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SPEECH THROUGH THE ETHER.

ON Sept. 6, Sir Oliver Lodge lecturing before the British Association at Edinburgh on "Speech through the Ether, or the Scientific Principles underlying Wireless Telephony," said:

Was there anything the ether did not do? Yes, it did not convey sound. Sound was a vibration in matter, not in ether; while light was a tremor in ether, not in matter. They saw through the ether, they did not talk through it. But his subject was "Speech through the ether," speech by means of what they called empty space. How could that be? How could they utilise the ether for conveyance of sound? It could only be done by transmutation. The ether had long been used to convey heat, yet heat was a property of matter. Heat from the sun reached the earth, but it did not travel as heat. At the sun the quiver of the particles was transmitted to the ether, it spread out as radiation, and where that fell it could excite a similar quiver. The heat disappeared in one place, to reappear in another. It travelled continuously as energy, but not as heat. So it was with sound also. The sound vibrations must be transmuted, must be delivered up to the ether to travel as radiation, and at the distant station it must be received by something which could transmute the energy back to sound again.

FAITH IN THE POWER OF DISCOVERY.

The transmutation of heat from matter into etherial energy was effected by the atoms themselves, by mechanism only partially known to us. Through all the geological ages—literally from time immemorial—it had been going on. It was not so with sound. No trace of sound reached us from an exploding star. We saw the flash; we heard nothing. To transmute sound into an etherial tremor, and to change it back again into sound at a distant station, required human agency. It needed discovery and invention. Discovery and invention were rife among us, though handicapped in their early stages by poverty and lack of opportunity. Only when some practical result was forthcoming did that difficulty begin to disappear. Faith in the power of discovery, latent in not a few of our strenuous youth, would accelerate the process. Faith removed obstacles, and gave to genius its chance. Other nations would soon be beginning to realise this, if we did not. Great achievements were not due to one man, but to a succession of workers, each passing on the torch to the next. Each man's life was too short for extensive achievement. The great building rose, stone by stone, but it took generations to complete—nay, it was never completed. The long chain of discoverers had no end, and no specifiable beginning. One could but pick out a few salient peaks. Nor was it one line only; it was a branching line. Different paths seemed to converge on some one goal.

It was well to remember great names of recent times. Kelvin, Maxwell, Fitz-Gerald, Hertz, the pioneers on one line; and on another, Crookes, J. J. Thomson, and others who were working hard to-day. The first line dealt with the ether and its properties; the second line discovered the nature of electricity. It was only with scientific principles that he was dealing, not with the technical details of application. Methods of application were protean; many an amateur was acquainted with them, and the subject was advancing so quickly that devices a few years old might hiss the speaker. Each twelve-month teemed a new one. But the fundamental principles remained, and one of these was the nature of electricity.

THE DOCILE ELECTRON.

It had turned out to be corporeal, atomic, or rather electronic. The discovery which closed the nineteenth century was the isolation of the natural unit of electricity. Small almost beyond conception, mobile and active to an extraordinary degree, the electron was becoming our most docile servant. The skill of man had harnessed them; it was by their aid that sound vibrations could be transmitted to the ether, and after transit across great vasts of space could be transmuted back again. In an empty Crookes tube they could be driven off from matter. From a hot wire they evaporated, and they could be deflected and guided as we wished. Their obedience was absolute and instantaneous; they had next to no inertia or sluggishness of their own; and they obeyed the slightest force. An electric pole attracted, or else repelled, them, according to its sign; and so their motions could be encouraged or could be checked. If faced with a positive plate, they rushed to it; if the plate was negative, they retired discouraged. Their journey was itself an electric current, and thus they got an electric current varying and responding to every fluctuating control. Electric oscillations were known; we owe them to Kelvin and FitzGerald. They were of extraordinary frequency, millions of vibrations per second, and they generated waves in the ether, as was shown by Maxwell and Hertz. Let them arrange a microphone—an ordinary telephone transmitter to which they could talk in the ordinary way—and let the slow sound vibrations, a few hundred per second, be applied to strengthen or weaken electric oscillations of a few million per second. Thousands of oscillations occurred during the time that every sound wave lasted, and by letting them control a crowd of electrons in an exhausted vessel or vacuum tube their intensity could be controlled by every ripple, every rustle, every shock, and every sibilant which went to constitute human speech. And the radiation emanating from the electric oscillations would then be graduated in intensity, so that the waves which travelled in the ether should be strong or weak exactly as the stimulus required. If they received the electric waves and conveyed them to another empty bulb containing again a hot wire giving off electrons the crowd of particles would respond, another current would be generated, carved into fluctuations of corresponding strength, and these variations of current when employed to actuate a telephone could accurately reproduce the tones of the distant voice.

Roughly and generally that was the plan, and by a set of lantern slides he hoped to give some idea of the ingenious devices whereby the astonishing feat was carried out. For it was astonishing. He was not specially astonished by the wireless transmission of coarse signals, like the dot and dash of ordinary telegraphy. It was no more difficult to send impulses across space than to guide them by wires. What Mr. Marconi had made practical as "wireless" might have come in first, and then wires might have been regarded as an improvement, like speaking through a tube instead of shouting into the open air. Any mechanical sending key and many a mechanical relay, could accomplish that. But no mechanical relay could follow the variations of quality in human voice; no agency short of the electron would be quick and docile enough. But with their aid the feat was accomplished, and the electric waves which acted as the intermediary could travel a thousand miles or more before being received and once again transmuted.

VOICES ACROSS THE ATLANTIC.

One more principle he must emphasise. How could the human ear or any instrument follow vibrations of millions a second? It could not. Only the electron could do that. But let them suppose that in addition to the oscillations coming from a distant station they set up home oscillations, in a small subsidiary vacuum tube, of nearly the same frequency. Let the incoming waves vibrate a million times, for instance, while their local arrangement vibrated a million plus 500, what would happen? They would "beat." They would give 500 beats a second, and that was a musical note. To that they could listen, and upon that the variations of intensity could be superposed. This was not the first plan adopted. The first plan was the utilisation of crystals and other detectors, such as the Fleming valve, to rectify the oscillation—to check all the negative pulses and utilse all the positive— to let only one sign through. Thus they got the vacuum valve. But soon this was improved by Lee Forest into a magnifier, so that an original impulse, exceedingly weak, could be strengthened a hundred or even a thousand times by using the electrons as relays, and putting a number of relays in series. So, also, for transmitting, the magnifying device was available. The electric impulses from the first valve, the one directly actuated by the microphone—these need not be given to the ether; they could be used to stimulate another valve, so as to increase their intensity until the waves generated were powerful enough to be allowed to rush across the Atlantic. This they were able to do in a fraction of a second. And there, though what arrived was only a feeble residue, since they had spread far and wide by that time, they still preserved all their peculiarities intact; every pulse of the speech was retained, and could be reproduced, and by adequate magnification could be made easily audible. Distance was no deterrent, it only enfeebled; it did not confuse and spoil, as it did with a wire embedded in the ocean. The properties of the ether were perfect, and all the fluctuations were accurately conveyed. All that they required was a magnifier to get a convenient intensity; and that the ingenuity of man had supplied.—(Abridged from *The Scotsman.*)

THE BAUDOT—XXV.

BY J. J. T.

WE have now reached a stage in the study of the Baudot system where it will be advantageous to deal with the adjustment of the synchronism. By reference to Vol. VI, page 56, Fig. VIII, we recall M, the movable segment connected with the correcting electro-magnet. These are shown diagrammatically, M and CM (Fig. LXIX). The adjustment is known as that of orientation, and consists in placing the movable segment M of the *corrected* station and the segments of Ring I, which, as we know, are connected with the electro-magnet coils one to five of their respective receivers, in such a position as to ensure that they shall each receive the maximum duration of current intended for them. It is indeed *the position of the movable segment which determines* this situation and makes the system not merely synchronous but isochronous.

Upon this movable segment M there is a point to be found where the local current from the tongue of the receiving relay R, which traverses the coils of the electro-magnet correcting coils by the medium of the brush during its passage over M, *is just* sufficient to actuate the armature and its correcting pin. This point is known as the *point of repere.*

Let B (Fig. LXIX) represent Rings 2 and 5 of the distributor of a *correcting* station and A Rings 1 and 4 of its corresponding *corrected* station. Presuming the installations to be of a quadruple 24 segment type then segment 23 of Ring 2 at B will emit the correcting current destined to actuate the coils CM by means of the relay R at station A. Suppose M to be the correct position of the movable segment and that the energising of the correcting coils CM and its armature demand a *duration of the current equal to the time taken for the brush of Ring* 1 *to move from* a *to* a^1 *then* a^1 *is the point of repere*, the correcting currents being received at station A in the positions shown C, C^1.

It will be immediately recognised that the signals transmitted by the Baudot follow one another at equal intervals and are of equal length, be they positive or negative, *i.e.*, 1/13 in a 13-segment, 1/24 in a 24-segment distributor, and so on. Therefore these emissions will be received at similar intervals at the distant end of the line, whatever may be the propagation value of the latter. Suppose now that station B transmits a marking current from segment 19 (or a distance 4 24ths from segment 23) destined to actuate electro-magnet No. 2 and its appendix p^2. This current will *commence* to be received at A exactly 4 24ths prior to the *commencement* of the arrival of the first or marking correcting current and therefore at p^1. It therefore follows that the *commencement* of *segment* p^2 of Ring I at A should be at a distance from the point of repere a^1, equal to 5 24ths, because this point a^1 *corresponds* with the *completion* of the positive correction current, that is the current from segment 23 at B.

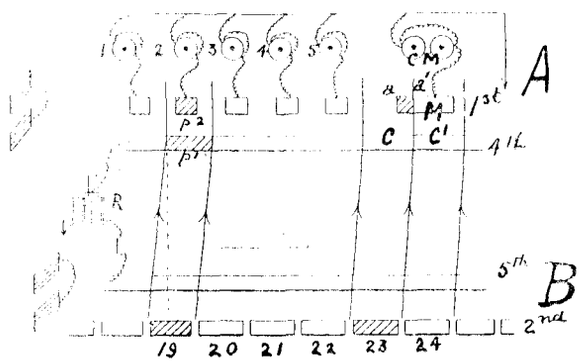

FIG. LXIX.

In this position the reception at A should be exact. Let us now shift the movable segment M to the right, thus extending the distance between M and p^2. This will now be greater than 5/24, and the correction being delayed the current from 19 destined for electro-magnet No. 2 will probably also be delayed sufficiently for some of the current to reach the fourth ring in time to also actuate electro-magnet 3. Indeed if M be moved the distance of a complete segment in the same direction electro-magnet 3 *instead* of 2 will be actuated.

Let us now move M back again into its original position and then in the opposite direction towards p^2. If station B continues to transmit a marking signal from 19 then we shall find that gradually electro-magnet 1 as well as 2 will be actuated until the movement of M continuing in the same direction segment 1 instead of 2 will be actuated.

The practical method of finding the point of repere is by deftly inserting a sheet of paper between the rotating brushes and the movable segment M completely covering the latter. Then with the finger bring the armature of the relay over to marking and gradually uncover M by withdrawing the paper. Watch for the moment when the electro-correcting magnet commences to be actuated. At that moment the edge of the piece of paper will denote the actual *point* of repere and that portion of the movable segment which is then uncovered represents the distance which the distributor brush will have to travel to permit the complete actuation of the correcting system. M should then be moved so that it gives that same amount of surface necessary to coincide with the discovered repere point.

Once fixed the causes which may effect a change in the position of the point of repere are few. The movable contact may itself

have shifted through not being tightly screwed in position. A change in the voltage of the local battery of the relay may have taken place. (3) The correcting system may have become less mobile, *i.e.*, the armature may move too stiffly on its bearings or it may have worked down too far away from the cores of the electro-magnet.

In each case it is evident that a longer period of time will be occupied to actuate the mechanism and the point of repere will therefore be a slight distance farther along M in the direction of the rotating brushes. With the present system of secondary batteries the second cause is very infrequent and with careful adjustment and examination of an installation at the beginning of a day's work, stoppages due to these causes should be rare. In cases where owing to changes at repeater offices there may be reason to doubt the absolute accuracy of the repere point it is always possible to make a rapid adjustment by requesting the intermediate office to "give the third," adjustments of M being made by that means. Such adjustments are, however, abnormal and refer generally to foreign circuits.

(To be continued.)

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(Continued from page 185).

Grid Rectification.

The method of detecting signals just described, in which anode rectification is used, is easy to understand, because of the resemblance between its action and that of a simple crystal detector. A better method of using a valve as a detector, however, is that known as "grid rectification." The connexions for this method are shown in Fig. 16, in which the various parts, so far as they are common to both grid and anode rectification, have been lettered to correspond with Fig. 15. It will be seen, however, that in this arrangement the potentiometer is omitted, and that a condenser, C_3, is placed in the lead from the upper plate of the condenser C, to the grid. A high resistance, R_3, is joined between the plate of C_3 which is connected to the grid and the negative end of the filament.

When no signals are being received the grid takes up approximately the same potential as that of the negative end of the filament, because the two are joined together by R_3. The grid potential will not be exactly the same as that of the negative end of the filament. There will be a weak current flowing along R_3 towards the grid, because some of the electrons which are shot off from the filament will be absorbed by the grid. The potential difference between the ends of R_3 so set up is, however, only small, and may be ignored in an elementary explanation of the method. The anode current, therefore, takes the value corresponding to zero grid voltage, as shown by the curve in Fig. 13. (It will be remembered that the grid volts in this curve are measured with reference to the negative end of the filament). At this point the curve is sloping steeply, so that a small change in the potential of the grid will produce a large change in the anode current.

Suppose now that signals from a spark station are received. The train of waves produced by each spark will set the aerial circuit into oscillation, and by means of the coupling between the coils P_1 and S_1 of the oscillation transformer, the circuit C_1S_1 will also be set into oscillation. The potential of the upper plate of the condenser C_1 will therefore alternately rise above and fall below that of the lower plate, which is connected to the negative end of the filament, and these voltage changes will be impressed on the grid through the condenser C_3. The potential of the grid will, therefore, oscillate above and below its steady value, which, as already explained, is that of the negative end of the filament.

We have already explained how, while the filament is glowing, it gives off a stream of negatively charged electrons. It is the stream of these electrons, attracted across the valve to the positively charged anode, which constitutes the anode current. In just the same manner some of the electrons will be attracted to the grid when its potential is above that of the filament, but they will not be attracted to the grid when its potential is lower than that of the filament.

Consequently, as the grid potential oscillates above and below its steady value, the grid, and consequently the plate of the condenser C_3 which is joined to the grid, will pick up electrons during the periods when the grid potential is above that of the filament, while no electrons will be picked up during the period when the grid is negative. Thus during the time that the circuit C_1S_1 is oscillating a gradually increasing negative charge will accumulate on the plate of C_3, which is joined to the grid and consequently the mean potential of this plate, about which the voltage oscillates, will fall. The grid potential will fall in the same way. In the interval between

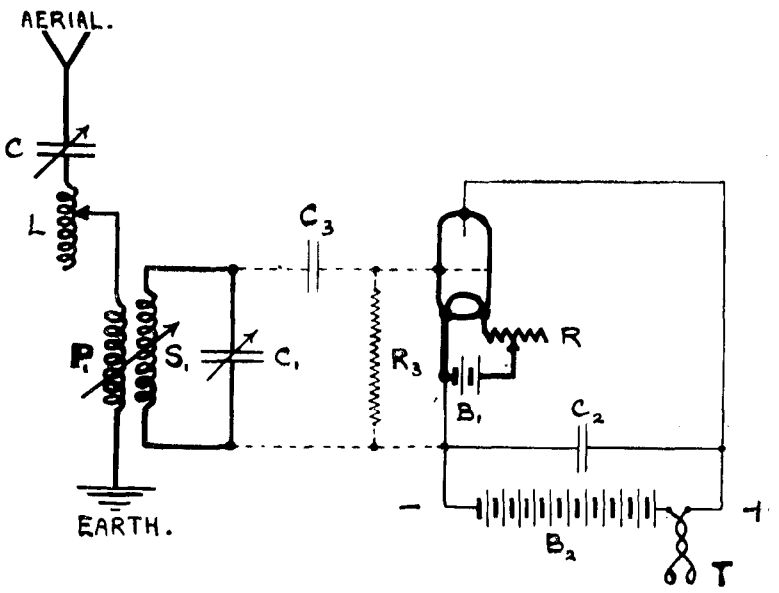

FIG. 16. GRID RECTIFICATION.

one spark and the next this accumulated negative charge in C_3 will leak away through the resistance R_3, and the grid will therefore return to its original potential. Consequently, as can be seen from the curve in Fig. 13, the anode current will gradually get weaker during the passage of the train of waves corresponding to each spark, and when the train of waves ends the anode current will regain its original value.

Thus for each spark at the transmitting station the anode current will first fall and then rise again to its original value. Since the anode current flows through the telephones each such change will produce a click, and so, during the time that the key at the transmitting station is held depressed, the musical note corresponding to the rate at which the sparks follow one another will be produced.

Note Magnification.

We have described above how a valve can be used to amplify the high-frequency oscillations set up in the receiving apparatus when a train of electric waves passes the aerial of a receiving station. In exactly the same manner a valve can be used to increase the amplitude of the low-frequency pulses of current which result from the rectifying action of the detector, before these current pulses are sent through the telephones and so rendered evident as sound.

It is convenient to have a special name for the amplification of these low-frequency pulses in order to distinguish it from the amplification of high-frequency oscillations. It is accordingly described as "magnification," and the apparatus by which it is accomplished is known as a "note magnifier," since in nearly all modern wireless practice a musical note is heard in the receiving telephones. The connexions of a note magnifier are shown in Fig. 17.

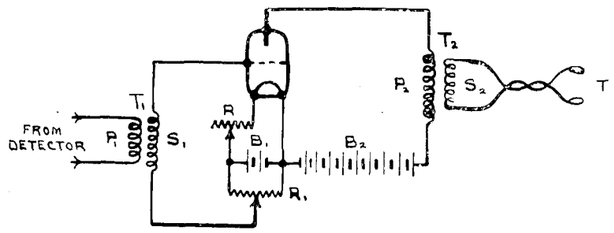

FIG. 17. NOTE MAGNIFICATION.

P_1 is the primary coil of a transformer, T_1, which takes the place occupied by the telephones when magnification is not used. The Secondary coil S_1, of this transformer has one terminal joined to the grid of the valve, and the other terminal joined to the slider of the potentiometer R_1. This potentiometer is joined across the filament heating battery B_1. The brightness of the filament is controlled by the adjustable resistance R.

The high-tension battery B_2 has its negative terminal joined to the filament, and its positive terminal joined to the anode of the valve through the primary coil, P_2, of another transformer, T_2.

The Secondary coil, S_2, of this second transformer is joined to the telephones, T. The potentiometer is adjusted so that the grid is brought to a potential corresponding to about the middle of the straight portion of the characteristic curve, (Fig. 13).

The current pulsations in P_1 cause corresponding voltage fluctuations in S_1. These voltage fluctuations are impressed on the grid and cause the anode current to vary in an exactly similar manner, as already explained. The variations of the anode current in the primary coil, P_2, set up similarly varying currents in the secondary coil, S_2, which pass through the telephones, and so the signals are reproduced. Owing to the steepness of the slope of the characteristic curve small current changes in P_1 will produce considerably larger current changes in P_2, and so the sounds heard in the telephones will be correspondingly louder than if the telephones had been joined up directly to the detector. Without note magnification the energy supplied through the detector is used directly to actuate the telephones, but when note magnification is employed this energy is only used to control the much greater supply of energy from the high tension battery.

(*To be continued.*)

THE TELEPHONE AND TELEGRAPH SOCIETY OF LONDON.

PROGRAMME 1921-22.

THE meetings will be held at the Institute of Electrical Engineers, Victoria Embankment, and the following papers will be read:—

Date.	*Subject.*
Oct. 17.	"Imperial Telegraph Communications," by Mr. F. J. Brown, C.B.E.
Nov. 21.	"Possibilities of Post Office Development," by Mr. A. C. Winyard.
Dec. 19.	(1) "The Telephone Service: Suggestions for Improvement," by Miss A. Flanagan.
	(2) "The Night Telephone Service and some of its Problems," by Mr. Ernest J. Lansbury.
Jan. 16.	"Printing Telegraphy in America," by Mr. H. H. Harrison.
Feb. 20.	"Women as Civil Servants," by Miss L. M. Herring.
Mar. 20.	"Public Intelligence," by Mr. Bernard Chapman.
April 24.	"High-Frequency Circuits," by Mr. A. B. Hart.

The meetings commence at 5.30 p.m.

THE TRUNK SYSTEM.

BY A. E. COOMBS, LIVERPOOL

BEFORE me, I have a list of trunk charges issued by the Department in the days of '95. Amongst the centres shown on the schedule are Belfast, Birmingham, Bristol, Cardiff, Exeter, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Newport, Plymouth and Swansea. The charge for a call from Manchester to Glasgow was 2*s.* 6*d.*, from Liverpool to Newcastle-on-Tyne 1*s.* 6*d.*, from Cardiff to Leeds 2*s.* 6*d.*, and I notice that for calls originated at call offices, graduated fees of 3*d.*, 4*d.*, and 6*d.* were charged according to the distance of the call.

The present day trunk telephonist can have no idea of the troubles of her predecessors. In spite of all, however, the service, such as it was, proved extremely useful commercially, and competition was keen on the part of business men to obtain first use of the trunk lines. Strict priority of connexions had to be observed so that callers interested in similar business should be treated impartially. Even in later years priority of booking as a claim for prior connexion had to be carried out strictly, especially at market opening times. I have known charges of favouritism being made in cases where, owing to some unavoidable cause, a caller was not connected in due turn.

The trunk system developed so rapidly that for some years lines could not be constructed speedily enough to ensure services on a reasonable delay basis. I fear much of this development was at the expense of the sister telegraph service.

About 1904 consideration appears to have been given to the comparative cost of building new lines and of endeavouring to obtain more paid time by improving operating methods. In 1907, Mr. John Lee and Mr. Stuart Jones were appointed Asst. Traffic Managers at Headquarters. I think these gentlemen worked out the details of the arrangement of the call wire and the continuous attention systems of working. Obviously in increasing the number of calls which could be connected in the busy hour by improving the operating methods, heavy capital expenditure required for the provision of long-distance trunk lines could be saved, and development provided for, without great expense. Although operating charges had necessarily to be increased these charges were much less than would be incurred by the cost of erecting and maintaining long aerial lines. Experimental call wire working was therefore introduced between London and Liverpool, and it was found that the average number of effective calls was increased from 10 to 15 per hour. The system provided for subscribers being rung at each end a few seconds in advance of a trunk line becoming disengaged and by this means communication was made immediately a trunk line became available. A disadvantage of the telephone call wire system was that a line had to be withdrawn from commercial use, and this ultimately led to the introduction of telegraph call wires formed by superimposing on a telephone loop. As is often the case the introduction of call wire working gave rise to the problem of dealing with long-distance through traffic, which still continued to be dealt with under the ordinary procedure, for through working. To overcome this the Zone system was introduced This system has been very successful and is not likely to be superseded. A number of the largest trunk centres were selected in accordance with a defined scheme to form Zone centres. Control of all long-distance traffic was vested in these centres and the exchanges associated with them had to circulate the long-distance traffic to the Zone centre. Continuous attention working of Zone lines was introduced about this time. Instead of controlling 4 trunk lines an operator was given 2 or 3 only, and she had to listen-in as far as possible, so that immediately it was apparent that a subscriber had finished conversation, steps could be taken to connect the next call, both waiting subscribers having been rung by pre-arrangement between the exchange operators. At the Zone centre the telephonist was given control of the through calls originated within the Zone for connexion on the long-distance lines, and all traffic was then dealt with in the same manner as calls originated locally.

