down to give trouble, however, he had the misfortunate to play a good ball from McManus into his wicket.

Taylor, a burly hitter, soon got to business, and was severe on Lee, whom he drove for four and a six, a drive which revealed perfect timing. He had quickly strung together 20 when he stepped in front of a straight one, and paid the penalty. Leather gave no trouble, but Turner started confidently, and Riley now monopolised the scoring by discretionary forcing tactics, while correct batmanship on the part of Turner defied the attempts to dislodge them, and the pair had added 29 runs to the score when time expired, leaving honours even.

In one department of the game, however, the Mancunians excelled over their friends the enemy, and that was in the field, where the Manchester men showed anticipation and judgment, but the catch of the match was left to Blackburn through Vaughan, who gave an interesting all-round display.

MANCHESTER.

Mr. MacDonald, b. Vaughan	... ...	0
„ Pugh, b. Vaughan	... ...	10
„ Langhorn, c. and b. Vaughan	... ...	7
„ Lee, c. Gregory, b. Hilditch	... ...	83
„ Deaville, c. Vaughan, b. Gregory	... ...	11
„ Owens, c. Gregory, b. O'Brien	... ...	10
„ McManus, c. Taylor, b. Riley	... ...	8
„ Chadwick, not out	... ...	12
„ McFadden, b. Riley	... ...	12
Extras	...	13
For 8 wickets (dec.)		166

Messrs. S. Johnson and Bridges did not bat. Mr. Taylor took 3 wickets for 50 runs, and Mr. Riley 2 for 23.

BLACKBURN.

Mr. J. W. Gregory, c. Lee, b. Langhorn	... ...	15
„ Hilditch, c. Chadwick, b. Langhorn	... ...	1
„ Riley, not out	... ...	47
„ Vaughan, b. McManus	... ...	19
„ Taylor, l.b.w., b. Owen	... ...	20
„ Leather, c. Deaville, b. Chadwick	... ...	0
„ Turner, not out	... ...	9
Extras	...	2
For 5 wickets		113

Messrs. Fazakerley, Walmsley, Walsh and O'Brien did not bat. Mr. Langhorn took 2 wickets for 19 runs.

PERSONALIA.

LONDON TELEPHONE SERVICE.

Promotions to Assistant Supervisors Class II. :—

Miss E. M. TILLING, Telephonist, of Avenue Exchange.
Miss G. C. DAVIS, Telephonist, of Clerkenwell Exchange.
Miss A. N. M. BACKHOUSE, Telephonist, of Harrow Exchange.
Miss I. C. PEACOCK, Telephonist, of Toll Exchange.
Miss E. BRAY, Telephonist, of Victoria Exchange.
Miss N. FOREMAN, Telephonist, of Richmond Exchange.
Miss F. M. MILLMAN, Telephonist, of City Exchange.
Miss M GROVE, Telephonist, of Hop Exchange
Miss D. PONTER, Telephonist, of City Exchange.
Miss J. G. GRAVES, Telephonist, of Clerkenwell School Exchange.
Miss L. G. SMITH, Telephonist, of Royal Exchange.
Miss L. PENNY, Telephonist, of Regent Exchange.
Miss N. M. KING, Telephonist, of Victoria Exchange.
Miss R. J. H. CUTTING, Telephonist, of Central Exchange.
Miss MARGARET PORTER, Telephonist, of Museum.
Miss V. B. MARSHALL, Telephonist, of Gerrard Exchange.
Miss A. CHAMBERS, Telephonist, of Hop Exchange.
Miss A. S. DUNNETT, Telephonist, of Paddington Exchange.
Miss E. KEPPLE, Telephonist of Kensington Exchange.

Resignations on account of marriage :—

Miss E. C. MANN, Telephonist, of London Wall Exchange.
Miss V. M. WOODHEAD, Telephonist, of London Wall Exchange.
Miss A. M. EVANS, Telephonist, of London Wall Exchange.
Miss G. M. COSSONS, Telephonist, of London Wall Exchange.
Miss A. R. BARNHAM, Telephonist, of Holborn Exchange.
Miss C. W. GAIGER, Telephonist, of Holborn Exchange.
Miss I. WHITAKER, Telephonist, of New Cross Exchange.
Miss D. JONES, Telephonist, of East Exchange.
Miss A. GORDON, Telephonist, of East Exchange.
Miss K. E. M. T. CLARK, Telephonist, of East Exchange.
Miss W. SIMS, Telephonist, of Regent Exchange.
Miss C. BURKETT, Telephonist, of Regent Exchange
Miss ESTHER M. WRIGHT, Regent Exchange.
Miss F. E. SHAKESPEARE, Telephonist, of Regent Exchange
Miss E. M. FARNES, Telephonist, of Victoria Exchange.
Miss E. McEWAN, Telephonist, of Victoria Exchange.
Miss L. H. PHILLIPS, Telephonist, of Trunk Exchange.
Miss M. CANDY, Telephonist, of Trunk Exchange.
Miss J. DREW, Telephonist, of Trunk Exchange.
Miss H. CARTER, Telephonist, of Trunk Exchange.
Miss O. S. ALLEN, Telephonist, of Trunk Exchange.

CENTRAL TELEGRAPH OFFICE.

The following promotions have been made :—

Mr. E. W. GOODING (Cable Room), promoted to Assistant Superintendent.
Mr. F. H. PEARSON (Cable Room), Telegraphist, promoted to Overseer.
Mr. L. C. M. ROWAN, Overseer, promoted to Assistant Superintendent.
Mr. F. J. TAYLOR, Overseer, promoted to Assistant Superintendent.
Mr. H. AUSTEN, Telegraphist, promoted to Overseer.
Mr. A. W. LEAVER, Telegraphist, promoted to Overseer.
Mr. W. T. GEORGE, Telegraphist, promoted to Overseer.