It might be argued that the holding of short-distance lines for the immediate connexion of long-distance calls lead to delay on the shorter routes, but experience showed that this effect was not so marked as might have been expected. At any rate from an economic point of view line development between the Zone centre and the smaller exchanges could be provided more cheaply and readily, than between long-distance centres. An increase of revenue earning time by 50 per cent. on the long lines was of far greater importance than a decrease of, say 10 per cent. on the shorter lines.

Whilst the Traffic Department improved the operating results the Engineering Department had installed lamp signalling exchanges at a number of Zone centres, and a night concentration system. The time check had been introduced and the calculagraph had been brought into use. The brass connecting test boards had been replaced by the "U" link board which, in turn, gave way to the "Jack" type of board. Cross connecting facilities had been improved and facilitated, and the "morning test" arrangements seemed to have been perfected. Later on, however, the "Megger" replaced the tangent galvanometer. Still, complaints of unsatisfactory conversations were fairly numerous. In spite of the efficient work of the Engineering Department certain trunk routes always gave the testing officers much cause to grumble. In this respect I have retained an appreciation of the work of the testing officers attached to the office at which I made my early efforts

to become conversant with the Telephone service. They took a keen interest in their work and I fear the linesmen in the Section had often a rather hard time. These testing officers appeared to know the routes inside out, and in cases of breakdown it was remarkable with what facility they could pick up lines and make "crosses" in order to restore communication. The flexibility of the trunk test board and the standard electrical conditions at all Trunk Exchanges helped considerably in this direction. They had the advantage of having grown up with the development of the system and so had a sound knowledge of traffic requirements and knew on what routes lines could best be spared for the purpose of making good faulty long-distance lines.

In those days the breakdown of even one long-distance line often resulted in heavy delay arising.

As well as being well acquainted with the routes, these officers also knew the linesmen, with the result that co-operation and goodwill was maintained. Of course, it must not be imagined that at all times was there smooth working. I recollect the Wheatstone Bridge test proving the supposed distant looping point to be sometimes incorrect.

The keen interest shown by these pioneers of the telephone test set an example to the men who were to follow them. No line found noisy or of low-speaking efficiency on the speaking test was passed as satisfactory. Every fault noticed was reported to the "Test" officer. These latter were loaned from the Telegraph Branch for operating work in the mornings and evenings and their practical knowledge stood them in good service when they took up testing duties. For reasons of economy, part time operators have been employed during the past few years, yet one is inclined to doubt whether this has proved to be true economy. It is not to be expected that part time men in outside employ will take the same interest in the work as the original staff did. However, this is a digression from the article.

The introduction of the Zone system led to the simplification of traffic circulation and a well-defined scheme was issued in 1906 bearing in view economy in operating expenses and engineering construction. Prior to that time the provision of trunk lines had been made on no properly regulated basis, with the result that through circulation reached a point which was not economical, and much traffic was circulated over unnecessarily long routes. The tendency to centre all trunk lines on the largest towns led to congestion of aerial routes. Direct lines between trunk centres had been provided where justified, and this resulted in the construction of many new routes carrying only a small number of circuits. From a traffic point of view the provision of direct lines was amply justified, but the engineering costs increased considerably. The Zone system had for its object the collection at the Zone centre of all long-distance traffic originated within the Zone area in order to equalise the delay on all calls and to develop the between-Zone lines with a view to Call Wire or Continuous Attention working being introduced and so obtaining the advantages of working on large groups, although in special circumstances direct lines still continued to be provided between towns in adjacent Zones. Systematic traffic statistics were called for. Paid time returns were submitted regularly to Headquarters in respect of all Zone routes worked by call wire or continuous attention, and if the standard was not attained, a satisfactory explanation had to be given. There was usually not much difficulty in furnishing explanations in such cases, as any lapse from the standard was mainly due to interruptions on the lines or difficulty in establishing communication on long-distance through calls.

Returns of the average work done per telephonist during the busy hour were periodically taken and a summary giving a comparative statement of the results at each of the largest Zone centres was regularly issued from Headquarters. By these means a check was kept on operating efficiency and costs. The maintenance efficiency was also kept under review and abnormal loss of the use of trunk lines owing to faults was reported to Headquarters.

Gradually an efficient trunk service was being built up, but the dual control of the telephone system stood in the way of development. Many anomalies existed which could not be avoided. For instance, direct communication might not be possible between two adjacent exchanges because they happened to be in different trunk areas. Then again, the limits of the trunk areas were not based on defined mileage principles. A trunk area in one direction might be of lesser extent in another, and so subscribers connected to one exchange would be able to obtain local and junction communication over a far greater mileage than another connected to an exchange more adjacent to the commercial centre. The dual control necessitated a trunk and a local exchange being situated in many small towns. This was an uneconomical and undesirable arrangement. Housing and operating costs were unavoidably heavy, although it often occurred to me that there seemed to be no insurmountable difficulty in arriving at a system whereby the old Company could have undertaken the trunk work in the small towns. As a number of trunk exchanges were not open throughout the night, elaborate arrangements had to be made to afford a night service by extending the trunk lines at large centres by means of junction lines to the local exchange. When in 1912 the Post Office took over the National Telephone Company's system, the Department had already planned the amalgamation of trunk and local exchanges at many of the small centres; therefore, immediately the transfer had been completed, steps were taken to effect this. Local exchanges were transferred to the trunk exchange or the trunk lines transferred to the local exchange. The saving in operating costs and charges for accommodation must have been considerable, but from a traffic point of view this was not so important a factor as the possibility of abolishing the cumbrous trunk system of communication between exchanges within 30 or 40 miles of each other. With remarkable foresight the Department had already arranged

to become conversant with the Telephone service. They took a keen interest in their work and I fear the linesmen in the Section had often a rather hard time. These testing officers appeared to know the routes inside out, and in cases of breakdown it was remarkable with what facility they could pick up lines and make "crosses" in order to restore communication. The flexibility of the trunk test board and the standard electrical conditions at all Trunk Exchanges helped considerably in this direction. They had the advantage of having grown up with the development of the system and so had a sound knowledge of traffic requirements and knew on what routes lines could best be spared for the purpose of making good faulty long-distance lines.

In those days the breakdown of even one long-distance line often resulted in heavy delay arising.

As well as being well acquainted with the routes, these officers also knew the linesmen, with the result that co-operation and goodwill was maintained. Of course, it must not be imagined that at all times was there smooth working. I recollect the Wheatstone Bridge test proving the supposed distant looping point to be sometimes incorrect.

The keen interest shown by these pioneers of the telephone test set an example to the men who were to follow them. No line found noisy or of low-speaking efficiency on the speaking test was passed as satisfactory. Every fault noticed was reported to the "Test" officer. These latter were loaned from the Telegraph Branch for operating work in the mornings and evenings and their practical knowledge stood them in good service when they took up testing duties. For reasons of economy, part time operators have been employed during the past few years, yet one is inclined to doubt whether this has proved to be true economy. It is not to be expected that part time men in outside employ will take the same interest in the work as the original staff did. However, this is a digression from the article.

The introduction of the Zone system led to the simplification of traffic circulation and a well-defined scheme was issued in 1906 bearing in view economy in operating expenses and engineering construction. Prior to that time the provision of trunk lines had been made on no properly regulated basis, with the result that through circulation reached a point which was not economical, and much traffic was circulated over unnecessarily long routes. The tendency to centre all trunk lines on the largest towns led to congestion of aerial routes. Direct lines between trunk centres had been provided where justified, and this resulted in the construction of many new routes carrying only a small number of circuits. From a traffic point of view the provision of direct lines was amply justified, but the engineering costs increased considerably. The Zone system had for its object the collection at the Zone centre of all long-distance traffic originated within the Zone area in order to equalise the delay on all calls and to develop the between-Zone lines with a view to Call Wire or Continuous Attention working being introduced and so obtaining the advantages of working on large groups, although in special circumstances direct lines still continued to be provided between towns in adjacent Zones. Systematic traffic statistics were called for. Paid time returns were submitted regularly to Headquarters in respect of all Zone routes worked by call wire or continuous attention, and if the standard was not attained, a satisfactory explanation had to be given. There was usually not much difficulty in furnishing explanations in such cases, as any lapse from the standard was mainly due to interruptions on the lines or difficulty in establishing communication on long-distance through calls.

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The working of trunk lines on a no-delay basis between busy centres resulted in a considerable reduction in supervising and equipment expenses. The efficiency of the service was also greatly improved.

Had the war not intervened there seems no doubt that a no-delay service would now have been established on all short-distance routes. Unfortunately many schemes have been retarded and are still held up because of the shortage of material and skilled labour, and in other cases because of the lack of funds. From time to time heavy storms had caused serious breakdowns on the aerial routes, and the consequent dislocation of business led to the Department having to consider seriously the possibility of laying underground cable between the most important long-distance Zone centres. The paper cable had been tested, but the speaking efficiency was not sufficiently good for long-distance work until the loaded and balanced cable came into use. As soon as this type of circuit was proved likely to be successful, funds were allocated for a cable to be laid between London, Birmingham and Liverpool. This cable was, I think, brought into use in 1916. Had the paper cable been a commercial proposition in 1905 it is conceivable that aerial construction would have been greatly curtailed as the advantages of cable lines gained by the absence of faults through storms, saving in ultimate cost, maintenance, expenses and consistency of service are outstanding factors.

In the meantime much had been heard of the tandem and toll systems of working, which were claimed to have been successfully proved out in the United States, and a group of Post Office officers visited the States with the object of enquiring into American standard telephone practice. The outcome of the visit was the introduction of the tandem and toll systems in this country.

A tandem system was introduced at Manchester in the early days of May, 1917, whereby a number of trunk centres were afforded intercommunication on a no-delay basis, and considerable economy in staff and switchboard accommodation resulted. The toll system was installed at London and Birmingham about the same time. It was my misfortune in January, 1915, to be swept up by the wave of patriotism, and I lost touch with telephone progress for over four years. These four years seem now to be part of a nightmare. To live like a rabbit amidst persistent warfare, in an atmosphere frequently reeking with gas and above all to lose repeatedly good and brave friends, left its mark, and I returned to official life ill-equipped to carry on. In the light of after events this absence has been a misfortune in many ways.

With no time for recovery, the service claimed me, in general with others, to strenuous labour in order to restore the service to its pre-war efficiency. During the last two or three years of the war, there appears to have been little progress made with the many schemes in hand for the development of the trunk service. Everything seems to have been subservient to war needs, and the Post Office was faced with enormous arrears of work. Contractors were—and still are—months behind with their work. Shortly after the ending of the war, the public, regardless of the fact that the Department had had a number of its best men serving in the Army, made a great outcry respecting the efficiency and administration of the service, but having in view all the factors it might safely be claimed that the service was maintained in a very satisfactory state of efficiency. If errors in policy have been made, they can with reason be claimed as unavoidable in a service which has not yet become standardised.

Since 1919 the Department in common with commercial businesses has had many difficulties to overcome, and in spite of the loyalty of its officials it is only recently that results are being obtained commensurate with the labour entailed in bringing the service to the old standard. Cable schemes for the improvement of the trunk service are gradually being completed. The time should not be far distant when service on a no-delay basis will be afforded between all exchanges within 30 or 40 miles of each other and long-distance calls connected consistently within 20 to 30 minutes. As a traffic officer I hope that the ideal of a no-delay service between all long-distance centres with close commercial interests will eventually be attained.

Looking forward there appears to be no reason why the development of the trunk service should not be equal to that before the war. Gradually the working of short-distance lines will, I hope, be placed on a no-delay basis and worked similarly to the old junction services. Operating costs will be reduced, long-distance lines will, I suggest, be worked by the Continuous Attention method which, although increasing the operating expenses, will result in full use being made of expensive lines and so save the heavy charges of laying high-grade cables. To the Engineering Department we must look for line efficiency and to the grading of lines in order that construction expenses may be reduced to a minimum. A definite and consistent policy is now all that is needed to make our trunk service unequalled for efficiency in the world.

The foregoing does, I think, prove that the Department has justified its control of the trunk service, and that it is not asleep. One hears of the remarkable efficiency of the American long-distance service, but I imagine this can only be the case on services which are specially maintained by the Bell Company. For consistency of service it would be interesting to learn how the general efficiency compares with that in this Country. At any rate I have heard Americans temporarily resident here speak highly of our long-distance service.

REVIEWS.

"Automatic Telephone Systems." By William Aitken, M.I.E.E., A.Am.I.E.E. Vol. I. Messrs. Benn Brothers, Ltd., 8, Bouverie Street, London, W.C.4. 25s. nett.

The author of this volume whose name is familiar to Telephone men throughout the world as being the father of *Aitken's Manual of the Telephone*, has made what, so far as we are aware, is the first attempt to deal with the whole subject of Automatic Telephony in one book, the second volume of which is not, however, yet ready for publication. The advantages of such a book are obvious. One book serves the purpose of several and it is not necessary to consider the need for discounting the treatment on a particular system as is so necessary where the author of a book deals with one system only, and is therefore prone even if not an interested party, to laud that system over all others. In Vol. I Mr. Aitken deals with the Strowger System, and the systems of Messrs. Siemens Brothers & Co., the Western Electric Co., the Relay Automatic Telephone Co., and the Coventry Automatic Telephones, Ltd., so far as the exchange equipment is concerned; and in Vol. II (still in the Press) it is proposed to deal with equipment in subscribers' offices, including party line and switchboard working and satellite offices, trunk and toll line working, lay-out of plant, traffic problems, power plant, &c.

The first volume is arranged in 83 sections, any one of which it is apparently the intention of the author to rewrite when it becomes out of date; and the 83rd section contains the present standard terms and definitions. The size of the pages is larger than is usual, and advantage is taken of this fact to make the diagrams clearer and more easy of reference. The diagrams are indeed an outstanding feature and the adoption of numbers for the circuit routes, on the analogy of the treatment of "bus routes" on the familiar transport maps of London, does much to avoid the confusion which seems inseparable from circuit plans of automatic telephone systems. Indeed, it is possible to read the diagrams without going over the lines laboriously with a pointer and incidentally straining one's eyesight in the process.

We shall welcome the second volume.

"Thermionic Tubes in Radio Telegraphy and Telephony. By John Scott-Taggart. Published by The Wireless Press, Ltd., 12 & 13, Henrietta Street, Strand, W.C.2. xxiii + 424 pages. Price 25s.

Although many books on thermionic tubes have recently been published, the one under review fills a place which is occupied by none of the others.

In these the matter has been dealt with mathematically, and although in general they are admirable expositions of the subject, yet the reader without the necessary standard of mathematical knowledge finds himself unable to take full advantage of them. The present book deals with the subject in a non-mathematical manner, and the average operator and amateur who wishes to know the "reason why" of the apparatus which they manipulate will find it exactly the kind of treatise which they require.

The first chapter deals with the general theory of thermionic currents and their use in two electrode valves. In the second chapter the effect of the introduction of the grid is discussed. Then follow chapters on the principle of retro-action, on multi-stage high and low frequency amplifiers, on combined high and low frequency amplifiers, and on various arrangements in which the principle of retro-action is applied to multi-stage amplifiers.

The detection and generation of continuous waves are next dealt with, followed by a description of the use of the valve in the various measurements required in wireless telegraph practice, and of its application for wireless telephony.

The two last chapters deal with the dynatron, the trigger relay, and several other miscellaneous devices in which use is made of the valve.

The get-up of the book is very good, the diagrams are excellent, and the number of printer's errors, usually large in a first edition, is extremely small.

There are only a few points which we have to criticise unfavourably.

On page 4 the author states that if a body possesses more detachable electrons than another, the first body is said to be at a higher negative potential than the second. It may be "said to be," but whether it is or not will of course depend on the relative capacities of the two bodies as well as on the magnitude of the free negative charge on each.

On page 97 the "characteristic surface" of a valve is mentioned, without any explanation having been given of what the characteristic surface is.

In the explanation on page 157 of the simple retro-active circuit shown in Fig. 118 reference is made to a certain coil "R" which does not appear in the diagram. From the context it would appear that it is the coil AB that is meant.

There is one other point which we must apologise for mentioning, but which we feel seriously detracts from what is otherwise a most excellent book. It is quite possible that in the natural enthusiasm inseparable from the production of a book of this description the writer has overlooked the danger of presenting to the public eye those more intimate moods which, especially as time softens one's youthful elations, are generally reserved for moments of private introspection. A glow of satisfaction following on efficient achievement is undoubtedly one of the legitimate rewards of the worker in any sphere.

Such paragraphs convey no information to the reader, but only tend to make him form a prejudiced opinion not in favour of the book as a whole. As we have indicated above, we consider that anyone who formed such an opinion would be wrong, but we can appreciate their feelings in the matter.

We have no doubt that the author's expectations as to the need for a second edition will be justified, and we would strongly recommend him in that edition to make the modifications we have suggested. We feel sure that he would not lose by the change.

ADVICE TO DIRIGEURS.

BY O. N. THESURFACE.

"Your committee visited Manlivgow, where they observed a number of the staff standing idle. They were informed that these were dirigeurs." Extract from a peregrination report:—

When the visitors come round,
Look Busy!
If the Traffic Staff abound,
Look Busy!
You can "cod" the bloomin' lot,
If you're cute upon the spot;
Run your apparatus hot!
Look Busy!

When Committees you espy,
Look Busy!
When economists ask Why?
Look Busy!
With a relay or a trad,
"Use the wit you've got," my lad,
They're appointed to be "had."
Look Busy!

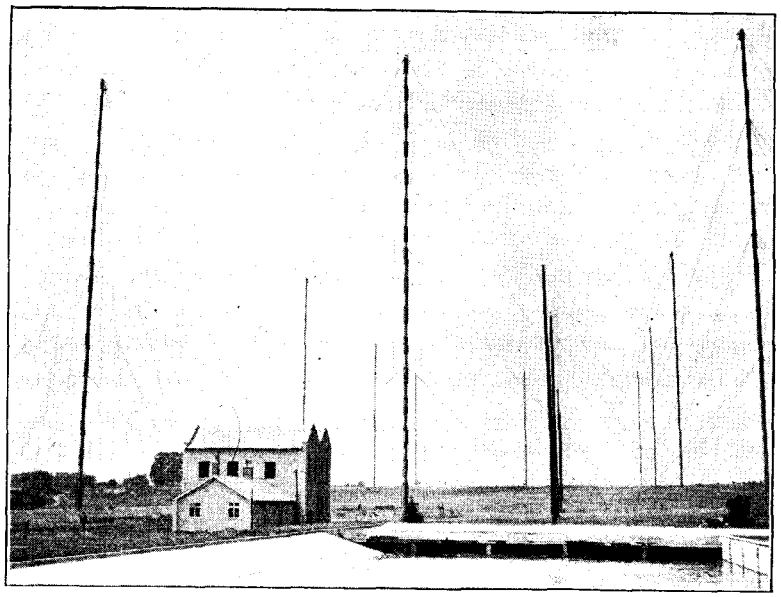
You know the "C & S" creed—
Look Busy!
All your bonus you will need,
Look Busy!
On the Western or Baudot,
You can reap whate'er you sow;
And you'll earn your watch below.
Look Busy!

OPENING OF LEAFIELD WIRELESS STATION.

THE high-power wireless station at Leafield (Oxford), which forms the first link in the projected wireless chain which is to link up the scattered portions of the British Empire, was opened by the Postmaster-General on Aug. 18.

The station is situated on the Cotswolds, about twenty miles north-west of Oxford. It is equipped with two 250-kilowatt Elwell-Poulsen arcs of similar design to those fitted at the large French stations at Lyons and Bordeaux.

It will exchange traffic with a similar station which is being erected at Abu Zabal, near Cairo. It is hoped that this station will be ready in about three months time. The chain will be continued *via* a station in East Africa to South Africa, and *via* India and Singapore to Hong Kong and Australia.



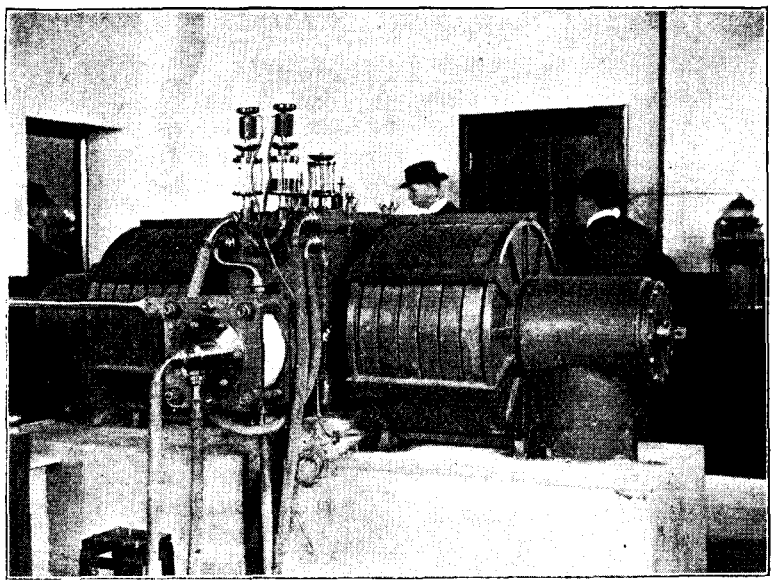
GENERAL VIEW OF WIRELESS STATION AND COOLING POND
THE MASTS ARE 300 FEET HIGH.

The charge for messages between England and Egypt by the wireless route will be 9*d*. per word, as compared with the cable charge of 1*s*.

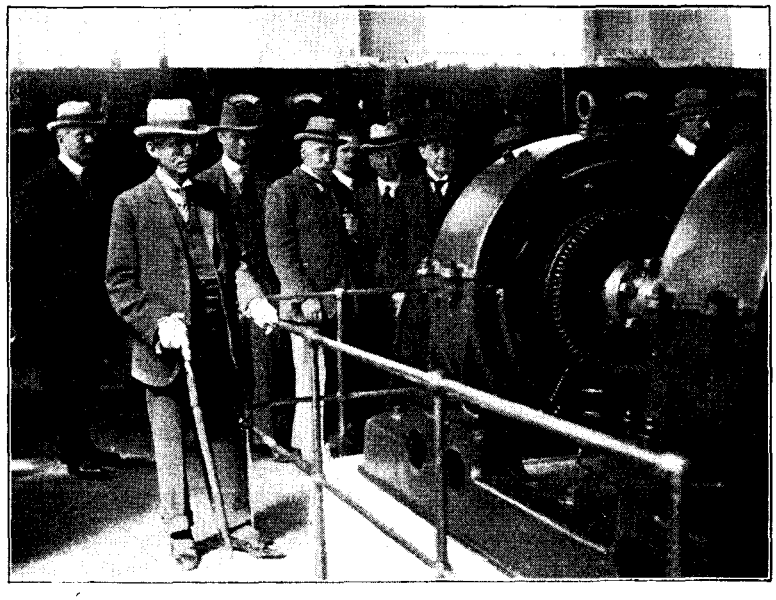
On the occasion of the opening ceremony two messages of greeting were sent out by the Postmaster-General, first to British stations and then to foreign stations. Replies by wireless were received within a few minutes from Malta, Paris, Rome, Budapest, Posen, Norway, Sweden and Germany, signals being reported as good and clear. Later replies were received by cable from more distant stations where the wireless transmitting apparatus were not sufficiently powerful for signals to be received in this country, and it is interesting to note that the messages from Leafield were read clearly at places as far afield as Constantinople, Mosul, Bermuda, and Barrington (Canada).

When the service between England and Egypt is in operation, the transmitting apparatus at Leafield will be actuated over a land line from Banbury, where the receiving apparatus will be situated. This arrangement will enable the system to be worked duplex, the receiving apparatus at Banbury being arranged so as to be unaffected by the signals radiated from Leafield, but at the same time to respond to signals from Egypt.

The provision of this new line of communication between England and the near East will not only be of great importance from the strategical point of view, but will afford a much needed relief to the submarine cable system.



ELWELL POULSEN ARC.



THE TURBINE ROOM.

MR. KELLAWAY IN THE FOREGROUND. MAJOR PURVES, MR. F. J. BROWN, COL. CRAWLEY AND MR. ELWELL IN THE BACKGROUND.

OBITUARY.

It is with deep regret that we announce the death of Miss I. Fuller, Assistant Supervisor, Class II., who passed away on Aug. 10, after having been ill for several months.

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 - - - 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 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. VIII. OCTOBER, 1921. No. 79.

WIRELESS AND ITS PROPHETS.

WIRELESS has caught the imagination of the public. We need not resent the fact. As Sir Oliver Lodge says it is just the mischance of sequence. If wireless had come before the telegraphy which we know so well we should all be thrilled with the idea of confining the impulses to a wire and multiplex would arouse the journalists. There are no bounds to the achievements of wireless in the minds of an old friend "the average reader." He can tell us of gunboats which leave Portsmouth without a soul on board steered safely by wireless waves and having guns which can be directed and shot by the same mysterious energy. The tribute which he pays to the unseen is also a tribute to the incomprehensible. He awakes each morning to a new discovery. The fell influence of atmospherics is no more; it is gone with the King's Evil. The problem of overhearing is solved again and again. Through the mysteries of a wealth of technical language he threads his way, and he is as convinced that there is no world left for a Columbus or an Alexander as was his predecessor in the Victorian Age. It would be a pity to disillusion him, and in fact for all we know he may be only a little in advance of real achievement. Who shall set a bound to achievement?

For all that it is just as well to understand that there remain some difficulties to be surmounted. Atmospherics have not yet entered the swine of Gadara in despair at having anything else to upset. The truly faithful wireless expert is modest and humble. He emphasises what has not been achieved rather than what has been achieved. He is anxious lest there should be premature optimism. Of course that makes a poor appeal to popular psychology. Modesty and humility always do. The positive assertion is "the stuff to give 'em," but sooner or later they may ask for more nutritious food. The man who says sweepingly that in six months' time there will not be a telephone exchange, but that everyone will have a machine in his pocket with which he can speak at will to the Shah of Persia, will make a sensation which may not outlast the six months. The true scientist, however, will go pegging away, facing difficulties, accomplishing a little achievement to-day and another to-morrow, and conscious all the time that the future of telegraphy may lie neither with the wire as we have understood it nor with the wireless as we have not succeeded in understanding it. The newspapers will not find in him a daily thrill, but he will be the true benefactor in the end.

After all, the need is for the hour by hour transmission of written or spoken messages. To achieve this is worth all the research and experiment. There are routes where, obviously, wireless transmission will have advantages. At the risk of seeming to be dull reactionaries we may hazard the opinion that there are routes where a wire, worked by modern economic methods, will have greater advantages. Capturing the public imagination is a fine art, but the public imagination may grow weary of exercise. It may ask to pass from faith to sight. It may grow impatient of the process, if unduly prolonged, of passing from faith to sight. Wonderful things are being done by wireless, but they are not quite so wonderful as the promise. And it may not be amiss to say that the soundest empiricism is to be found in the actual working of routes, short routes and long routes, with living traffic. That is going on, so to speak, under our noses. It is not so theatrical perhaps and it leaves the heavily-leaded "caption"—if that is the word—but a poor chance for display. But it goes steadily on.

THE TOLL EXCHANGE.

THE completion of the new Toll Exchange which was formally opened by the Postmaster-General, Mr. Kellaway, on the 17th inst. marks an important step forward in British telephone practice. Henceforward it will be possible to obtain immediate trunk communication, without going through the trunk exchange, with all telephone subscribers within 25 miles of London. The saving in time may be gauged by the fact that generally speaking three telephonists will handle the call instead of seven and that 350 direct short distance lines are connected with the new exchange. It is true that trunk service on a no-delay basis already exists between Edinburgh and Glasgow, Manchester and Liverpool, and between the large towns in South Lancashire, the West Riding and the Black Country. There is, however, no great centre of population within short distance of London comparable with those separated by 20 or 30 odd miles in the districts mentioned; indeed, save Brighton and Southend there is no town of 100,000 inhabitants within 50 or 60 miles of the metropolis. But, within a radius of 25 miles there is a populous area studded with important medium-sized towns, both of a residential and business character, such as St. Albans, Luton, Watford, Maidenhead, Windsor, Dorking, Sevenoaks, and Gravesend. To these a no-delay service is now obtainable, and it is proposed in the near future to extend the radius to 50 miles, thus including Brighton, Reading, Southend, Bedford, Chatham, and other important places. When it is understood that about 35 per cent. of the trunk traffic consists of short distance calls, it will be realised how considerable a relief has been afforded to the trunk exchange by their deviation to the Toll exchange.

Mr. Kellaway inaugurated the first call from the Toll Exchange, obtaining communication with Col. Grant Morden at Uxbridge, in a fraction over 10 seconds. In an allocution to those present at the opening ceremony he expressed the hope that this would prove a happy augury for the success of the new exchange.

HIC ET UBIQUE.

THE publication of the Preliminary Census Returns affords an opportunity of estimating afresh the population of the London Telephone area. The old boundaries of the area of course disappeared with the introduction of the new rates in April last, and the present area is that included within a ten-mile radius from Oxford Circus, embracing Enfield, Ilford, Woolwich, Bromley, Croydon, Kingston, Harrow and Edgware. The population of this area is as nearly as can be gauged 7,068,500. The old larger area contained in 1911, 7,160,000 people. There were 331,910 telephones within the ten-mile radius at the end of April last, or one to every 21.3 inhabitants.

THE storm of the night of Sept. 11-12 caused considerable damage to the telephone system in the South of England. The breakdowns were chiefly caused by trunks and branches of trees falling across the lines; 200 subscribers' lines were broken down in Brighton, of which 70 were restored on the 12th and the bulk of the remainder on the following day. The main route to the Continent was brought down by a falling tree between Canterbury and Faversham, 12 poles were affected, and two Paris, two Brussels and the Lille circuit disturbed. They were restored on the following day, and indeed all the trunk and local wires affected on the South-East were dealt with very expeditiously.

ACCORDING to the *Morning Post*, Russia is another of the countries in which incredibly enormous charges are made for telephone and telegraph service. We learn that a single subscriber pays 350,000 roubles a year, a "collective" installation (one in a large house used by several people) 500,000 roubles a year. Trunk calls (for distance not stated) 7,200 roubles for 3 minutes. Local telegrams cost 100 roubles a word, long-distance telegrams 500 roubles, and urgent telegrams 3,000 roubles a word.

A TELEPHONE call office has been opened at Radford Semele in Warwickshire. This is not the only small parish with a quaint and intriguing name which the telephone reaches. Ampney Crucis, Zeal Monachorum, Steeple Bumpstead, Kingston Bagpuze, Lytchett Matravers, Middle Wallop, Upper Slaughter and many others are thus favoured; but Ryme Intrinseca, Toller Porcorum, Whitchurch Canonicorum, Kingsbury Episcopi, Collingbourne Ducis, Broadwood Widger, Berrick Salome, Flyford Flavell, Ewyas Harold, Messing, Mucking, and Great and Little Snoring are still amongst those engagingly named villages which are never in a telephonic sense "engaged."

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THE storm of the night of Sept. 11-12 caused considerable damage to the telephone system in the South of England. The breakdowns were chiefly caused by trunks and branches of trees falling across the lines; 200 subscribers' lines were broken down in Brighton, of which 70 were restored on the 12th and the bulk of the remainder on the following day. The main route to the Continent was brought down by a falling tree between Canterbury and Faversham, 12 poles were affected, and two Paris, two Brussels and the Lille circuit disturbed. They were restored on the following day, and indeed all the trunk and local wires affected on the South-East were dealt with very expeditiously.

ACCORDING to the *Morning Post*, Russia is another of the countries in which incredibly enormous charges are made for telephone and telegraph service. We learn that a single subscriber pays 350,000 roubles a year, a "collective" installation (one in a large house used by several people) 500,000 roubles a year. Trunk calls (for distance not stated) 7,200 roubles for 3 minutes. Local telegrams cost 100 roubles a word, long-distance telegrams 500 roubles, and urgent telegrams 3,000 roubles a word.

A TELEPHONE call office has been opened at Radford Semele in Warwickshire. This is not the only small parish with a quaint and intriguing name which the telephone reaches. Ampney Crucis, Zeal Monachorum, Steeple Bumpstead, Kingston Bagpuze, Lytchett Matravers, Middle Wallop, Upper Slaughter and many others are thus favoured; but Ryme Intrinseca, Toller Porcorum, Whitchurch Canonicorum, Kingsbury Episcopi, Collingbourne Ducis, Broadwood Widger, Berrick Salome, Flyford Flavell, Ewyas Harold, Messing, Mucking, and Great and Little Snoring are still amongst those engagingly named villages which are never in a telephonic sense "engaged."

BOOTH-BAUDOT DUPLEX.

THE Postmaster-General has awarded £100 to Lieut.-Col. A. C. Booth, M.I.E.E., as a gratuity in recognition of his invention and services in connexion with improvements in Telegraph working. This applies more particularly to the development of the Booth-Baudot Duplex giving 6, 8, 10, and 12 channels per circuit in place of the 3, 4, 5, or 6 channels by the ordinary Baudot as used in France for some 40 years.

In addition to the extensive inland service embracing both Scotland and Ireland, the system has spread to the Continent, being used on cable circuits from this country to France, Belgium, Holland and Germany, as well as between Marseilles and Algiers. Our Dominions also are about to use it, or some of its developments.

The first publication of the "Booth-Baudot Duplex" was made in Col. Booth's paper read before the Institute of Post Office Electrical Engineers as far back as March 1907. The world-wide demand for copies of this paper very quickly exhausted the supply, but the subject matter and most of the illustrations and diagrams have been reproduced by permission of the I.P.O.E.E. in modern books on Telegraphy.

The Postmaster-General's minute states that the installations of this apparatus resulted in the release of many Morse Telegraphists for the Signal Service of the Army. The Booth-Baudot Duplex has therefore contributed its share to the successful issue of the war.

The system was first started in June 1910, and its growth in the comparatively short space of 10 years has been extraordinary. The resulting economy in carrying on the world's telegraph service must be considerable.

TELEPHONE SERVICE.

FROM THE SUBSCRIBER'S POINT OF VIEW.

THE writer of a recent article in the JOURNAL put forward a plea to the effect that the subscriber's point of view should be considered more frequently than it appears to be at present. This is salutary, as it is feared that the telephone officer is apt to fall into the snare of viewing the question of service from an operating and engineering point of view unduly, and is sometimes too prone to make excuses, or perhaps it should be said to give reasons, why the subscriber should not receive the service for which he pays. It is thought, therefore, that a short dissertation on the subscriber's view of a telephone service may not be amiss, especially in these days when a considerable amount of adverse criticism is levelled against the service. There is some difficulty in treating such a subject in an interesting manner owing to the fact that there is very little new which can be said. This ground has been well ploughed and harrowed in the past. It is only by ploughing the same old earth each year, however, that the harvest for our daily bread is reaped, and in telephone matters old standing axioms have to be reiterated in order that a reaping of good service may ensue.

In viewing telephone service from the subscriber's standpoint, there are four outstanding points that appear to be uppermost in the minds of the public, and these are:—

Prompt answer from the exchange.
Quick and accurate connexion.
Freedom from faults.
Moderate cost.

There are other points such as courtesy and good transmission which may be sometimes at the back of his mind, but from a varied experience of the subscriber's requirements as he can voice them, it is thought that the four points enumerated sum up the essentials. Courtesy is taken for granted as the debt due between one individual and another, and such points as good transmission are left to the telephone officials as being of a more technical nature and demanding expert knowledge. The four headings, however, are simple, and the general public can readily voice a very definite opinion on them. It is proposed, therefore, to take them seriatim.

Prompt Answer.—Fundamentally, the telephone stands as a quick means of communication of oral messages between two people, and delay at any point in establishing a telephonic connexion detracts from its usefulness. It is therefore of great importance to a subscriber to have his calling signal answered by the exchange in a prompt and business-like manner. To be greeted quickly and cheerfully gives him a certain amount of confidence in the service and, as first impressions are lasting, he remembers a slow answer even if the further process of establishing the call is performed in good average time. Delay in the first stage of a call is apt to upset the subscriber's balance for the remaining stages and any trouble afterwards is magnified until he feels that he is a much abused individual. Slow answer gives rise to many hallucinations in the subscriber's mind, such as tea-drinking, reading and talking on the part of the operators, and that they will do anything rather than attend to the subscriber's signals. All this is very amusing to those who are actually employed in the telephone business, but if the subscriber's point of view is still pursued it may be seen that there is some excuse for his views whether they are correct or not. Telephone operating to the subscriber at the telephone, is invisible, and the process may be classed as doing business by proxy. When you do business in a shop you see what is going on, and if there is delay in serving you, there is generally a certain amount of interesting material to occupy your attention and prevent you working up a formidable grievance. You can also see that you are served in your turn or perchance you may find some interest in trying to get your order placed before other customers with a longer term of waiting have caught the assistant's eye. The invisibility of the operating to the subscriber explains to a large extent the remarkable phenomenon of the rapid passing or accumulation of time in the caller's mind when he is waiting at the telephone. If he waits 10 seconds, it is magnified at least three times, and it is rarely that a subscriber will condescend to mention seconds when complaining, it is generally minutes he deals in. The subscriber lifts his receiver, stares at a blank wall, tatooes with his fingers on the table or indulges in other performances not calculated to soothe the nerves. It might be worth while considering the question of supplying the subscriber with a little jazz music over the telephone from the future exchange band while he is waiting. To put joking aside, however, the fact that the subscriber does not see what is taking place during the establishment of a call makes his position somewhat difficult and the situation calls for a great amount of courtesy and tact on the part of the operators.

It is necessary, however, to protect the subscriber from himself; for although he desires an immediate answer to his signal every time he calls, such a state of perfection would make a very costly service, and it is well known how the question of price affects the telephone public. The erratic incidence of traffic and the longer time taken to establish difficult calls have to be taken into account in arriving at a reasonable average time of answer which will be satisfactory to the subscriber and the department. At the same time it is well to bear in mind that the subscriber lays considerable stress on a prompt answer from the exchange and that a quick and business-like salutation gives him a certain degree of confidence in the service.

To provide as even and rapid a time of answer as possible, there are two essentials necessary in the exchange and these are team-work and answering calls in sequence. These points have been so well drilled into the operators that it is inviting trouble to offer any explanations at this time of day. This much may be said, however, that the careful practice of the virtues of team-work and answering in sequence makes all the difference between an even and satisfactory time of answer and an erratic service with long delays in answering.

Quick and Accurate Connexion.—It may be taken that the subscriber is not particularly interested either in the methods of establishing a telephone call or of the difficulties to be overcome before he gets in conversation with his client. If he is of a scientific or enquiring turn of mind, he may evince some interest in the procedure during his quieter moments, but when he makes a telephone call, all he desires is to get in touch with his client as quickly as possible. This is quite a natural state of mind and is borne out in our daily life in all directions. For instance, when the electric light is switched on who desires at that moment to know the process of manufacture or the difficulties of supply to be overcome? All that is desired is the luminant and if it fails—well, most of us are in as bad a way as the average subscriber is when something goes wrong with his telephone call. There is, therefore, no doubt that to a subscriber requiring a quick connexion, a wrong number, cut-off, or a false "no reply" is very provoking, and it can be understood that when such a thing happens, many subscribers are not in a fit state of mind to accept an explanation. It is strange that, according to the subscriber, trouble generally takes place on important calls. If viewed, however, from the subscriber's standpoint all his calls are important, and therefore it is easy to understand the extraordinary failure of the important connexions. The principal difficulties experienced by a subscriber are as already stated "wrong numbers" "cuts-off" and false "no replies." These troubles are easily accounted for by those in the service but to the outside public they are heinous offences and are the cause of much complaint.

It cannot be expected, however, that all calls will go through sweetly, but it is up to the telephone officers to see that there is a minimum of difficulty and if a call does go astray, the subscriber should be tactfully dealt with and not spoken to as though he caused the difficulty himself. To keep difficulties at a minimum the following broad axioms are put forward with apologies for their antiquity and reiteration:—

> Clear enunciation; give subscriber time to make necessary corrections; careful connecting and disconnecting; changing junctions, and if possible, subscribers' lines before giving "no reply."

Freedom from Faults.—This is another point where the subscriber is not interested in the difficulties attendant on his telephone service. If his telephone is out of order, it matters little to him whether it is caused by an earth on the "B" line, disconnexion at the D.P., or any of the other technically known points of trouble. His telephone is out of order and that is sufficient for him. He states that he is paying for a service and that the knowledge of the number of soldered connexions or intricate apparatus is no compensation if he is not receiving what he pays for. It should always be borne in mind that the subscriber supplies the sinews of the service and as such, he is the one who should receive the necessary attention. It is, therefore, of the greatest importance that faults should be cleared quickly and with as much permanence as possible. The telephone is of vital importance in cases of emergency and as great a degree of reliability as possible should be the aim of the Department in order that loss of life or property may not be attributed to a faulty telephone line or apparatus.

Moderate Price.—The subscriber desires as cheap a telephone service as possible, but at the same time he wishes it to be speedy and reliable and not a gimcrack affair. It is beginning to be recognised to a certain extent that a good telephone service implies a heavy money outlay, and unless a deficit has to be borne by the State it is difficult to run a service as cheaply as the public would like. The subscriber claims that the telephone is a business necessity, and that if it is expensive, there is a danger of business being hampered. At the same time, if the subscriber is reasonable, he will admit that a good service is a valuable asset and as such its value is worthy of an adequate monetary return. The matter of telephone costs, however, is an academic one, and the issues have to be so well thought out from every point of view that it is beyond the scope of an article such as this. Still there is no denying the fact that the public wish as cheap a telephone service as possible consistent with a reasonable efficiency.

TELEGRAPHIC MEMORABILIA.

SOME time ago the Admiralty announced that an International Hydrographic Bureau had been established at Monaco, Vice-Admiral Sir John Barry and Captain Spicer-Simson representing Great Britain together with Captain Phaff and Captain Muller from the Netherlands and Norway respectively, forming its directors. The Bureau is the result of a London conference held in 1919 at which 20 States were represented, 19 of which approved the statutes then drawn up, and constituting themselves members of the same. The Argentine Republic, Belgium, Brazil, the United Kingdom and Australia, Chili, China, Denmark, France, Greece, Japan, Monaco (the Prince of Monaco is particularly interested in oceanography), Netherlands, Norway, Peru, Portugal, Siam, Spain, Sweden and Uruguay. This institution should prove of inestimable value to telegraph engineers engaged in the laying of submarine telegraph and telephone cables, for which there is likely to be ample demand for many years to come despite, or perhaps because of, the extremely interesting developments of wireless systems as applied to both telegraphy and telephony.

These developments as foreshadowed are proceeding very largely along the lines of improvements in selectivity and the elimination of atmospheric disturbanes together with increases in speed. The chairman of the Marconi Company (Senor Marconi) at the Twenty-fourth Ordinary General Meeting of the Company claimed that the successful solution of *elimination* had been very nearly reached and even foreshadowed the possibility of wireless telephony between this country and Australia. In the opinion of this expert, however, wireless telegraphy must exist before there is a possibility of the other. Chatting with other experts the writer has had the privilege of obtaining other views which if one may write the words, have arrived at a less optimistic forecast to the extent that they counselled considerable further expenditure on submarine cable construction in the near future. Again, on the other hand, one hears the youthful scientific seer visualise the time when selectivity shall have reached that fineness of adjustment where the mesh of the sieve shall prove so minute and accurate as to make it easily possible to distinguish between waves of a difference of but one metre! With this range of studied opinions from which to choose one can only wait and watch with open mind the gradual and wonderful evolution.

By the way, the Spanish courts have given a verdict in favour of the *Compania Nacional de Telegrafia Sin*, Hilos, and the Marconi Company against the *Compania Iberica de Telecommunicacion* for infringement of certain patents relating to thermionic valves.

Reverting to the science of hydrography, a correspondent writes the following interesting paragraph: "Deep sea soundings taken by the British and American gun-boats *Challenger* and *Dolphin* in the Atlantic are full of interest to telegraphists. These soundings show an immense ridge running roughly North and South in mid-Atlantic, rising almost sheer about 9.000 feet from the ocean depths around it, the higher parts being only a hundred to a few hundred fathoms beneath the surface." *Think what a splendid chain* of telegraph repeater stations could have been erected on these mountain peaks had they not disappeared in the gigantic cataclysm of some ten thousand years B.C.! That at least is the approximate date given for the disappearance of the legendary ancient continent of Atlantis, of which the Azores may be presumed to have been a part. By how many multiples of an aeon this may have to be magnified let the modern geologist determine when the mystery attached to the source of our sun's energy has been solved! The present situation in mid-Atlantic is that owing to the dearth of landing places the Azores stands a very good chance of one day becoming a submarine telegraph Atlantic centre, and a veritable International submarine cable Clapham Junction. The following information culled from the *Electrical Review* would appear to be specially *apropos* of the subject: –

> "In the event of the reported allotment of one of the German cables between South America and the Azores to Italy being realised, the Italian Government intends to lay a complementary section *between the Azores and Italy, and thus establish for the first time* direct cable connexion between Italy and the American continent. The cost of the complementary section has already been reckoned and is set at 20,000,000 gold lire. The scheme will have a further *complement in that it will eventually enable direct connexion, to* be made with Northern Europe. The saving upon the fees now paid to foreign cable companies for the carriage of messages will suffice to pay for the outlay on these several schemes, estimated to *cost over 75,000,000 gold lire.*"

From the same reliable source it is also gathered

> "that a Bill authorising a concession to lay a cable between Italy, Spain, Brazil, Uruguay, and the Argentine was introduced at Rome on July 23."

These last two items are a very clear indication of the activities in the realm of wire telegraphy as are the following paragraphs in that of *Wireless*. The Perth (Western Australia) Observatory authorities are installing a wireless telegraphic receiving apparatus which will be capable of intercepting messages over a distance of 12,500 miles.

> "The wireless station at Bamako in the French Soudan, begun in 1918, is expected to be finished before the end of the present year. During its construction a temporary post of 10-k.w. capacity with musical spark was set up to maintain communication between Bamako and the coast stations. When completed the Bamako station will be the chief one in the French Soudan, and will have antennæ with horizontal emission, supported by six 120-metre high towers. The other equipment will comprise two 275-h.p. Diesel engines to yield the motive power. Transmission will be made by quenched wave with a 100-k.w. alternator group. Later on a second group will be installed."
>
> "The Polish Government appears to have made a contract with the Radio Corporation of America for the construction of a $3,000.000 high-power radio station at Warsaw, having direct communication with Rocky Point, Long Island. It is understood that the Polish Government will own the station, which will be operated in conjunction with the Radio Corporation for a period of 30 years."
>
> "On the authority of the Stockholm *Svenska Dagbladet* it is stated that the negotiations for the amalgamation of the English Marconi Co. and the Swedish Radio Co. have led to positive results, but the majority of the shares will remain in Sweden."

The White Star steamship, *Majestic*, the largest vessel in the world, is fitted with three wireless stations, the largest being capable of maintaining permanent connexion with both Europe and America during the whole of a trans-Atlantic voyage. Elaborate submarine signalling gear has also been provided so as to ensure as far as humanly possible the safe navigation of the vessel in fog. Two of the motor life-boats with which she is provided are also equipped with wireless installations.

The petition of the Institution of Electrical Engineers for a Royal Charter of Incorporation has been approved and a Royal Charter granted. His Majesty the King has expressed his willingness to become patron of the institution.

According to Reuter's Trade Service of Stockholm, the Swedish Telegraph Board's annual report for 1920 shows an increase in revenue of Kr.20,000,000, making a total of Kr.90,000,000. This increase is due to the raised fees, but expenses are also higher. The net profit works out at Kr.10,000,000.

It is understood that the Russian Soviet Government has granted a concession for telegraphic connexion between Russia, Denmark, Japan, and China to a Scandinavian company.

Items of information which come to hand from time to time from one source and another regarding telephonic conditions, and results should on the whole tend towards satisfaction with State management in this country. Was it not Hull which was held up as an example of the best served town in the Kingdom? It has fallen on evil days with a deficit of £13,279 on a year's working. Turn we now to Czecho-Slovakia, where by a new law, according to the *Exchange Telegraph*, all telephone subscribers to the State service must buy a minimum of 6,000 kronen in Government bonds. Anyone refusing to make the purchase will have his or her telephone cut off. Two hundred kronen is equal to about £1 at the present rate of exchange. Needless to say, protest meetings have been held!

On Aug. 8 of this year there passed away in his 90th year at Winchester, one of the early pioneers of industrial electricity as represented by the electric telegraph and electric lighting. Samuel Alfred Varley, A.M.I.C.E., as a boy attended Faraday's lectures at the Royal Institution, and was the son of Cornelius Varley, artist and microscopist. He was associated with one of his brothers, Cromwell Fleetwood Varley, in the laying of at least one of the Atlantic cables. He went out to the Crimea during hostilities as electrician and was probably the first to instal and operate a field line telegraph in actual warfare.

According to an informant of *The Times* newspaper, East of the Volga the peasants attribute this year's drought to the wireless apparatus erected on the Votkin works. "They stuck an iron pole into the sky and that stopped the rain," they say. One wonders if this is more ridiculous than the *attempt of certain enterprising (?) and intelligent leaders of public opinion* who here in the capital of our educated empire discharged tiny fire balloons in order to bring the rain down!

A telegraph engineer specially expert in high speed type-printing telegraphy writes a very interest letter on Tape and Page printing anent certain observations which appeared in these columns some time since. His opinion and experience are willingly placed before the readers of the T. AND T. JOURNAL. He says: –

> "There is of course much to be said for both Tape and Page printing. Tape printing is good for very long lines when a greater speed than 30 to 35 words per minute cannot be obtained. At this speed it is possible for operators to gum the tape, and in addition there is also a slight saving of line time (about 5 per cent.)
>
> "On heavy traffic loaded circuits, however, Page printing is best. For example, the New York-Boston circuit operates quad duplex at 50 w.p.m. per channel. Now at this rate the operators could not keep pace if required to gum tape. Moreover, the transmitting operators would find it difficult to feed the transmitter if given no assistance. With Page printers the receiving operators are able to sign the outgoing messages and so help the senders."

"M. Montoriol seems to think that the Western Electric is tied up with page printing. (This is a reference to the new volume written by M. Montoriol of which a review appeared in our last issue.—ED.) As a matter of fact we can use Baudot *traducteurs but we do not want to do so, because these instruments* 'space' after the shift signals and therefore cannot print mixed groups of letters and figures exactly as handed in by the senders. . . . It was stated in the T. AND T. JOURNAL that the Western Union were turning to tape printing or that there is a tendency to do so. The fact is that the latter

company believes that tape printers would be useful on their slow speed, long-distance circuits. . . . The French engineer appears to think that because the Western Electric only operates on Duplex circuits it is at a disadvantage. I believe if the Baudot could not be duplexed its use in England would still be confined to the Anglo-Foreign circuits. All Inland circuits utilise duplex so that the French impression that quadruple *simplex* is superior to Double *duplex* is apparently not shared in this country. The W.E. realises that nobody would operate a circuit simplex when the traffic carrying capacity can be practically doubled by using the duplex balance.

Mr. W. T. Hunter, telegraphist of Deal Post Office, and Amateur Golf Champion, is now in the United States, having resigned his position in the British Government Telegraph Service. Prior to leaving England he went round the Walmer and Kingsdown course in the excellent score of 67, thus beating the record he himself set up last year, by one stroke.

Mr. Lecomte, one of the steadily diminishing number of the late Submarine Telegraph Co., retired upon reaching the age limit a few weeks ago, when he was presented with a time-piece by the members of the staff as a souvenir of his long association with the Telegraph Service and a token of the unfeigned respect in which he is held by his colleagues, staff and supervisors alike.

The promotion of Mr. R. H. Hatswell of the Secretary's Office to Staff rank is an event which cannot be allowed to pass without a word or two of hearty congratulation. This is mingled with the sincerest and keenest regret that this well-deserved advancement should involve a severance of close official association with the foreign telegraphs.

With Mr. Hatswell's practical knowledge of telegraphy learnt—dare it be stated how many years ago?—there has always been a sympathetic understanding of the special difficulties associated with this particular arm of the Service which have rendered decisions wise and instructions particularly helpful. It is hoped that if officially we may be compelled to lose touch with a much respected administrator at least the Fates will be kind enough to permit a glimpse of certain of his activities through *St. Martins*.

It was with something approaching a sense of horror that the C.T.O. received the news of the terrible and fatal accident which befell their colleague, Miss M. Hodgson, while cycling. Miss Hodgson was an expert cyclist and was well-known in cycling circles as an excellent organiser in matters appertaining to cycle club life. Her withdrawal from this field of activity in any ordinary circumstances would have been met by unfeigned expressions of regret. The tragic end of our much respected colleague left little that we could do to soften the blow for her sorrowing relatives. That little was done. Fifty cyclists followed at the funeral and many wreaths from allied cycling clubs were reverentially laid upon her last resting place.

J. J. T.

LONDON ENGINEERING DISTRICT NOTES.

C.T.O. Section.

ON Saturday, Sept. 3, the Mechanicians and Linemen of the C.T.O. Section held their annual outing at picturesque Haslemere in Surrey. The journey was made by motor coach. After lunch a sports meeting was held. Some very fine running and close finishes were seen, and the friendly rivalry was capital to witness. After the sports, the prizes were presented to the winners by Mr. Bang, Y.Y., an engineer of the Chinese Telegraph Administration, Pekin, and a temporary member of the C.T.O. Section staff. He congratulated the winners, and assured the party how delighted he was to be with them, and to see the manner in which they took their recreations and sports. After tea the party left Haslemere at 6.30, and journeyed to Esher, where a concert was held. Among those who contributed to the evening's entertainment special mention must be made of Messrs. Coombe, Houghton, and Kennedy for their performances on piano, banjo, and mandoline, and of Mr. B. Wright, sen., in his rendering of "Our Cat." Mr. Bang recited, both in Chinese and English, some ballads written by a great Chinese poet. Leaving Esher at 9.30, the party arrived at the C.T.O. about 11 o'clock, thus concluding what was unanimously agreed to be a most enjoyable day.

Opening of Grosvenor Exchange.

Another step in developing the Telephone system of London was taken on Sept. 3, when the New Grosvenor Exchange was put into commission.

The exchange is situated in South Audley Street, W., and has accommodation for 2,000 subscribers and 480 junction circuits. A total of 963 subscribers were transferred on the opening day, the change over being effected very smoothly. The installation of the plant and the cabling of the area were carried out by the District staff, and it is satisfactory to record that the usual high standard of workmanship was maintained. This new exchange will help to serve the southern portion of the Mayfair area. It will be remembered that the Langham Exchange was built to relieve the northern portion of the area.

London Toll Exchange.

The first of the Toll exchanges, if the temporary switchboard in G.P.O. South recently re-christened "Annexe," is left out of account, was duly opened for traffic on Aug. 27. For a number of reasons the opening of this exchange had to be a gradual process so far as the lines were concerned. Lines had to be intercepted and the back ends used for other circuits, and since it was important to retain the provincial lines in service until the moment of the change over, a close working arrangement between the traffic and engineering officers at Toll and the provincial engineers was necessary to ensure that lines were handled in suitable group order. During the week ending Sept. 17 out-going lines were connected and the exchange enabled to take traffic in both directions.

A full description of Toll appeared in the September TELEGRAPH AND TELEPHONE JOURNAL, and it was there shown that in a number of ways it was different from any other exchange. To the casual visitor it suggests the ordinary local equipment, but the absence of subscribers' lines, the very limited number of plug-ended junctions—and the concentration arrangements do not, on the other hand, reproduce the "Trunk" atmosphere. In-coming junctions from local exchanges are jack-ended.

Toll is, as it were, the half-way house between the bustling local exchange and the more deliberate Trunk Exchange.

Radiotelegraphy.

The enthusiasm of the staff and public regarding this rapidly developing science shows no sign of abatement and the number of experimental amateur installations authorised in this district now exceeds 1,300. The recent release from Post Office custody of several hundred packages of wireless apparatus to the owners, will probably increase the ever-growing list of searchers for signals from Mars.

Growth.

Recent returns indicate that the decrease in stations caused by the depression in trade and revision of rates has been arrested and the district figures which now stand at 158,761 exchange lines, 146,835 internal extensions, 10,134 external extensions, and 301,993 stations are going ahead again. These figures relate to the London Engineering District only, which does not coincide with the London Telephone Area.

Denman Sports Club.

Denman Sports Club, who after a lapse of five years, had a very successful football season for 1920-21, when they won Stamford Hill League, Div. II's Cup and Medals, have once again kicked off for what they hope will be as successful a season as last. This season, they have entered for the London Junior Cup, Middlesex Junior Cup, and Tottenham Charity Cup, and have two teams entered for Div. 1 and 3 of the same League in which they were so successful last season. Any member of the staff in the City Engineering Branch wishing to join the above club will be heartily welcome. For further particulars apply: Hon. Sec., Football, W. F. Steers, 26, Thornham Grove, Stratford, E.15; or to Gen. Sec., Sports Club, E. Forsdike, 21, Pelham Road, Tottenham, N. 15. Other secretaries please note.

MR. G. DAWKES.

Mr. G. DAWKES retires from the Controllership, Telegraphs, Edinburgh. He has had a varied career. He was Inspecting Telegraphist in the North-Eastern District, Travelling Clerk in the Surveyor's establishment; Chief Superintendent, Telegraphs, Leeds; Assistant Traffic Manager, G.P.O., and then Controller, Edinburgh. In so varied a career Mr. Dawkes met a large number of the officers of the Post Office, and it is not too much to say that he attracted very genuine respect and esteem. He had travelled the whole country and seen the working at most offices, and he never confused constructive criticism with censoriousness and never failed to appreciate the difficulties which often are better known locally than to visiting officers. At Headquarters during the war he was identified with many changes which had to be swiftly made, and he carried them out with the least inconvenience and disturbance to others. He was full of considerateness, and singularly able to fulfil his duty with enthusiasm while retaining the insight which prevented him from appreciating other points of view.

A warm supporter of the Telegraph Messengers' Institute, he identified himself with the messengers in all their various activities. To mark their appreciation of Mr. Dawkes the inspectors and messengers presented him with a solid silver rose bowl, Mrs. Dawkes at the same time receiving a basket of flowers.

The Telegraph staff and the heads of the various Departments in the General Post Office gave him a handsome tea service, and Mr. Prescott, Superintendent, Telegraphs, who made the presentation, drew attention to the fact that, although Mr. Dawkes had only been Controller for six years, these years had probably been the most strenuous of his official career. He spoke with confidence of Mr. Dawkes' unsparing labours during the war period, and how keen was his desire that the Telegraph Department should always be in a position fit to meet any of the requirements that might be made by the Naval and Military Authorities. In the name of the subscribers he wished Mr. and Mrs. Dawkes all good wishes and the best of health.

Mr. Dawkes in a few words thanked all the subscribers for their good wishes, which he reciprocated to the full.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

THE first meeting of the Session takes place on Wednesday, Oct. 5. The president is Mr. M. C. Pink and the subject of his address is "The Future Development of the Telephone Service."

Telephone and Telegraph Society.

The programme for the coming session is a particularly interesting one. The president is Mr. F. J. Brown, C.B.E., Assistant Secretary, Telegraphs, who will open the session with a paper on the subject of Imperial telegraph communications, a subject of peculiar interest at the present time in view of the discussion which has raged round it at the recent Imperial Conference. An original feature of the programme is four papers by prominent members of the Union of Post Office Workers. The authors and titles are:

Mr. A. C. Winyard, "Possibilities of Post Office Development."
Miss A. Flanagan, "The Telephone Service: Suggestions for Improvement."
Mr. E. J. Lansbury, The Night Telephone Service and some of its Problems."
Miss L. M. Herring, "Women as Civil Servants."

The paper by Mr. Bernard Chapman entitled "Public Intelligence" should attract a good audience in view of the controversy which has taken place in the Press on the Civil Service generally, and on the Post Office in particular. It is believed that Mr. Chapman will not take the title of his paper too literally, but will deal rather with the subject of the education of the public (and incidentally the Press) through the Press. Before coming to the Post Office Mr. Chapman had experience in the matter at one of the war-time Ministries.

Papers of the more highly technical nature are only two in number. One is by Mr. H. H. Harrison of the Automatic Telephone Manufacturing Co., whose subject is "Printing Telegraphy in America" and the other is entitled "High-frequency circuits," by Mr. A. B. Hart, who is so well known to all members of the Society.

The meetings take place at the Institute of Electrical Engineers, Victoria Embankment, on the third Monday in each month (except the April meeting which will be held on the fourth Monday) so that the session opens on Monday, Oct. 17.

New Exchanges.

September has probably created a record so far as London is concerned in the opening of new exchanges. Grosvenor was opened on the 3rd, Toll which was opened partially in August will be in full swing from the 17th, and Minories opens on the 24th. Grosvenor Exchange is a relief to Mayfair and is situated in South Audley Street in premises which were formerly occupied by an antique dealer. In one of the rooms is a valuable fireplace which however is boarded up to prevent damage; 24 A and 10 B positions have been installed. Minories Exchange is located in a bungalow building in Mansell Street, near the Tower Bridge, and serves to relieve Avenue. Its equipment embraces 35 A and 15 B positions.

Conscience Money.

A postal order for 3*s.* 6*d.* was received recently enclosed in a letter card with the advice "3*s.* 6*d.* for directory from a call office." The sender apparently appropriated a stiff covered copy of the directory from a call office and satisfied his conscience in this manner.

West Traffic District.

ON Sept. 1 the West Traffic District held their Swimming Gala at St. George's Baths, Buckingham Palace Road. The baths were well filled with enthusiastic spectators and competitors and a great evening's sport was provided. There were about 100 entries for the 11 competitive events, and in addition there was an exciting water polo match, a display of high and fancy diving, and a very fine display of ornamental swimming by the Misses Elliott, three in number, who demonstrated how apparently simple it is to combine gracefulness with dexterity.

The competitors from the various exchanges had no grounds for complaint that their supporters did not cheer them on, for the noise made by the "fans" (if the ladies will excuse this Americanism) was really deafening. The presence of water and a bath seems to have an irresistible influence on mankind, causing him to exercise his vocal cords, witness the strange noises emanating from the bathroom when the man in the house has his morning shave. Whatever the cause the effect was produced to perfection at St. George's Baths.

The principal events and results were:—

Supervisors' Handicap.—Miss Money (G) first. Miss Tripp (VI) second.

Invitation Team Race.—Regent Exchange (Misses Cole, Williams, Amos, Phipps) first. Gerrard Exchange (Misses Roblon, Burt, Wilson, Davis) second.

Engineers' Handicap.—Mr. Wilks (G) first. Mr. Warren (RE) second.

100 *Yards' Championship* (Western District).—Miss A. Phipps (RE) first. Miss E. Williams (RE) second. Miss Amos (VI) third.

Diving Championship (Western District).—Miss Davis (G) first. Miss Phipps (RE) second. Miss Williams (RE) third.

At the conclusion of an eventful evening the prizes were presented to the winners by Mrs. Pounds who thus brought to a fitting conclusion the gala which was under the direction of Mr. E. A. Pounds, whose penchant for seeing these things through is too well-known to be enlarged upon here.

Trunk Exchange.

The Imperial Swimming Club, in connexion with the Trunk Exchange, held a very successful gala at Holborn Baths on Wednesday, Sept. 14. Much enthusiasm was shown by the audience throughout the evening. This year's learners' race of 1 width, 5 competitors entered, two of which were able to compete for the Needle and Thread race, 2 widths.

The winners of the following races were:—

Learners' Race (1 width).—Miss Parker first. Miss D. Pearce second.

Needle and Thread (2 widths).—Miss Coller first. Miss Peto second.

Graceful Swimming (Breast stroke).—Miss Harold first. Miss G. E Sutton second.

In the 100 Yards' Championship Miss L. K. Davies was returned as champion, and Miss Powell second. The competitors for the 60 Yards' Invitation Handicap open to all Postal Service resulted in a large number of entries. The winners being Miss Bishop (Centels), first; Miss Bleach (London Wall), second. Miss Phipps (Regent), third.

Great amusement was caused by the Old Clothes Race, the dressing of the competitors and the comical way in which they entered the water proved that they were out to entertain the audience, and judging by the uproar of laughter, their efforts were not in vain.

A splendid display of diving was given by the Amateur Diving Association, and great appreciation was shown when the Royal Life-Saving Society exhibited their different methods of saving life.

The Polo match was played between the Metropolitan Police ("F" division) and the Star Athletic, the latter team being the winners.

The day following the Trunk Gala application was received for 40 tickets for the coming L.T.S. Gala on Oct. 7, thus proving the great success of the evening.

City Traffic District.

The staff of the exchanges in the district subscribed the sum of £50 towards the cost of a holiday camp for boys drawn from Canning Town. A "Special Commissioner" visited the camp and in his extremely picturesque report which is reproduced below, he tells how well the money was spent.

I located the Fairbairn House Boys' Camp on what is known as the Pett Level between Winchelsea and Rye at a spot which I afterwards found to be the bed of the one-time harbour of the Cinque Port of Winchelsea. There were 85 boys in camp, all fit and strong and thoroughly enjoying themselves, and some 10 grown ups, which number included the Warden of the Mansfield House Settlement and his wife (Mr. and Mrs. Reade), who were engaged in doing practically all the work of the camp, leaving the boys to partake to the full of the joys of the seaside, &c. Mr. Moon was the C.O. of the camp and Mr. Gunter his second in command.

A description of a day in camp as I saw it would perhaps convey to you an impression of the life which the boys lead. I will take last Sunday. Somewhere between 8 and 9 a.m. we arose from Mother Earth, not to a blare of trumpets or piping of whistles but each one at his own sweet will. About the latter hour a clatter of plates and mugs signified that the lads were ready for breakfast. They lined a convenient bank and were ready to enter the tent when a mariner, equipped with bell-bottomed trousers and earrings, asked for the services of the lads in launching his fishing smack which had been left high and dry on the shingle by an inexperienced hand. A few minutes tramp across the shingle and over the sea wall brought us to the derelict. Ropes were attached to the forepart of the keel and the lads were soon hauling and pushing with might and main. She took the water more like a rhinoceros than a swan but that mattered not to the lads of Canning Town to whom a launching of any description was a unique experience. Breakfast was now the more acceptable. It consisted of porridge, with sugar and milk, bread and butter and tea. Like little Oliver, of whom they all seemed to have heard, they came for more—and got it.

After a short service, shop was opened and we sold chocolate, apples, caramels, nuggets (nougat), ginger beer and stamps. Some of the purchases we "put on the slate" until the morrow when the bank was opened. This bank contains the savings which the boys have accumulated, penny by penny, during the preceding months and during camp it is opened on week-days so that the boys can draw out what they require. At post time some of the lucky ones received postal orders which they desired either to turn into cash, apples or sweets, immediately or to put in the bank. Shop over, we scrambled down to the sea and had a glorious bathe.

Dinner, consisting of cold roast mutton, potatoes, marrowfat peas, boiled rice and jam, which had been cooked by "old Tom" who among other articles of clothing sported a "rugger" jersey and a cricket cap, was disposed of and one small basket would have held all the remnants.

After tea we visited the ancient church at Winchelsea where the Vicar preached a short homely sermon to the boys, and after the service explained to them the antiquities of the Church. The boys proceeded home

independently and from the hill we soon saw them dotted over the plain in all directions, some hurrying, some daudling and some gathering pokers from the rush beds in the dykes.

After supper and a sing-song I was "told off" to see No. 9 tent to bed, and my 13 lads soon had their ground sheets down and crept into the sleeping bags, a sewn-up blanket which their mothers had provided for them, and after I had tucked a blanket round each three and slacked off the tent ropes, I said "Good night" feeling that we all had had a good day.

At teatime on Monday, the last meal I attended, Mr. Moon explained to the lads that it was owing to the kindness of the ladies in the City District that it had been possible to extend the camp to a fortnight and the lads expressed their thanks in a way in which only boys can—the marquee pole nearly came down. I had a great "send off" which I shall not forget in a hurry, but I realise that it was not so much for me as an expression of thanks to those whom I unworthily represented.

Mr. Moon explained to me that each lad pays something towards the camp expenses and is assessed according to what his parents can afford to pay. All grown up engaged in running the camp pay their full share of the expenses. The railway fare for the return journey is at the special rate of 6s. per person and all other money is spent in hiring camp equipment and providing food. The lads are wholesomely but not sumptuously fed and their appearance and cheerfulness shows plainly how much they have benefited by the holiday. I was assured by Mr. Reade that the extra week which the subscriptions of the City District has made possible will make all the difference to the benefit derived from the camp. The campers had only one regret and that was that it was not possible for some of the ladies who had subscribed to visit them.

BRIGHTON.

SUNDAY, Sept. 4, will stand as one of the most memorable dates in the annals of the Brighton Post Office.

The unveiling of the office War Memorial, which took place on that day, was a ceremony deeply reverent, of simple dignity, indescribably impressive; and of a significance that must have engraved itself on the hearts and minds of everyone present.

The sympathy exhibited by the presence of so many controlling officers, together with a large number of retired members of the staff, was keenly appreciated. To the staff, the occasion presented homely aspects, and they were as one great family with the relatives of the departed; all sharing their sorrow and their pride.

The Postmaster of Brighton (Mr. J. F. Horn), who unveiled the Memorial, recalled how 577 Postal Servants in the Brighton district responded to the country's call, and that of this number no fewer than 63 made the supreme sacrifice. Continuing, he said: "Our every-day struggle for existence tends to make us selfish. In our homely way we call it "looking after number one," and are somewhat inclined to regard it as a virtue. But it is on occasions such as this that deep down in our hearts, if not with our lips, we admit the meanness of this view. The action of these dead comrades contains no suggestion of looking after number one; we know that they did their bit willingly without any selfish motive. Some of us who remained at home might ask ourselves whether we were entirely free from selfishness; and all of us who remained at home owe to these dead men and to others whose lives were forfeited in the defence of our country, a debt of gratitude quite beyond our power to repay. Into the Great Beyond these men have passed bearing with them evidence of their worth and marks of wounds and suffering; evidence, dumb but eloquent, of a burden borne; a duty done."

In the unavoidable absence of the Vicar of Brighton, the Memorial was dedicated by the Rev. Canon Burton, O.B.E., who served with distinction during the war.

Prior to the formal dedication the Canon delivered a brief but impressive address, emphasising the same need for unselfishness in everyday life as displayed by our fallen comrades.

During the proceedings, the solo "Abide with me" was finely rendered by Mr. R. Dandy, whose voice was heard to advantage in the large office, after which the whole company sang the hymn "O God, our help in ages past," though it was noticed that many could not join in owing to their emotion, and a conclusion was reached by the sounding of the "Last Post" by trumpeters of the R.F.A., and the singing of the National Anthem.

From first to last the one right note was maintained, and for the arrangements the utmost credit is due to Mr. Gilder, the Honorary Secretary to the Roll of Honour Committee.

The Memorial took the form of a plain oak panel enclosed in a finely designed frame with Corinthian columns and capitols. The beautiful carving of the inscription and names of the fallen was the work of Mr. Perry Hill, of the Brighton School of Art, and the frame was very kindly presented by Mr. Frank Trill, who was a temporary employee at the Post Office during the war.

THE CENTRAL TELEGRAPH OFFICE SECTION, LONDON ENGINEERING DISTRICT.

G. F. GREENHAM AND P. G. HAY.

IN last year's September and October issues of this JOURNAL some details of the London Engineering District were given in which it was stated that the work of the district is organised on functional lines and consists of fourteen sections. The bulk of the work in 13 of these sections has to do with the telephone service, although the Engineer in most cases is responsible for the telegraph plant in his section. There is one section, however, in which the bulk of the work has to do with the telegraph service. This section, known as the C.T.O. Section, because the Central Telegraph Office provides the bulk of its work, does however, include some telephone plant, as will be seen later.

The equipment and maintenance of the vast amount of apparatus contained in the Central Telegraph Office, the largest of its kind in the world, is a task of no mean order. For the benefit of those who are not familiar with this hive of industry in St. Martins-le-Grand, in the building known as G.P.O. West, a brief outline of some of its salient features will be given.

The instrument rooms occupy three floors usually referred to as galleries. Speaking broadly one gallery is allotted to foreign circuits, one to provincial circuits, and one to Metropolitan circuits.

THE SECTIONAL ENGINEER, MR. STEED, AND HIS PRINCIPAL OFFICERS.

In the last named are found nearly the whole of the circuits serving the Metropolitan area, but also a number of those to the Home Counties. Although some of the lines terminate on apparatus special to them yet the majority are connected to the intercommunication switchboard. This switchboard serves a somewhat similar purpose as a multiple telephone switchboard of the C.B. type, and contains many features incorporated in the latter. Battery power is concentrated at the C.T.O., thus simplifying the plant at the distant stations. The introduction of this switchboard in 1902 resulted in considerable economies both in plant and personnel. There are about 1,200 circuits connected with it. By its aid one Metropolitan Office can be connected direct to any other office so that re-transmission of telegrams is avoided and the circuit time correspondingly reduced. There are a number of instruments connected with the switchboard for the purpose of receiving messages from stations connected with the switchboard for transmission to other stations not so connected and *vice versa*. The method of working is briefly as follows:—a call from an out office is indicated by the glowing of a small filament lamp on the switchboard. The operator by means of plugs and cords transfers the calling circuit to an idle apparatus set if the telegram is for the provinces or local delivery; if for another Metropolitan Office the two are connected direct at the switchboard by the operator. On the completion of a transmission, clearing lamps on the switchboard are made to glow and normal conditions are resumed by the operator withdrawing the plugs.

All the circuits connected to the Metropolitan switch are worked manually, the familiar hand-operated key and sounder being used in all cases.

As is generally known, however, machine telegraphs are used on important long-distance lines.

Machine telegraphs generally speaking are designed to permit of messages being transmitted at a greater speed and with more precision than is possible by manual working and are, as the term implies, largely mechanical in their functions.

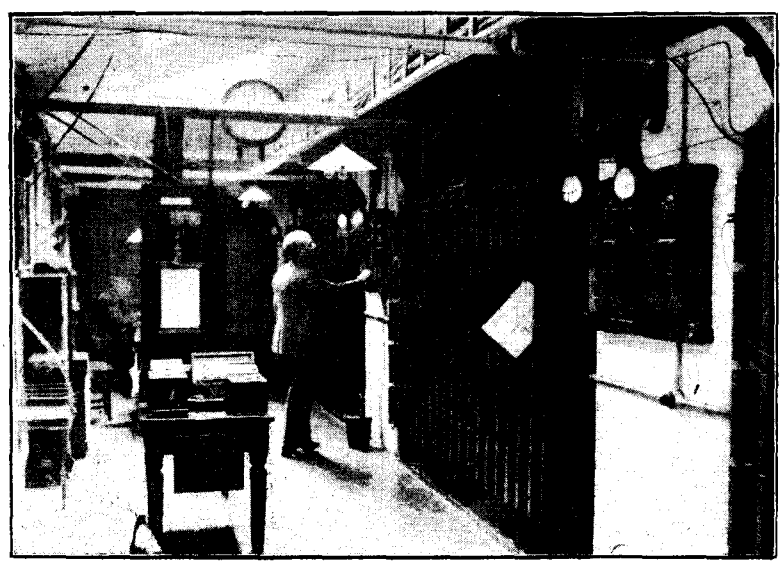
Modern machine telegraphs can be broadly divided into two classes, viz., apparatus used for high-speed working and that used for Multiplex telegraphy.

Transmission is effected by means of currents sent out either directly by the operation of a keyboard or automatically with the aid of a specially prepared tape, which is perforated in accordance with the particular system in use, and which is passed mechanically through an automatic transmitter within which certain electrical contacts are made in accordance with the perforations in the tape.

High-speed telegraphy in which speeds of the order of 400 words per minute can be attained is effected by means of an automatic transmitter used in conjunction with a perforated tape.

The tape is perforated either manually by feeding it through a 3-key device, the keys being hit by strikers held in the operator's hands, or through a machine fitted with a keyboard similar to that on a typewriter. In the latter the depression of a key sets up electro-magnetic action, which results in the appropriate perforations being made in the tape.

In addition to the purely mechanical perforator in which the punches which perforate the tape are operated in suitable combination by the 3 keys there are punchers in which the keys control punches worked by pneumatic power. One type of pneumatic puncher is capable of perforating as many as 8 tapes by one operation. This is helpful when messages, principally for the Press, have to be transmitted simultaneously to different parts of the kingdom. The keyboard perforator can be operated at a much higher speed than the 3 tapper device, moreover its operation does not necessitate a knowledge of the Morse code.



T.S.B.

High-speed transmission naturally necessitates automatic apparatus for receiving. Various types of high-speed receiving apparatus have been designed capable of recording the received signals direct on a paper tape and more recently by perforating a tape to correspond to the perforations on the tape at the transmitting end. The latter can be used for re-transmitting the received messages to other stations by means of automatic transmitters or for printing the messages by passing the tapes through automatic printing apparatus. The receiving perforator and its associated printer are actuated by an ingenious combination of electric and pneumatic power.

Multiplex machines are designed to cope with a problem entirely different to high-speed transmission between two points, namely, the multiplication of the number of traffic channels which can be established on one telegraph line.

This object is effected by means of two distributors to which the line is connected, one being placed at the up and the other at the down office.

These distributors connect the line, both for sending and receiving purposes, to several operators in rotation so rapidly that to all intents and purposes the stations are enabled to work simultaneously. Clearly each operator must send only during the periods in which the line is associated with his set. The operator is made aware of the psychological moment in each revolution of the distributor by an electro-magnetic tapper.

Naturally, the distributors at the two ends of a line must work in synchronism, and this is assured by various electrical devices.

Transmission from each station is effected under one system directly from a keyboard, and under another indirectly by passing specially perforated tapes through transmitters of a particular type, with which are associated keyboard perforators for preparing the tape.

In the case of the direct keyboard system the messages are recorded on a paper tape by a type wheel and in the other system a tape is perforated by the receiver identically with the transmitting tape, and is then passed through a translator which typewrites the message on a form. In the Provincial and Foreign Galleries at the Central Telegraph Office many types of telegraph printing or recording apparatus are in use. As may be imagined such a vast quantity of complex apparatus as is in use in the galleries requires the care of a skilled mechanical staff to keep it in an efficient condition. The commercial staff includes officers known as dirigeurs, whose duty it is to perform small acts of adjustment, but a number of officers attached to the engineering staff are in constant attendance to deal with circuit faults and troubles beyond the power of the dirigeurs to handle. The upkeep of the apparatus requires the assistance of a staff of skilled mechanics who are accommodated in two workshops on the premises, and are unfortunately through the exigencies of space, somewhat cramped.

In spite of severe limitation of space it has been found possible to provide the shops with such useful equipment as power-driven lathes and drills, and specially designed testing sets to enable troubles in the complicated apparatus to be rapidly located and to simplify adjustments.

The circuits to each gallery at the Central Telegraph Office pass through main and divisional test boards located in the gallery. These testboards are so arranged as to provide the commercial staff with facilities for testing lines, the localisation of faults, and for arranging the lines and apparatus to suit the ever changing traffic requirements.

All circuits entering the building pass through a main distributing frame situated in a room in the basement, which is under the sole control of the engineering staff. This room is known familiarly as T.S.B. The main frame is fitted with the usual protective devices, and a test jack is associated with every line.

(To be continued).

CRICKET.

"CENTELS" *v.* SECRETARY'S OFFICE.

Played at Dulwich on Wednesday, Sept. 7, 1921.

Secretary's Office.		*Centels.*	
C. R. Young, st. F. Randall, b. A. Randall	38	W. T. Cook, c. Reed, b. Peel ...	84
D. O. Lumley, st. F. Randall, b. A. Randall	3	C. J. Fallaize, c. Lumley, b. Reed	10
L. F. Masters, c. A. Randall, b. Cook	6	T. P. Wilmot, b. Coye	19
C. L. K. Peel, b. Smith	24	A. W. Randall, b. Coye ...	1
T. G. Reed, c. Smith, b. Wilmot	10	H. Minhinnick, c. Hurford, b. Coye	9
H. Hurford, b. Cook	4	F. Randall, not out	23
S. Hambridge, st. F. Randall, b. A. Randall	9	P. Edsall, not out	25
P. P. Coye, lbw., b. Minhinnick	19	J. D. Cooke, L. G. Banks, H. C. Smith, G. F. Mitchell	did not bat.
H. W. Hardcastle, st. F. Randall, b. A. Randall ...	10		
N. Moore, b. Minhinnick	26		
G. O. Wood, not out	1		
Extras ...	3	Extras ...	4
	153	(5 wickets) ...	175

BOWLING: Wilmot, 1 for 22; Randall, 1 for 51; Cook, 2 for 15; Smith, 1 for 8; Minhinnick, 2 for 5; Banks, 0 for 19.

BOWLING: Reed, 1 for 62; Hurford, 0 for 30; Coye, 3 for 42; Young, 0 for 25; Peel, 1 for 15.

The above score speaks for itself. What is perhaps of even more value was the happiness of the occasion. One of the superior officers of the Central Telegraph Office had befriended us by obtaining the loan of the Dulwich ground. Both sides were accompanied by friends, Mr. Leech, Assistant Secretary, being the chief representative of the Secretary's Office. Rival, but not ungenerous applause marked various achievements, and proud as the C.T.O. is of its victory, it is almost as proud of the fact that Mr. Cook's wicket—a valuable wicket, seeing that Mr. Cook is a Surrey County player—was obtained by Mr. Peel. It was a happy commingling and our respect for our Chiefs in the Secretary's Office is not lessened by the fact that we beat them at cricket, but it is heightened by an intimacy of intercourse which comes too rarely.

J. L.

RETIREMENT OF THE SUPERVISOR OF EDINBURGH CENTRAL EXCHANGE.

MISS AGNES ST. CLAIR JOHNSON, the Supervisor of Edinburgh Central Exchange, has just retired at the age limit. Miss Johnson has spent her whole life in the Edinburgh Telephone Service, and she has been the Chief Supervisor of the Central Exchange since it was opened about twenty years ago. Her retirement will be a great loss to the service and the Edinburgh public, for whom Miss Johnson has done much, will miss her.

Miss Johnson has always been a woman of phenomenal energy and enthusiasm, and to the end of her service her activity never flagged, nor did her interest in her work diminish. Since 1912, when the telephone system was transferred to the Post Office, Miss Johnson has served the public with the same thoroughness she displayed in the service of the National Telephone Company.

Miss Johnson insisted on the same high standard of duty in others she set for herself, and it can be truly said that if she closely kept her staff to their work no one of them worked harder than she did. She had no patience with indifference to duty, but her sympathy and help to members of her staff in times of trouble were as liberal as her enthusiasm for efficiency was marked.

For the high standard of telephone service always given in Edinburgh the public have largely to thank Miss Johnson, and now that she has gone into retirement many subscribers will miss her courteous and kindly way of accepting a complaint or smoothing over a difficulty.

MISS AGNES ST. CLAIR JOHNSON.

To those of her colleagues who knew her well Miss Johnson was an inspiration as she was a direct challenge to those who are unable to associate enthusiasm, alertness, and initiative with the servants of the State.

Even when away from duty, Miss Johnson kept in close touch with the working of the exchange at times of emergency. During the war her loyalty in this way was of inestimable assistance, for she was ever ready to give her advice and assistance to those who required it.

Before leaving Miss Johnson received a handsome testimonial from the staff in and around Edinburgh, and she goes from the service with that respect and esteem which it is never possible to withhold from those who throughout their lives put duty before everything else.

CALENDAR OF COMING EVENTS.

Oct. 5.—London Telephonists Society. Presidential address by Mr. M. C. Pink, "The future development of the Telephone Service."
,, 7.—L.T.S. Swimming Association. Grand Water Gala, Great Smith Street Baths, Westminster, 7 p.m.
,, 29.—City Traffic District, Dance at Australia House. Tickets can be obtained from members of the staff at Bank, Central, City, or Trunk Exchanges.

CENTELS FOOTBALL CLUB FIXTURES

First Team.

Oct. 20.—London Electric (Home).
Nov. 3.—Cricklewood General (Away).
,, 10.—Brentford Thursday (Home).

Second Team.

Oct. 13.—Palace Rangers (Home).
,, 20.—Palace Rangers (Away).
,, 27.—Parsons Green (Home).
Nov. 3.—Holloway Athletic (Home).
,, 10.—Holloway Athletic (Away).

C.T.O. DIVISION, LEAGUE, AND CUP COMPETITION.

Oct. 4.—F. *v.* E.
,, 24.—T.S.F.A. *v.* T.S.F.B.
,, 25.—K. & I. *v.* A. & B.
,, 25.—H. & I. *v.* F.
Nov. 1.—A. & B. *v.* H. & I.
,, 8.—K. & L. *v.* F.
,, 8.—T.S.F.A. *v.* H. & I.

PERSONALIA.

LONDON TELEPHONE STAFF.

The following resignations took place on account of marriage:—

Miss B. M. ALTON, Assistant Supervisor, Class II, of Trunk Exchange.
Miss I. E. BILES, Assistant Supervisor, Class II, of Trunk Exchange.
Miss M. D. EDWARDS, Assistant Supervisor, Class II, of Park Exchange.
Miss L. G. BROWN, Assistant Supervisor, Class II, of Holborn Exchange.
Miss F. M. WEEKS, Assistant Supervisor, Class II, of Museum Exchange.
Miss C. K. A. WOOD, Assistant Supervisor, Class II, of Victoria Exchange.
Miss L. M. SCHOFIELD, (Tel. on Allce.), of Hammersmith Exchange.
Miss A. G. WINDALL, Telephonist, of Trunk Exchange.
Miss W. M. AVERILLO, Telephonist, of Trunk Exchange.
Miss M. BRANNIGAN, Telephonist, of Trunk Exchange.
Miss A. S. WRIGHT, Telephonist, of Park Exchange.
Miss B. R. POLLARD, Telephonist, of Holborn Exchange.
Miss A. E. BEARD, Telephonist, of Museum Exchange.
Miss E. L. ABBOTT, Telephonist, of Museum Exchange.
Miss O. G. GAIT, Telephonist, of Museum Exchange.
Miss D. DOWDY, Telephonist, of Museum Exchange.
Miss E. GIBBS, Telephonist, of Victoria Exchange.
Miss A. R. MOORE, Telephonist, of Victoria Exchange.
Miss M. M. LOFTS, Telephonist, of Victoria Exchange.
Miss E. M. GILES, Telephonist, of Victoria Exchange.
Miss N. LYNES, Telephonist, of Victoria Exchange.
Miss H. M. MITCHELL, Telephonist, of Avenue Exchange.
Miss A. BURNHAM, Telephonist, of Avenue Exchange.
Miss E. GITTINGS, Telephonist, of Avenue Exchange.
Miss L. WILLINGALE, Telephonist, of Avenue Exchange.
Miss E. E. L. DAY, Telephonist, of Finchley Exchange.
Miss C. HOCKADAY, Telephonist, of Paddington Exchange.
Miss E. M. HARPER, Telephonist, of Paddington Exchange.
Miss H. GOULD, Telephonist, of Paddington Exchange.
Miss D. E. TERRY, Telephonist, of Streatham Exchange.
Miss E. M. GRACE, Telephonist, of Streatham Exchange.
Miss B. L. ELLIOTT, Telephonist, of Chancery Exchange.
Miss A. L. SKELTON, Telephonist, of Wimbledon Exchange.
Miss I. F. RAWLINGS, Telephonist, of Central Exchange.
Miss G. O. WERNHAM, Telephonist, of Central Exchange.
Miss M. E. AUSTIN, Telephonist, of Gerrard Exchange.
Miss E. MCGINNESS, Telephonist, of Gerrard Exchange.
Miss E. A. MOORE, Telephonist, of Gerrard Exchange.
Miss M. R. ROBINSON, Telephonist, of Gerrard Exchange.

PROVINCIAL.

Plymouth is pleased to place on record the promotion of Miss E. E. WESTLAKE from Assistant Supervisor, Class II, to Assistant Supervisor, Class I.

Miss M. THOMAS, Telephonist, Devonport (Plymouth), resigned on July 30 for a life partnership with Mr. J. Richards, Telegraphist, Devonport. They were presented with stainless cutlery and a plated teapot by their respective colleagues.

Miss G. BERWICK, Telephonist, Plymouth (formerly Telephonist, Cambridge), was presented by her colleagues with stainless cutlery upon her resignation on Aug. 20.

Miss O. FOSTER, Telephonist, Plymouth, resigned on July 27, in view of her approaching marriage. She was presented by her associates with a handsome plated spirit kettle.

Miss F. E. KELLOW, Telephonist, Plymouth, who resigned for marriage on Sept. 9, was presented by her colleagues with a set of cutlery.

THE

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IMPERIAL TELEGRAPH COMMUNICATIONS.*

IF its system of transport—communication by road, rail, canal, sea and air—may be described as the circulatory system of the community of nations known as the British Empire, telegraphic communication may be described as its nervous system. Both are necessary for its very existence; and an efficient system of telegraph communication—speedy, reliable and cheap—is necessary for its intelligent and well-ordered development. Anyone who contributes towards the practical working of such a system, whether by devising and planning it, or by its actual administration and operation when it is already in existence, deserves well of the Commonwealth. He is an Imperialist in the true and worthy sense of the word.

The Empire system of telegraphs before the war was the admiration and envy of the world. Other powers—Germany, France, the United States—had set out to emulate it, but they were still far behind. It had its critics, and some of the defects they pointed out were real; but it stood the test of the Great War, and although that time of stress and testing left its marks upon it—marks which have not yet disappeared—it was and still remains a more efficient system of communication that any other, and one of which the Empire may well be proud.

The cable system of the Empire is mainly the result of private enterprise. British technicians and British capitalists were pioneers in the making and laying of cables; and it may safely be said that British makers of submarine cables still lead the world.

To give a very brief and imperfect historical résumé. The projectors of trans-oceanic telegraphy appear to have been the brothers Brett in 1845. Cyrus Field, an American, endeavoured to interest British enterprise in a trans-Atlantic project in the fifties, and thanks largely to his efforts a company was formed, a cable was made, and an attempt to lay it began in 1857. The cable broke 300 miles from the Irish coast, however, and the attempt was abandoned until the following year. After several attempts in 1858, the cable was actually laid, and communication was established for a few days, congratulatory messages passing between the Queen and the President of the United States; but signals grew faint and soon disappeared owing to defects in the manufacture of the cable. Another attempt was made in 1865, but again proved a failure, the cable being abandoned in the Atlantic; and it was not until 1866 that success was finally achieved. These early cables ran between Ireland and Newfoundland, and the heavy cost was borne by the Anglo-American Telegraph Company—a British Company. Altogether it owns four abandoned cables across the Atlantic, and five which are still working.

It is interesting to note that a good deal of apparently instructed scientific opinion maintained that cable communication across the Atlantic was impracticable. In particular, the famous Robert Stephenson said with reference to the 1858 project that failure was inevitable. Such prophecies may encourage those of us who believe in the practicability of projects which even contemporary experts consider impossible—though the achievements of recent years have made the pessimists somewhat chary of speaking too positively of the impracticability of anything.

The first attempt to lay cables to the East was made in 1859 down the Red Sea and along the coast of Arabia to Karachi. This attempt was made by a private Company under guarantees from the Government, but the cables worked for a few days only, and were afterwards abandoned. The attempt was not repeated until 1868-9, when seven companies were started which subsequently became merged into the Eastern and Associated Companies. They were the—

Anglo-Mediterranean,
Marseilles, Algiers and Malta,
Falmouth, Gibraltar and Malta,
British Indian Submarine,
British Indian Extension,
British Australian, and
China Submarine.

These were reconstituted as the Eastern and Eastern Extension Australasia and China Companies in 1872-3.

South Africa was connected in 1879 by means of cables down the east coast of Africa; and in the intervening years, and later, numerous cables were laid throughout the whole system in duplication of the original single lines

The West Indian Colonies were connected up in 1870.

The Pacific cable—the State-owned route between Canada and Australasia—was opened in 1902.

Without proceeding further with our historical retrospect, we may now consider the present position of cable communication throughout the Empire.

First, as regards the North Atlantic, there are 14 cables between the United Kingdom and North America, all of which land either in Newfoundland or Canada. Of these 8 are controlled by the Western Union Company and 5 by the Commercial Cable Company—both United States Companies. One of the 8 controlled by the former is the cable which formerly belonged to the so-called Direct United States Cable Company, a company which despite its name was a purely British concern. This cable, which runs from the south-west of Ireland to Newfoundland, thence to Halifax, and thence to Rye Beach in the United States, was bought by the Post Office last year, but has continued to be leased to the Western Union Company under an Agreement terminable at short notice. Three of these cables run from Cornwall. The remainder

* A paper read before the Telephone and Telegraph Society of London on Oct. 17, 1921, by Mr. F. J. Brown, C.B.E., Assistant Secretary for Telegraphs.

start from the south-west of Ireland, with connexions to London by means of short cables to Cornwall or Weston-super-Mare—alternatively by Government landlines. Their termini in Newfoundland or Canada are connected by cables or landlines with New York. The bulk of the traffic which they carry—probably five-sixths at least—is to and from the United States, but they are of course all available for communication with Canada, and through Canada with Australasia by means of the Pacific Cable.

So far, I have described 13 cables only. The remaining one is the Imperial Cable, which runs from Penzance to Fayal in the Azores, and thence to Halifax, Nova Scotia. To this we will return later.

From Halifax a cable runs to Bermuda and thence to Jamaica; and Jamaica is connected with the principal British West Indian islands and British Guiana, *via* the United States islands of Porto Rico, St. Thomas and St. Croix. These West Indian cables are old. They are said to have been badly laid in the first instance, and they are very frequently interrupted. The West Indian cables beyond Jamaica are, indeed, the weakest spot in our Imperial communications, and are giving much concern to the Imperial Communications Committee—the Advisory Committee on telegraph communications which was established some 2½ years ago under the presidency of the Secretary of State for the Colonies, with representatives from the principal Departments of the State concerned in telegraph communications—Colonial Office, Foreign Office, India Office, Board of Trade, Treasury, War Office, Admiralty, Air Ministry, and—last but not least in this connexion—the Post Office. The present proposal is that a new cable should be laid from Bermuda to Barbados, Trinidad and British Guiana, if this can be done for a moderate subsidy; or failing this that communication between these points should be established by wireless telegraphy.

From Halifax, connecting with the Imperial Cable, also runs a landline, *via* Montreal, which connects with the Pacific cable at Bamfield, Vancouver. It is owned and maintained by the Canadian Pacific Railway along which it runs, but is leased and worked by the Pacific Cable Board.

The Pacific cable runs from Bamfield by a long stretch of nearly 3,500 miles—the longest stretch of cable in the world—to the lonely little island of Fanning, thence to Suva in the Fiji Islands, thence to Norfolk Island, where it bifurcates, one branch going to Auckland in New Zealand, and the other to Southport in Queensland. A cable owned by the Pacific Cable Board also connects Auckland with Sydney, so that there are two routes from Norfolk Island to Australia, one direct and the other *via* New Zealand.

To turn now to the Eastern and Associated Companies' cables. Five cables run from Porthcurno in Cornwall directly or indirectly to Gibraltar, whence they are continued by four cables to Malta, and thence again by five cables to Alexandria. There are numerous landlines across Egypt from Alexandria to Suez, whence four cables run to Aden. These lines from Porthcurno to Aden are the backbone of the system, and a strong backbone it is. At Aden the cables bifurcate, one route going eastward to Bombay or Colombo, and the other southward to Zanzibar. The eastward group is continued, partly by Government land-lines across India to Madras, and partly by cables, as far as Singapore, where the route again bifurcates, one line going to Hong Kong to serve China and Japan, and the other going southward to serve Australia and New Zealand, incidentally serving the Dutch East Indies on its way. This was originally the Companies' only route to Australasia; but some twenty years ago they laid an important new line of cables from Porthcurno *via* Madeira, St. Vincent, Ascension and St. Helena to the Cape, and thence *via* Mauritius, Rodriguez and Cocos to Western Australia, linking up by a cable from Cocos to the Dutch East Indies with the other route. This is now the Company's main route to South Africa and Australasia.

The Cable Companies afford an instance of a controlled undertaking. The British Government has no legal monopoly of telegraph communication with other countries, in the same way that it has a monopoly of internal telegraphy. But the foreshore belongs to the Crown, and before a cable can be landed the consent of the Government must be obtained. This necessity affords the Government an opportunity of imposing such conditions as it pleases upon the undertaking. The traditional policy of Great Britain has been free trade in cables, and the conditions which it has imposed have always been light. For some years past, however, the Government has been inclined to favour comparatively short licences, in order to give it an opportunity of reviewing the conditions at fairly frequent intervals. The usual conditions imposed in recent years include half rates for Government telegrams; a most favoured national clause, which ensures that the British public shall enjoy rates at least as favourable as those in force elsewhere; general observance of the conditions of the International Telegraph Convention, except in the case of Atlantic Companies, where this condition has not yet been imposed owing to the United States and Canada not being members of the International Telegraph Union; and latterly a clause providing for control of the licensee's rates of charge through the medium of the Railway and Canal Commission. This clause has never yet been put into operation, because there has not yet been any serious difference between the Government and the Cable Companies as to the reasonableness of their charges. But it might conceivably be of value if the Companies should ever forget their public duties in this respect.

Talking of charges, it may be interesting to give particulars of some of the earlier charges as compared with those now in force.

To the Eastern Provinces and States of North America, the minimum rate was originally £10 for 20 words. In 1872, the rate was 4*s.* a word. In the eighties, when the Commercial Cable Company first entered the field, and began to compete *à outrance* with the existing Companies the rate was reduced to 6*d.* for some 18 months; but this rate was found to be unremunerative, and the group of Companies combined to make the rate 1*s.*, at which figure it has remained ever since.

The following are some specimens of the rates of the Eastern and Associated Companies:—

To Egypt	1870	...	30*s.*	0*d.* for 20 words
	1873	...	20*s.*	0*d.* for 10 words.
	1876	...	1*s.*	7*d.* per word.
	now	...	1*s.*	0*d.* „ „
„ India	1870	...	40*s.*	0*d.* for 10 words.
	1876	...	3*s.*	9*d.* per word.
	1903	...	2*s.*	6*d.* „ „
	1905	...	2*s.*	0*d.* „ „
	now	...	1*s.*	8*d.* „ „
„ Cape	1879	...	9*s.*	3*d.* „ „
	1895	...	5*s.*	0*d.* „ „
	1899	...	4*s.*	0*d.* „ „
	1902	...	3*s.*	0*d.* „ „
	1903	...	2*s.*	6*d.* „ „
	now	...	2*s.*	0*d.* „ „
„ Singapore ...	1871	...	100*s.*	0*d.* for 20 words.
	1876	...	6*s.*	3*d.* per word.
	1897	...	4*s.*	6*d.* „ „
	1902	...	3*s.*	6*d.* „ „
	now	...	2*s.*	10*d.* „ „
„ Australia (N.S.W.)	1872	...	191*s.*	0*d.* for 20 words.
	1876	...	10*s.*	8*d.* per word.
	1886	...	9*s.*	6*d.* „ „
	1891	...	4*s.*	2*d.* „ „
	1901	...	3*s.*	6*d.* „ „
	now	...	3*s.*	0*d.* „ „

The system of deferred telegrams at half-rates was introduced generally in 1912—the theory being that time which would otherwise be unoccupied on the cables during the less busy hours could thus be filled up. The Atlantic Companies went one better, and charged 3/8ths (4½*d.*) instead of half the ordinary rate for such messages, although they have recently increased the charge to one-half. The system has been an unqualified success from the point of view of the public, and the Companies have had no reason to comp lain, because, although they carry a large traffic at deferred rates, their full rate service still remains large. In 1913 the week-end service at quarter-rates, with a minimum usually of 20 words, was introduced, the object being to fill up the spare capacity of the cables during the week-end. It was discontinued during the war, except in the form of soldiers' messages, and has not yet been re-introduced save on the Imperial and Pacific route to Australasia. The fact is that, broadly speaking, the long-distance cables are now too congested to warrant the resumption of the week-end service, as the week-end hours are largely required for working off accumulations of deferred traffic. On the Pacific route the amount of week-end traffic is quite large. From Australia it amounts to nearly as much as all the rest of the traffic put together. In the opposite direction, curiously, the proportion is much smaller. Clearly the week-end service on this route fills a public want. Whether it is altogether satisfactory from the point of view of cable finance is another question.

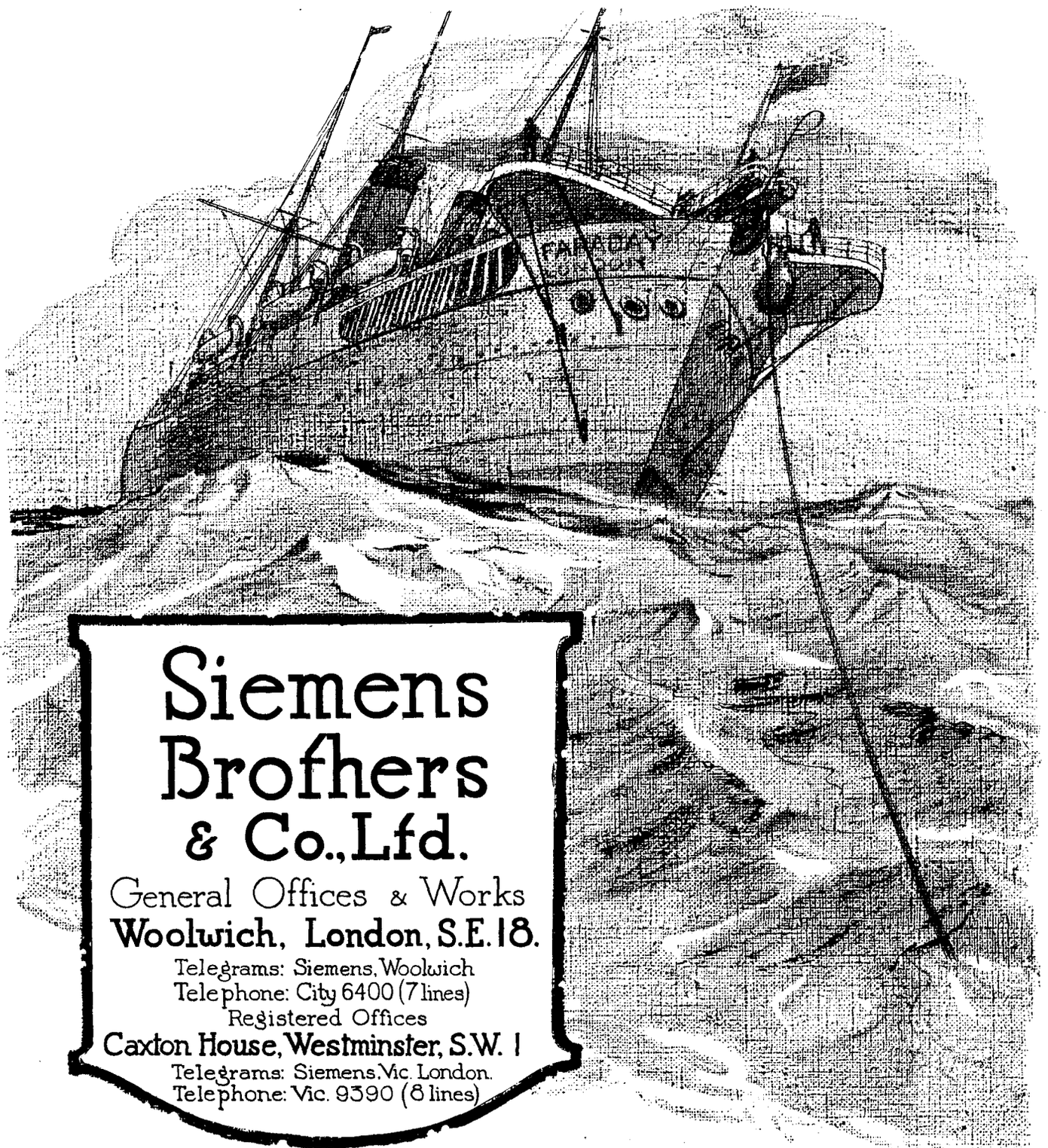
To encourage the transmission of news between the various parts of the Empire, low press rates have been introduced—though these are not quite low enough to satisfy the demands of the Press. The following are examples:

Between the United Kingdom and Canada	3½*d.*
„ „ „ „ Egypt	3½*d.*
„ „ „ „ India	4*d.*
„ „ „ „ Cape	3½*d.*
„ „ „ „ Australasia ...	7½*d.*
„ Canada and Australasia	5*d.*
„ the Cape and Australasia	3*d.*

On the Imperial and Pacific routes a "deferred" press rate is in operation of 2½*d.* a word between the United Kingdom and Canada, 4½*d.* between the United Kingdom and Australasia, and 2½*d.* between Canada and Australasia.

The traffic generally increased enormously during the war, and became still larger immediately after the war, when it amounted to about two-and-a-half times as much as just before the war. No wonder, therefore, that heavy delays were experienced, especially as the Indo-European Company's landline route to India through Germany, Russia and Persia was out of action, as well as the Great Northern Company's route to the Far East *via* Russia and Siberia—with the result that all traffic to and from the East was thrown on the Eastern Company's cables. The traffic has now somewhat decreased, as every expert thought it would, and with the opening of additional cables the state of things has much improved, though delays are still greater than one could desire. To remedy this, the Companies are contemplating the provision of a new line of cables from England to Singapore, at a cost of more than £3,000,000—a good indication that in their opinion cables are by no means played out.

I promised to refer in greater detail to the Imperial Cable, and this seems a suitable point at which to redeem the promise. I start by saying that when war broke out the Germans were in possession of an important system of cables in the Atlantic and Pacific Oceans. The former system only concerns us at the moment. Apart from two comparatively short cables between Emden and Brest and Vigo, they owned two cables which ran from Emden



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Contractors for the Manufacture, Laying & Repairing of Submarine Telegraph and Telephone Cables

to the Azores and thence to New York, thus affording direct communication between Germany and the United States—each roughly 4,000 miles long, and each having cost roughly £1,000,000. They also owned a cable which ran from Emden to Teneriffe, thence to Monrovia, and thence to Pernambuco, with a branch from Monrovia to the German Possessions of Togoland and the Cameroons. The main line gave them a direct route to South America. All these cables were cut near the Straits of Dover immediately on the outbreak of war. Some sections in the Channel were used quite early in the war for the purpose of providing additional lines to France, etc., but the main sections remained unused for some time. In 1916, the suggestion was made that they might be diverted at this end to Allied soil, and used for providing communication between the Allies and North and South America. At that time the United States were still neutral; and it was considered that if an attempt was made to work the North Atlantic cables to New York, neutrality might be infringed. As an alternative, therefore, it was decided to divert one of them to Halifax, and the other to the French island of St. Pierre, near Newfoundland, which was already connected by cable with New York. The *Colonia*, the largest British cable ship, which is owned by the Telegraph Construction and Maintenance Company, started on her mission late in 1916; but was held up for some time by fear of submarines and raiders, and it was not until early in 1917 that she reached the scene of operations, picked up one of the German cables at a depth of over 2,000 fathoms—over 2 miles—S.S.E. of Halifax, joined on to it a new section which she carried, and then proceeded to lay the new section to Halifax. When this work was finished, a further difficulty manifested itself. The tests showed that a fault existed in mid-ocean at a still greater depth. In such cases it had hitherto been the rule to locate the position of the fault from each end of the cable, but this was not possible in the present instance, as the cable had been cut some time before near the Azores and had not yet been joined up again. It was therefore decided to rely on the indications given by the test from Halifax alone, and it speaks volumes for the skill of the experts concerned that the ship was able to find the place where the fault existed without serious difficulty. To repair the fault, however, was another matter, and took much time, and it was not until July 17, 1917, that the working of the cable began. It was worked direct between London and Halifax, with relays at Penzance and Fayal. Those of us who were concerned with the work will never forget the early days of the service, for it was a novel event in Post Office history, and in certain respects even epoch making. Little was made known at the time, but the cable for several months rendered most useful service, carrying large quantities of Government and other traffic between England and Canada and Australasia—with those terrible casualty messages each several thousand words in length, which the operators never handled without grief and never without pride.

By the time that the Halifax cable was put into operation, America had entered the war, and the other North Atlantic cable was therefore not diverted from New York.

About the end of 1917 the cable became interrupted through some cause, probably quite natural, which was never precisely ascertained. Owing to the submarine peril, it could not be repaired until after the Armistice; but from the time of its repair, with one short interruption, it has continued to work with the greatest regularity and efficiency. It is regularly carrying a load of from 220,000 to 240,000 words a week, or about 11,000,000 words a year, to and from Canada, the West Indies, New Zealand and Australia, and is making a satisfactory profit. It carries a few messages to the United States. But that is not its primary purpose. As its name implies it is an Imperial cable, intended to strengthen the links which bind the Mother Country with the great Dominions Overseas, and we have not thought it desirable that such a cable should be used seriously to compete with the great United States Companies for traffic to and from the States. Nevertheless, the United States public do not suffer in their service with Europe generally owing to this feature of the Imperial Cable service, because the traffic with Canada and Australasia which it carries would otherwise have to go by the American Companies' cables, to the detriment of United States traffic.

As every one knows, the German cables were ceded by the Treaty of Versailles to the five Principal Allied and Associated Powers—Great Britain, the United States, France, Italy and Japan. Their precise allocation among these Powers was not settled at the time; and this allocation was one of the principal items on the Agenda of a Conference which was held at Washington last autumn, and at which I had the honour to be the senior British delegate. The United States delegates were inclined to agree that the ownership of the Halifax cable should be ours, more especially as they recognised that we were not getting more than our fair share of the cables. But they were also inclined to complain that by the present use of the cable they were deprived of the direct service with Germany which they formerly emjoyed. In order to meet their views we agreed provisionally to exchange the cable for an equally good one touching only on British territory, if such an exchange could be effected without cost to Great Britain, and there the matter remains for the present; for although the United States agreed provisionally to this arrangement they refused to make it definitive until the general question of the remaining cables, in which we are not directly concerned, has been settled. This question could not be settled while we were at Washington, and is still not entirely settled.

At all events, the Imperial cable, whether the ex-German cable *via* the Azores, or an equally good cable touching only on British territory, has come to stay. And as already explained we have provided a duplicate by purchasing the Direct United States Company's cable, which—although leased for the moment to the Western Union Company—can be taken over immediately if the Imperial Cable is interrupted, or if the traffic becomes too great for it.

My remarks to-night would be incomplete without a reference to Imperial Wireless Telegraphy. The Imperial Wireless scheme has had an unfortunate history—not because of any misdeeds on the part of the Post Office, but mainly because of the outbreak of war, and the consequent dislocation of the plans of the Government of the day. Without going into past history, I will attempt to describe the present position. The Post Office has just completed the station at Leafield, near Oxford, which was begun before the war, and which is designed for communication with a station near Cairo. The Cairo Station will be completed about the end of the year. Under the scheme of the Imperial Wireless Telegraphy Committee which reported in the summer of 1920, and whose report has been approved by the Government, these two stations will form the first link of a chain to East Africa and South Africa. A further pair of stations will be erected in England and Egypt, which will form the first link in a corresponding chain to India, Singapore and Hong Kong; and which, as we hope, will also be continued from Singapore to Australia and New Zealand. There will also be a further link between England and Canada. It was the view of the Committee to which I have referred—commonly called the Norman Committee, because it was presided over by Sir Henry Norman—that communication by comparatively short links of from 2,000 to 2,500 miles was preferable on all grounds, and especially on the grounds of reliability and cheapness, to communication by longer steps. It is mainly on this account that the report of the Committee has been criticised. The Prime Minister of Australia would have preferred more direct communication between Australia and England; and Mr. Robert Donald has been the chief representative here of the so-called "one-step" scheme to India, and the two-step scheme to Australia through a single intermediate station. I confess that I entered the Committee prejudiced in favour of the longer steps. But none of my colleagues favoured the idea, and the experts brought very strong arguments against it. The experts who are now planning the stations, in accordance with the recommendations of the Committee, have reconsidered the question, but are still in favour of the short step scheme, although they consider that with the short step scheme direct communication will be possible during an average of two hours daily between England and Australia, and communication by means of a single intermediate station for a much longer time. I find too that the best experts everywhere regard the Committee's recommendations as thoroughly sound, and I therefore acquiesce in and support them.

The only other point on which the Committee have been criticised is their proposal for Government ownership and working of the scheme. The success of private enterprise in the case of cables is pointed to, and it is said that private enterprise could provide the wireless chain more quickly and more efficiently than the Government. But, however this may be, the Government have decided that there are conclusive objections to handing over the scheme to private enterprise. The principal of these objections is that wireless telegraphy is in the nature of things monopolistic in character. The number of wave-lengths suitable for long-distance communication is very limited, and the wireless chain could not be duplicated in the present state of knowledge without the gravest risks of interference—such interference indeed as would probably render the working of the stations impossible. Hence we must contemplate limiting ourselves for the present to one set of stations only, serving the various parts of the Empire; and if there is to be one set of stations only—in other words a monopoly—it cannot be allowed to be a monopoly in the hands of a private company—it must be a monopoly in the hands of the State. These considerations obviously do not apply to cable communication, which is not by its nature a monopoly, seeing that cables do not interfere physically with one another.

The Norman Committee was careful to point out that no existing long-distance wireless service is entirely satisfactory from a commercial point of view. Owing to difficulties of reception arising from atmospheric disturbances, etc., the rate of working is slow compared to that of cables. In a recent answer given in the House of Commons, the Postmaster-General stated that —*e.g.*, the Bordeaux station in France and the Nauen station in Germany both of them communicating with the United States—is not more than some 14,000 words a day, or say 100,000 words a week, as compared with the load of from 220,000 to 240,000 words which is carried by the Imperial cable—and that cable is by no means filled to its full capacity. The experts who are now planning the Imperial stations are hoping to produce much more efficient stations than any which now exist, and this is necessary if wireless telegraphy is to compete successfully with cables, or at all events to carry traffic at materially lower rates. The capital cost of a pair of long-distance wireless stations is, or should be, considerably less than a corresponding cable; but the rate of depreciation, and the engineering cost of working are greater; and it has still to be proved that on the whole the annual expenses are very much less in the one case than in the other. Hence, if the possible load is also materially less, the supposed advantages of wireless in point of costs disappear.

But a wireless chain throughout the Empire we must have, if only for strategic reasons, and if only because other great Powers are rapidly building similar chains. And if we are to have a wireless chain at all, it is obviously for every one's interest that it should be a commercial success. This is what the experts who are designing the stations are aiming at. And I am able to assure you that as soon as their plans are complete—and I hope that will be next month—the scheme will be pressed forward by the Postmaster-General with the utmost speed, with the object of providing the Empire with a system of wireless communication, which, like its cable system, shall be the best in the world.

ACCURACY OF REGISTRATION.

ANSWERS TO SOME QUESTIONS RAISED BY SUBSCRIBERS.

(1) "*How are our calls registered?*"

"*What is the telephonist supposed to do?*"

The telephonist's instructions are these:—

(*a*) Calls within the unit fee area:—Depress "effective" register key once at the end of the call.

(*b*) Calls beyond the unit fee area:—Prepare ticket bearing calling subscriber's number and particulars of distant exchange; place cap over "effective" register key so that it cannot be depressed; and mark ticket "effective" when communication with distant subscriber has been established.

(*c*) "No charge" call:—Place cap over "effective" register key so that it cannot be depressed, directly it is known that the call is free of charge.

(*d*) Double lamp-clearing signal:—When both supervisory lamps (actuated by the subscribers' hanging up their receivers) glow at the end of a call, depress "effective" register key once (for unit fee call) see that ticket is marked "effective" (for call beyond unit fee area).

(*e*) Single lamp-clearing signal:—When only one supervisory lamp glows at the end of a call, enter circuit after waiting about ten seconds and say, "Have you finished?" If there is no answer repeat the expression, "Have you finished?" If neither subscriber replies, treat call as effective and disconnect.

(2) "*If a telephonist charges for a call which is ineffective, how could she correct the error?*"

If it comes to a telephonist's knowledge that a call she has registered as effective was in fact ineffective, her instructions are to act as follows:—

(*a*) Give the subscriber a free call of similar value if he is ready to take up such a call when the error is discovered.

If he is not ready to take up such a call:

(*b*) Cancel the charge either by preparing a "credit ticket" (for unit fee calls) or by the cancellation of the original ticket which has been wrongly marked as "effective" (in the case of calls beyond the unit fee area).

Credit tickets are assembled and their value is credited in the subscriber's fee account.

(3) "*But your register keys are operated by telephonists, and even the best telephonists make mistakes. What safeguards does your system provide against accidental overcharge?*"

The safeguards are these:—

(*a*) The universal rule, known to the youngest telephonist leaving the operating school, that no charge is to be made for a call known to be ineffective.

(*b*) The positive indication of the completion of conversation given by the glowing of the "supervisory lamps."

(*c*) The special procedure laid down for "delayed answer," "no reply," calls in which efforts to gain attention extending over 90 seconds and including complete change of connexions are made before the call is abandoned.

(*d*) The co-operation of the subscriber. When a call fails through difficulties disclosed after connexion with the distant number has been established, *e.g.*, cut off, wrong number, &c., the subscriber, by moving his receiver rest, can flash the telephonist into circuit and advise her of the difficulty, enabling her to give a fresh call free of charge.

(*e*) The system of "credit calls" referred to in Section 2.

(4) "*What is to prevent a telephonist deliberately overcharging a subscriber?*"

(*a*) The character of the staff, whose standards and traditions of service are as high as those of any body of workers in the Kingdom. This must always be the chief safeguard in any system operated by human agency.

(*b*) A pilot lamp glows on the switchboard face, and in full view of the supervisors and the telephonist's colleagues every time she depresses a register key. Charge tickets are also regularly checked.

(*c*) There is continuous supervision of the telephonists at the switchboard throughout all the hours of the day.

(*d*) The work of the telephonists is continually under observations at the Central Observation Office without the knowledge of the telephonists themselves. No telephonist, therefore, knows whether at a given moment her work is under observation.

(*e*) In addition to (*d*), similar service observations are frequently taken in the exchange in order that the local controlling officers may be aware of the points in regards to which improvement is needed.

(5) "*You require a subscriber to accept the Department's record as evidence of calls made. Since registration is effected by human agency, how can you claim infallibility?*"

Infallibility is not claimed. All telephone administration throughout the world, whether National, Municipal or private Companies, require acceptance of their records as one of the conditions of service. The reason for this is that there is no practical alternative.

(6) "*Then, if you do not claim infallibility, what reason is there for supposing that your record is more correct than a subscriber's?*"

The reasons are these:—

(*a*) The telephonist is carefully selected from a very large number of candidates for her possibilities in regard to accurate and speedy telephone work. Before appointment she has to pass educational and medical tests of fitness, undergoes a thorough course of training in an operating school before taking duty in an exchange, and steps are taken to ensure that she thoroughly understands the whole system of recording calls before she is put in charge of subscribers' circuits. For some time after entering the exchange, she is under special supervision, and her work is under close observation. In the case of a subscriber—except those large private branch exchange subscribers whose telephone work is entrusted to trained telephonists—the work of passing and receiving calls is frequently entrusted to persons others than the subscriber himself:—clerks, servants, &c., &c.—whose sense of responsibility, experience and sometimes reliability must in ordinary course be inferior to that of the specially-trained telephonist. Generally, therefore, in the case of disputed charges, it is a question between a specially chosen and trained expert, and a relatively inexperienced employee or servant of the subscriber.

(*b*) To each individual telephonist, the operation of recording, and where necessary of crediting, is one of the routine items incidental to the operation of every call. To the subscriber, the keeping of a complete record of calls is an additional operation, the necessity for which would only be fully apparent to the subscriber himself, and not to others who might be in a position to use his telephone. Not infrequently a subscriber's telephone may be used by individuals who would not desire their use of it to be known.

(*c*) Since acceptance of official records is a condition of service, it is the responsibility of the telephone administration to take all possible steps to ensure the accuracy of its records. It is not in strictness the responsibility of the subscriber; and though he personally may endeavour to take such steps in his own interests, it is frequently impossible for him to convey to all who may have access to his telephone anything approximating to his own sense of responsibility. This difficulty is likely to be felt particularly in the case of those London subscribers formerly on the Unlimited Service Rate, in the case of which it was formerly unnecessary from the subscriber's point of view to keep a record of calls.

(7) "*Why not take a brief written record of every call instead of a merely numerical record by the depression of a key? A subscriber would then be able to identify calls with which he is charged.*"

The taking of a written record of calls in this way would occupy very much more time than the depression of a register key. If a written record were taken of all calls, the number of calls which could be handled by a telephonist in a given time would be greatly reduced, and operating staff, Exchange equipment, and supervision costs would be greatly increased, necessitating further tariff increase if the system is to be operated on business lines. It must be remembered that the addition of even a few seconds to the operating time per call is a serious item in the aggregate, since during the year some 260 million effective calls are handled in London. Moreover, the fact that a call to a particular number is recorded against a subscriber would not necessarily convince him that it had been made from his telephone, with the result that questions as to the accuracy of charges would not be appreciably reduced.

Further, the system of recording calls in use in London has been investigated from time to time by representative business men; and has been approved by a committee of telephonist users in New York, and by a committee of the London Chamber of Commerce.

(8) "*Why not introduce an automatic register?*"

Because no automatic register has yet been devised which can distinguish between effective and ineffective calls. A register which recorded both effective and ineffective calls indiscriminately would be useless both from the point of view of the subscriber and of the Administration.

(9) "*Does not registration at the exchange of what were formerly unlimited rate calls, add greatly to operating expense?*"

No! For Administrative reasons and to maintain a high standard of accuracy, unlimited rate calls have always been registered at the Exchange. This practice made possible the simple and easily remembered operating rule that every effective call has to be registered.

(10) "*Is a subscriber, then, ever justified in challenging the accuracy of the account presented to him?*

Yes! Occasionally errors will occur in every business organisation; sometimes mistakes in reading the registers or in transferring the readings to the subscriber's account may arise; and a subscriber who keeps a careful record of calls made and is able to ensure that others using his telephone follow the same practice should call attention to any *large* discrepancy. The Department is always glad to investigate such cases.

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

Continued from page 4.

Reception of C.W.

So far we have dealt with the reception of spark signals. For receiving the signals emitted from a station using continuous waves rectifying detectors as used for spark signals are not suitable, as already explained. For this purpose it is necessary to impress on the receiving apparatus a continuous oscillation of slightly different frequency from that of the oscillations to be detected. These two series of oscillations will then inter-act to produce "beats," as shown in Fig. 7. This figure was supposed to represent a sectional view of two trains of waves differing slightly in wavelength. By considering, however, the horizontal lines to represent a scale of time, and the distance of the curves above or below these lines at any point to represent the strength of the current in one direction or the other at the particular instant corresponding to that point, exactly the same figure can be used to represent the currents flowing in a circuit in which two oscillations of slightly different frequencies are simultaneously set up.

The frequency of the beats will be equal to the difference between the frequencies of the separate oscillations. By suitable adjustment the frequency of the local oscillation impressed on the receiving apparatus can be made to differ by any desired amount from the frequency of the oscillations set up by the incoming signals. The frequency of the beats can thus be varied at will.

The oscillations of first increasing and then of decreasing amplitude which make up each beat are rectified, and the resulting pulse of direct current is passed through the telephones. A note corresponding to the beat frequency is thus produced.

The apparatus for the reception of spark signals using high-frequency amplification, as shown in Fig. 14, can with suitable adjustments be used also for the reception of continuous wave signals.

In connexion with the description of that apparatus it was explained that, with the proper conditions, continuous oscillations would be set up in the oscillatory circuits of the receiving apparatus. Suppose this state of affairs to have been brought about. The continuous oscillations in the circuit S_2C_2 will produce an alternating voltage of uniform amplitude across the plates of the condenser S_2, and owing to the rectifying effect of the crystal detector D a steady current will flow through the telephones.

Suppose now that continuous wave signals are received, of a frequency differing slightly from that of the oscillations already set up in C_2S_2. The signals will set up oscillations of their own frequency in the aerial, and these oscillations will be repeated across the transformers into the intermediate and final oscillatory circuits. It must be remembered that, although these circuits are tuned to the frequency of the locally generated oscillations, the frequency of the incoming signals will differ very little from that of the local oscillations and so the circuits will respond also to the signal oscillations.

The locally generated oscillations and the signal oscillations will therefore be impressed simultaneously on the circuit S_2C_2. Beats will be produced, the amplitude of the alternations of voltage across the plates of the condenser C_2 will rise and fall, and the current through the detector and telephones will pulsate in a similar manner. Thus a musical note will be produced, of a pitch corresponding to the frequency of the beats.

It is, however, possible to dispense with the use of a separate rectifying detector for receiving continuous wave signals. One method by which this can be done is shown in Fig. 18.

The valve filament is heated by the battery B_1, the current from which is controlled by the adjustable resistance R. The negative terminal of the high tension battery, B_2, is joined to the filament, while its positive terminal is joined, through the telephones, T, and the coil S_1, to the anode of the valve. The adjustable condenser C_1 is joined across the coil S_1 and forms with it an oscillatory circuit. The condenser C_2 is joined across the battery B_2 and the telephones.

The coil S_1 is one winding of a triple transformer, the other windings of which are P_1 and G. P_1 is joined in series with the aerial, the usual aerial tuning condenser C, and aerial tuning inductance L, being inserted. G has one end joined through the condenser C3 to the grid of the valve, while the other end is joined to the negative terminal of the battery B_1. The condenser C_3 is shunted by the high resistance R_3, the "grid leak."

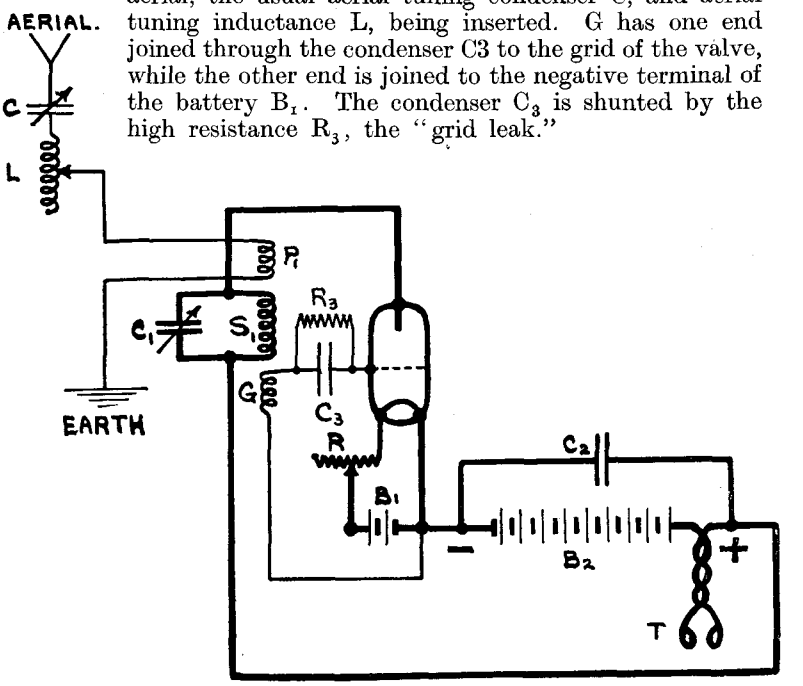


FIG. 18.

With this arrangement properly adjusted oscillations will be set up in the circuit C_1S_1.

Each swing of the alternating currents in S_1 sets up a voltage pulse in the coil G, which is impressed on the grid, and causes a corresponding change in the anode current, which flows through the coil S_1. These changes of current set up electro-motive forces in S_1, as already explained in connexion with the high-frequency amplifier, Fig. 14. The connexions are so arranged that the electro-motive forces in S_1 occur at just the right intervals to assist the oscillations already set up in the circuit C_1S_1. These oscillations consequently increase in magnitude till the resistance losses in the various parts of the circuit just balance the energy gains from the high-tension battery. When this state of affairs is reached the amplitude of the oscillations remains constant. The condenser C_2 provides an easy path for these oscillations across the battery B_2 and the telephones.

The oscillations will cause a negative charge to accumulate on the right-hand plate of the condenser C_3, as explained in connexion with grid rectification, and the mean value of the anode current will be reduced. Since the oscillations are steady, however, this reduced mean value will remain constant, and consequently no sound will be heard in the telephones.

Suppose now that continuous wave signals are received. The aerial circuit will be set into oscillation, and these oscillations will be impressed on the circuit C_1S_1 in which the locally generated oscillations are already occurring. If the natural frequency of this latter circuit, which determines the frequency of the local oscillations, be suitably adjusted the two series of oscillations will inter-act and produce beats. The amplitude of the alternating current which actually flows in the circuit C_1S_1 will vary similarly to the curve (*c*) in Fig. 7. The beats of alternating voltage set up in the coil G by the current alternations in S_1 are impressed on the grid, are rectified there and cause corresponding current pulsations in the anode circuit. Since the current in this circuit flows through the telephones a musical note, of the frequency of the beats, will therefore be heard.

(*To be continued.*)

THE BAUDOT—XXVI.

BY J. J. T.

Continued from page 3.

IN the last article we dealt with the orientation, or phasing as we may call it, of the *corrected* station. The *point of repere* having been fixed at the corrected end of the line it is now time to examine the position of affairs at the *correcting* station B (Figs. LXIX and LXX) which we recall sends *out* the correcting currents to the *corrected.* station A in order to actuate the synchronising coils CM. In the case of a *correcting* station the marking currents sent out by its *corrected* station should be received by the former exactly at the moment when the brushes pass over the segments connected to the respective electro-magnets of the receivers. Let the *corrected* station A (Fig. LXX) send out a marking current from any segment connected to one of its transmitting keys, D for example. This current after traversing the usual path from Ring 2 would pass out to line and should be received at B, while the distributor brush was passing over the corresponding receiving segment D^1 of Ring 2 at this station. Presume that this particular current is destined to actuate electro-magnet E^3, then the brushes at B should necessarily pass over S^3 of Ring 1 (the local ring) at exactly the same moment when those of Ring 2 at B are passing over segment D^1 (Fig. LXX).

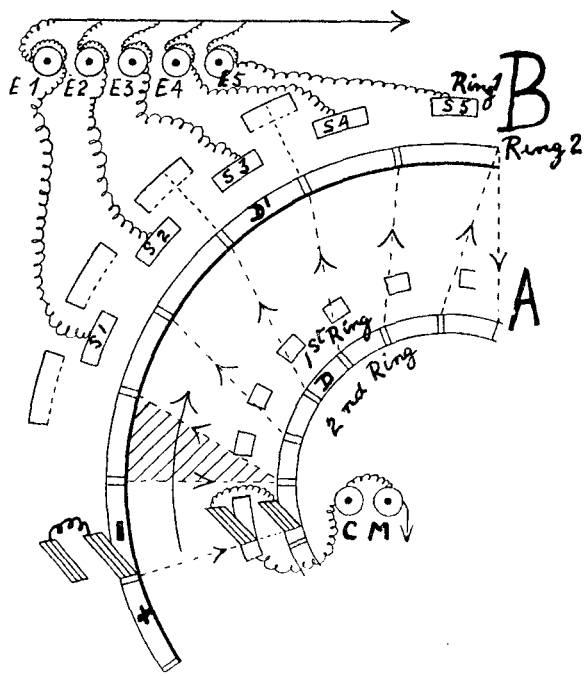


FIG. LXX.

Suppose, however, that the brush of Ring 2 were to pass over D^1 while the brush of Ring 1 was passing over S^2 then the electro-magnet E^2 would be actuated, *i.e.*, the "second" would be received instead of the "third" or to put it in another fashion, B would be receiving "in advance." If the reverse were to take place and the brush of Ring 2 were to pass over D^1 while that of Ring 1 was passing over S^4 then E^4 would be actuated and B would receive the "fourth" instead of the "third" or B's reception would be retarded. These effects could be remedied by moving the complete sector of Ring 1 of the distributor backward against the direction of the brushes in the first instance and forward in the same direction as the movement of the brushes in the last example. In the case of a double-plate Baudot, the entire receiving plate would be similarly moved until the middle position between the extremes was discovered. We will suppose that this position has been found, in which case B should continue to receive correctly.

Now it should be recognised that a *corrected* station is always in the more favourable position for receiving correctly than a *correcting* station.

It is, however, not quite so obvious that the position of the *repere* point of the *corrected* distributor has a deciding influence upon and is a governing factor in the reception of signals at the *correcting* end of a Baudot circuit. In this connexion students may need to be reminded of what actually takes place when the correcting pin is thrown out between the star-wheel of the correcting

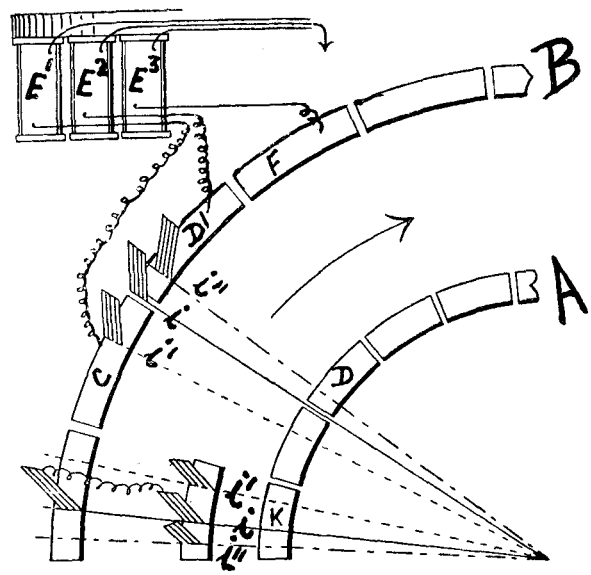


FIG. LXXI.

system of a Baudot distributor and the effect upon the rotating brushes of the epicyclic movement thereby set in motion (see Art. V, Vol. VI, No. 59, "we set the hands back," &c., &c.). With this refreshment of the memory the following paragraphs concerning the possible causes of a variation in the orientation of the *correcting* station should prove easier of comprehension. Suppose (Fig. LXXI) that the point of *repere* of the station A has been fixed at *i* on K and that A transmits a marking current from the segment D intended to actuate electro-magnet E^2 *via* segment D^1 at station B. If now by some means the *repere* point becomes shifted to i^1 on K, the angular distance between the *repere* point and D will no longer be the same, because the segment D will be nearer to the new *repere* point *i*. That is to say, station A transmits the marking current in question sooner than should be the case, since the segment D makes contact with the rotating brush sooner after the action of the correcting currents (*vide* Art. XXV).

Station B will therefore receive the marking current sent out from D somewhat earlier, receiving the same say at i^1 on C. The local current will consequently also act earlier and instead of actuating electro-magnet E^2 will energise electro-magnet E^1, the currents following being corresponding advanced in their arrival until the *repere* point is re-adjusted. If then the latter be shifted, let us say to i^{11} on K, this will mean that the angular distance between the original point *i* and D has by so much INCREASED and the current from D will be sent out later, reaching B at say i^{11} on D^1, even a portion being received on F, so that electro-magnet E^3 will be actuated as well as or instead of the intended E^2.

Figs. LXX and LXXI it should be noted are diagrammatic and do not of course represent actual connections.

(*To be continued.*)

CALENDAR OF COMING EVENTS.

Nov. 4. Society of Civil Servants. "Civil Service and Foreign Policy." Lord Eustace Percy, M.P.

„ 18. Society of Civil Servants. "Regionalism in Relation to Administrative Problems." Mr. G. D. H. Cole, Hon. Sec., Labour Research Department.

„ 21. Telegraph and Telephone Society. "Possibilities of Post Office Development." Mr. A. C. Winyard (U.P.W.).

Dec. 2. Society of Civil Servants. "London Government." Mr. Montagu H. Cox, LL.B.

RETIREMENT OF MR. STUBBS.

WE regret the delay in recording the retirement on July 31 last, of Mr. A. J. Stubbs, the senior Assistant Engineer-in-Chief of the Post Office. With the exception of a short period of 5 years, May 1902, to May 1907, during which he held the position of Superintending Engineer in the Metropolitan, North, District, Mr. Stubbs' service was spent entirely in the Engineer-in-Chief's Headquarters Office, and his retirement has severed the main link which, in the minds of many of us, remained in these later years to connect the present generation of Headquarters' engineers with the group of brilliant men who, after the transfer of the telegraphs to the State in 1870, laid the technical foundations which secured for the British Telegraph Service its long acknowledged reputation of the finest in the world. The wonderful page of State service history which unfolded itself during Mr. Stubbs' career was charmingly portrayed by himself in a paper, "Fifty Years of State Telegraphs," which he read before the Telegraph and Telephone Society of London in November 1920, and was reproduced in the JOURNAL during December and January last.

His contribution to the science and art of telegraphy cannot be expressed by a mere list of the many devices and items of apparatus which he has produced. His designs have been copied and adopted as standards all over the world, and scores of the beautiful drawings turned out with such facility in his earlier days are preserved in the Engineer-in-Chief's archives, but even more important is the fact that he was largely instrumental in shaping the governing tradition of British telegraph design which many others have, more or less unconsciously, adopted and followed.

A colleague who knew him well described him as "a gentleman and in every sense a man. He always joked; he never preached, but he could not help raising the tone of his company by his mere presence."

REVIEWS.

"Principles of Radio Communication." By J. H. Morecroft, Associate Professor of Electrical Engineering, Columbia University, assisted by A. Pinto, Assistant to Chief Electrical Engineer, New York Edison Company, and W. A. Curry, Instructor in Electrical Engineering, Columbia University. Published by Chapman & Hall, Ltd., London. X × 935 pp. Price 45s. net.

This is certainly the most important book on wireless telegraphy which has appeared recently. The developments which have taken place in this branch of Electrical Engineering during recent years have made obsolete much that appears in the older standard books, and in order to keep up-to-date, the student has to delve into the proceedings of the various Wireless Telegraph societies which exist in this and other countries. For many students this is difficult, if not impossible, and so the advent of a book in which, as far as possible, a complete up-to-date account of Wireless Telegraphy is given will be welcomed.

The book is divided into twelve chapters. The first one deals with the fundamental ideas and phenomena on which the whole of Wireless Telegraphy is built up and contains a full treatment of the laws of alternating currents, and a discussion of coupling and resonance effects.

The second chapter deals with resistance, inductance and capacity from the point of view of the high-frequency engineer.

In the third chapter is given a general view of radio communication and the difficulties which have to be overcome in practice.

The fourth chapter deals with the laws of oscillating circuits.

The fifth chapter deals with spark telegraphy, the sixth with thermionic valves, and the seventh with various systems of continuous wave telegraphy.

The eighth chapter is devoted to radio-telephony.

Then follow chapters on antennae and radiation, wave-meters and their use, and amplifiers.

The final chapter is on Radio Experiments and should prove of great use to the student who wishes to carry out practical work bearing on the theoretical matter discussed in the preceding portions of the book.

The book is very freely illustrated with curves and diagrams, which are extremely clearly reproduced. There are only a few photographs and these are not quite so well reproduced, but of course, for the serious student this is a very small drawback. The "all picture" type of text book is of little use to the man who really wants to *know*.

The standard of the book throughout is high, both as regards the method of treatment, and the way in which it is got up. Unfortunately the price is also high, but, considering present-day conditions in the book trade, it cannot be considered excessive.

The book is above the standard which the ordinary operator requires, but for anyone connected with the technical side of wireless telegraphy it should prove invaluable.

"The Post Annual." Edited by Geo. Middleton. Union of Post Office Workers. 76 pp. 2s.—This is a very enterprising and interesting production, well got-up and lavishly illustrated. It will, we imagine, appeal to a very large circle of readers, for it deals with all branches of the service. There are articles describing what the Engineering Dept. did in the war, the Air Mail Service, the Telephone from the operators' point of view, the Central Telegraph Office, what the Army Postal Service accomplished during the war, the Travelling Post Office, and London's largest sorting office. On the lighter side is an article on Early Days in the Savings Bank, written and illustrated by Will Owen, and there is a characteristic page of Mr. Heath Robinson's humorous drawings. Mrs. Patrick McGill has much that is interesting to say from the telephonists' point of view, but she repeats some of the charges she recently made in a daily paper, and we doubt if she serves their interests or flatters them by the statement that five years at the switchboard would make a wreck of the bonniest girl. It could easily be demonstrated that thousands of bonny girls have survived five years and longer service with their charms unimpaired. Such demonstration is not entirely within our province, but we think our long monthly lists of resignations on account of marriage are some sort of testimony. Portraits abound in the annual: the Postmaster and the Assistant Postmaster-General are there, and Secretaries, Officers in the "Signals," and Controllers are well represented. Mr. Sanderson finds himself in juxtaposition with Mr. Owen Nares, who comes in as judge of the Beauty Competition, a feature which we mention last, but not as the least.

RETIREMENT OF MR. SUTCLIFFE.

A CEREMONY of interest mainly to those connected with the Telephone industry, was performed on Oct. 3 at Leeds when a presentation was made to Mr. H. B. Sutcliffe, the late District Manager of the West Yorkshire Telephone District, and Mrs. Sutcliffe.

The presentation, which consisted of an elegant envelope card table, and a handsome sterling silver tea service of three pieces to Mr. Sutcliffe and a case of sterling silver teaspoons and tongs to Mrs. Sutcliffe, was made by Mr. T. Rodger (Traffic Superintendent) on behalf of the staff. Contributions towards the expense of the presentation were sent from all parts of the district, and the gathering (approximately 300) was representative of all grades. Among others present and taking part in the ceremony were to be noticed Mr. Hancock, Postmaster-Surveyor, Leeds. Mr. LeFevre, Postmaster of Bradford, Mr. Johnson, the Superintending Engineer of the North-Eastern District, and Mr. Lawrence, Postmaster, Dewsbury.

Reference was made with appreciation to the long telephone experience (37 years) of Mr. Sutcliffe and the loss that the service would suffer consequent on his retirement. Mr. Sutcliffe, on behalf of Mrs. Sutcliffe and himself suitably replied expressing his regret at this severance of his ties with the telephone world and pointing out that the way was now open for some younger man to take up the reins of office and push forward more strenuously towards the ideal of a perfect telephone service.

After the presentation ceremony followed refreshments, dancing, and a few musical items ably rendered by members of the staff. The occasion was the first meeting of the session of the West Yorkshire Telephone Discussion, Recreation and Social Circle. The membership extends over a wide area and is already about 200.

The
Telegraph and Telephone Journal.

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

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 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. VIII. NOVEMBER, 1921. No. 80.

IMPERIAL COMMUNICATIONS.

WE recommend to all our readers the special study of Mr. Brown's inaugural address to the London Society. It was an admirable résumé of the history of Imperial communications, and it included a valuable vision of what these communications are to be in the future. It did full justice to all private enterprise as done in the past and as being done in the present, and it gave us a precise estimate of the value of the Government-owned cables and of the Government-owned wireless scheme. It left controversy aside except for one reference to the necessity for the State control of wireless. It has been said recently by some experts that there is only room for 270 long-distance wireless routes. That being the case it is quite clear that private enterprise could not be allowed to monopolise any considerable number of the possible routes. In this respect, as Mr. Brown pointed out, there is an essential difference between wireless and cables, and any question which might arise as to the Government ownership and control of cables must be decided by other considerations.

Naturally enough the audience was most interested in the future. There is always a danger when a new development arises of expecting rather too much from it, and Mr. Brown's judicious estimates are of especial value in checking undue expectations. Yet in the development of the Imperial Wireless Chain there will be opportunities for the British telegraph world which may affect the calling considerably. It will largely depend upon all that we do to qualify ourselves for this new development to what extent the Service gains by it. There is opportunity for doing something rather more than insisting upon claims. Strenuous work in mastering the various ramifications of wireless and the application of high-speed apparatus to wireless will be necessary, and this study will have to be carried on from different angles. There is not only the technical work of understanding how these machines will be adapted to the transit of signals by wireless, but there is a field for research in respect of the actual passage of traffic—the best method of obtaining repetitions, for example, the suitable batches of telegrams, the adaptation of ordinary working regulations to methods which have difficulties of their own, such as the interference of atmospherics and the like. It opens up a fascinating realm for study, and probably the two aspects of the study, the technical and the traffic, will need to be encouraged side by side.

All the old ideas of a fierce and angry rivalry between the cables and the wireless may be dismissed. They will be complementary. We are only at the beginning of the possibilities of closer welding of the Empire by means of these different methods of communication. It must be a little gratification to all of us every morning to see telegrams coming from Australia by the long route across the Pacific and across Canada and across the Atlantic within a few hours. It is a further gratification to notice how rarely commercial firms find it necessary to use the triple urgent tariff. To those of us who look beyond the sphere of commercial communications what is being done for the Press is a matter of pride. The canvassers for the Imperial Cable have their own droll stories to tell. They find the strangest misconceptions. Fortunately they are able to remove these misconceptions. The best feature of the whole enterprise is that the loss of a client who has once discovered the value of the service is practically unknown. Mr. Brown has put the enterprise on a high plane and it is up to us in our own particular vocation to be worthy of the high level upon which he has placed our calling in respect of the Imperial Communications.

RECORDING OF CALLS.

WE make no apology—nor do we think any is needed—for again referring in our columns in the form of a catechism to the substantial accuracy of the Post Office records of telephone calls. The Post Office has adopted a manually-operated system, while subscribers naturally would prefer an automatic record, such as that attached to gas, water, or electric light, and they fail to see why they cannot have it. They do not realise that the chief obstacle to a meter is the Post Office principle of charging only for effective calls. It would be a relatively simple matter to install a meter to record each and every call; but what the subscriber wants is one that will distinguish between successful and unsuccessful calls and between actual calls and signals, such as "flashing" for an operator. Such mechanism has yet to be invented, and it is therefore necessary for the work to be done by human agency.

But it is a mystery why a certain—luckily small—percentage of subscribers should assume that the human agent always has a bias against him, despite the constant assurance that the operator has nothing to gain by overcharging, and that the Post Office takes every possible precaution to ensure that both person and machine work accurately. Maybe some of the grumblers are those who are especially prone to doubt the business probity of other purveyors,

and who imagine that in all dairy, grocery or other businesses it is the habit to resort to various little tricks to increase profits, such as watering the milk, sanding the sugar, &c. Or they may only be of that type of individual who from temperamental or national characteristics considers that every man's hand is against him if not actually in his trouser pockets. Or again, he may be only a bully, or a sufferer from liver or gout, those hoary-headed excuses of ill-temper, and his household or employees may purposely conceal their use of the telephone so as to avoid another outburst. Or lastly, there is the element which disapprove of Government services, either on principle or from personal interests, and purposely endeavour to whittle away the reputation of Government services by constant innuendo.

Whatever may be urged to the contrary the fact remains that the Post Office records are fundamentally as sound as those of any other telephone administration; and, as the Post Office does not claim omniscience, it is always willing to investigate any reasonable complaint.

HIC ET UBIQUE.

THE *Automatic Telephone* informs us that out of 14 million telephones in the United States about one million are worked on the automatic principle. The conversion of the New York system of 900,000 telephones to automatic working will commence next winter, and it is estimated that the work will take 10 or 12 years to complete.

THE Hull Municipal Telephone system had a deficit of £13,279 on the year's working. It is hoped, however, by the end of the financial year ending in March 1923, that the Corporation will be in a position to build up a reserve. The new rates (33⅓ per cent. on the old ones) are now in full operation. The *Yorkshire Observer* says that the rate of telephonic development in Hull is the highest in the country, 10 inhabitants per telephone, but our readers will see from the paper which we publish that this is not the case. The ratio should be 1 to 26, whilst that for London is infinitely better.

IN our notice of Mr. Dawkes' retirement last month the printer unfortunately dropped the important word "never" in the fifteenth line. We think, however, that the intention of the paragraph was nevertheless clear. No one who knew Mr. Dawkes would imagine him unable to appreciate other points of view than his own.

THE *Yorkshire Telegraph and Star* has the following paragraph:

It is said that in American Post Offices, the work is accompanied with music, which moves from grave to gay, from lively to severe, in harmony with the needs of the workers. It is not generally known that there is nothing new in this, but that our own Post Office has long been working to music, and keeping strict time. The favourite measure is the "Dead March." The *telephone department* works staidly to the strain of "I hear you calling me," and in its livelier moods to "She only answered 'Ting-a-ling-a-ling' to all I had to say," or "Somewhere a voice is calling (number engaged)."

We can only rejoin with "Do not trust him, gentle maiden."

MUDALIYAR A. G. TILLEKERATNE, A.M.I.E.E., F.R.C.I., Superintendent of Telegraph and Telephone Traffic, Ceylon, who was on a visit to Great Britain on a holiday, combined business with pleasure, by investigating British methods of Postal, Telegraph, Telephone and Wireless work, and now returns to Ceylon through the Continent.

TELEGRAPHIC MEMORABILIA.

THE obvious drawbacks to a monthly periodical interested in so lively a pair of subjects as Telegraphy and Telephony have been particularly present with us these last two or three years. Staff changes, inventions, the kaledioscopic modifications of routes and the developments of wireless have sometimes followed with so great a degree of swiftness as to have become back dates and ancient history by the time it has been or *would* have been possible to publish the items in these pages. This seems to have been the case to an accentuated degree during the month that has just come to a close. Added to this factor must be placed a personal confession to the effect that a very lazy holiday in delightful country under ideal weather conditions must take a share of the blame for the belated tendency of one or two items at least. Having accepted the leniency of the general reader as a foregone conclusion, it would perhaps be accepted as an additional salve to conscience were the writer to vary the contents of these columns by giving a brief description of the *dolce far niente* spot where the holiday was spent. This, however, would probably raise prices for accommodation in the near future, so one must refrain except to give but a faint clue to this *terra incognita* by stating that it possesses a Post Office which refuses to be troubled with either telegraph or telephone, though the poles of the latter pass its door; the butcher calls twice per week, and the policeman apparently less frequently. It is eight miles to the nearest barber, about the same distance to the railway station, one or two of the inhabitants have never seen a railway train, and one or two villagers have *pannage* rights.

Not only will the death of Commodore Suenson be felt as a personal loss by the Great Northern Telegraph Company but the telegraph administrations throughout the world will doubtless recognise the demise of this noteworthy figure, which took place at Copenhagen on Sept. 21, as leaving a distinct gap in the line of submarine cable pioneers. The commodore was born in 1842 and in 1864 saw active naval service when in command of the Danish fleet. According to *The Electrical Review* it was in 1870, when the Great Northern China and Japan Extension Telegraph Co. was formed (afterwards amalgamated with the present Great Northern Telegraph Co.) that Suenson was sent out as General Manager to the Far East, "there to make the necessary arrangements for the landing and laying of the first telegraph cables between Hong Kong—Shanghai, Nagasaki and Vladivostok." The British Colonial Government gave every assistance for a suitable landing place for the first cable at Deep Water Bay and the right to connect it by a land-line to an office at Victoria, the main town of the island.

The connexion with Shanghai proved a different proposition. Here, strange to say, not only did he meet with the opposition of the natives who believed that the Chinese god "Fungshui" objected to any opposition in the way of projections into the air, but, "the European merchants of all nationalities which were established there were anything but delighted at the thought of getting the telegraph introduced in China, as this would put an end to, or at all events limit, the large speculation going on, and would also deprive the richer merchants of the advantage they had over their poorer *confreres* by dispatching their quick sailing steamers to Singapore for the latest news of the state of the European markets."

Suenson was not to be discouraged and eventually overcame the difficulties by changing the landing place of the cables to Gutzlaff and at Woosung where they have since remained. Commodore Suenson attended all the Telegraph Conferences and was perhaps one of the most potent influences in favour of the private telegraph companies' interests, not least of his qualifications was a fluent knowledge of Danish (his own tongue), English, French and German.

In terminating one of his particularly interesting papers, read before the Franklin Institute, on "Carrier Current Telephony and Telegraphy," to which the enterprise of our British contemporary, *Electricity*, has recently given very considerable prominence, Chas. A. Culver, Ph.D., of Toronto, remarks that while radio-telephony has a distinct and very important field in communication at sea, it obviously has serious limitations when employed for strictly business and personal purposes. While there is no means of communication which cannot be "tapped" (an opinion undoubtedly very strongly voiced by the late International Radio Conference.—ED.), yet from the nature of the system, direct guided-wave telephony by means of wires possesses the greatest element of secrecy of any telephonic means of communication. When, however, the high-frequency super-channel is used as a trunk line and connected at either or both ends with physical telephone circuits, the element of secrecy is again reduced to that of a physical circuit for the entire distance.

Another advantage of this guided-wave system is that communication may be maintained between two points when *the physical circuit is out of commission for ordinary telephone service. Both wires of the physical pair may be cut, the lines short-circuited and even one of the pair earthed without interrupting communication over the super-channel.* This has been repeatedly demonstrated and naturally means much in emergency service of all kinds."

The developments of this system which so far is only an economical one for long-distance circuits owing to the higher initial and maintenance costs of the physical circuit which is the basis of the system, these developments let it be repeated are sure tokens that wireless progress is not to be permitted to pass unchallenged. Already as the author states, "multiplex telegraphy by means of guided-waves is a commercial fact."

An interesting comment on the lack of secrecy of wireless telegraphy and telephony is the fact published in the *Electrical Review* of Sept. 9 announcing that "the private station of Messrs. Cunningham, Ltd., 169/171,

Edgware Road, is now in operation, and *anyone* is invited to inspect it and *listen to the signalling and telephony.*" The italics are the writers.

Nevertheless, wireless goes ahead and not the least successful of Government developments is the steady improvement in the working of the London (C.T.O.) and Cologne (*Haupt Telegraphen Amt.*) circuit, the daily performance of which is generally in the neighbourhood of 100 words per minute. The definition of the Wheatstone signals is amazingly clear and has frequently permitted reception by means of the Creed printer. The circuit would appear to be one upon which (*pace* atmospherics) trials with Baudot, Hughes, Murray, Siemens, or Western Electric would form a most interesting series of experiments and these certainly could not be *easily* tapped, at least by the general public.

It is not generally known, perhaps, that direction-findings by means of wireless for ships at sea are supplied by the British Admiralty at a cost of 5*s.* to any vessel which has lost or is uncertain of her bearings. The number of these demands during the month of August, according to *The Times*, was 160. As many as one thousand direction-found bearings were communicated during one of the preceding months. The demand, however, fell considerably below a couple of hundred when it ceased to be a free service !

The same authority gives an interesting little paragraph regarding the increase of the length of telephone lines in Czecho-Slovakia which it is reported has amounted to no less than 6,250 miles in two years. No further particulars are given so it is difficult to judge the real value of these statistics. Were they trunks or local circuits ? Were they 200, 300 or 500 pair cables ? Were they—— but no, one should not ask too many questions.

The projected submarine cable between Italy and South America, it is understood, will give direct communication between that country and Brazil, Uruguay and Argentina. The Italian landing place of the cable will be Fiumicino.

The following promotions at the C.T.O., consequent upon the retirement of Messrs. Bond, Fennings and C. Worthy, were unfortunately omitted from the last issue. It is hoped that these belated congratulations will lack nothing of sincerity by that fact. Each and all are tried and tested officers of a department which they have faithfully served, and the good wishes of all good men go along the road with them :—

Mr. D. M. Ford to be Assistant Controller.
Mr. F. W. Miles to be Superintendent, Section C.
Mr. W. H. Offord to be Superintendent, Section B.
Mr. T. M. Almond to be Superintendent, Section A.
Mr. D. Drenham to be Assistant Superintendent.
Mr. W. H. Marshall to be Assistant Superintendent.
Mr. E. W. Hewer to be Overseer.
Mr. W. S. Read to be Overseer.
Mr. M. Dunne to be Overseer.

Of the new Controller of the Edinburgh Telegraphs, Major A. A. Jayne, D.S.O., &c., what more can be said than has been said a hundred times regarding one of the most genial and understanding men the British telegraphist has ever experienced at home or abroad, in civil or military employ ?

There have been times when we have not always seen eye to eye with the Engineering Department. "We differed 'twas our common pride," but it has rarely been the case that these differences between Traffic and Engineering methods and points of view have gone beyond the stage of good-humoured banter and friendly relationship, and this over a period measured by decades. If there be any man on the engineering side who has helped more than another throughout the whole of his service, now terminated unfortunately by ill-health, to help and foster a kindly relationship that man is George W. Connell, Assistant Engineer. "George," as he was known all over the C.T.O. building entered the Post Office Service as wireman in September 1883, and was promoted to Sub-Engineer in September 1899 and to Assistant Engineer July 1911. By sheer force of character, excellence of work, thorough knowledge of his job, he had climbed these few rungs of the ladder. There was not a man who knew the wiring of G.P.O. West and North better than he or the connexions of every type of apparatus, simplex or duplex, when as a lineman this was but a part of his routine to which was then added that of the maintenance of the local and trunk switch and test boards of the Trunk Test Room on the second floor, and the "Inter" switch on the floors above. He saw the C.T.O. pass from the general use of primary batteries with their hundreds of cells to that of the secondaries with all the changes which this revolution in power distribution involved at the time and grasped the new questions and the new methods and the new principles which they involved with that practical quickness which was the outstanding feature of the man. Isolated "shorts" or a few dozen such as those which resulted from the T.S. text-box outbreak or the Manchester conflagration were a joy, not at the destruction wrought, but at the sheer satisfaction resulting from clearing up a "lurid mess." If when as foreman a man under him was in fault no one could be more scathing than he, but no one could throw around that same man the protective shield against further castigation, and never man helped so many lame dogs over stiles as G. W. C. Help was given to one and all alike to high or low, and official position was small barrier to his candour. Not a few test clerks but would pay tribute to his unostentatious helpfulness, and his whole-hearted co-operation, and not a little to the blind eye which he did not fail to utilise when minor regulations prevented the traffic and engineering departments from "getting on with the job." Those who really *knew* George Connell will be the first to agree that the few lines spent on his eulogium only but indifferently appraise the value of the man. Into his retirement the kindest thoughts of old comrades and colleagues will follow during the many years of recuperated health and strength which it is hoped are yet in store for our old friend.

The London *Daily News* "chiel among us" has been taking careful notes of the undoubtedly harrassing experiences through which the ordinary S. C. & T. has to pass while on duty at a Post Office counter grappling "with the intricacies of Savings Bank and Money Order business, issuing licenses and selling stamps." Within three minutes, the following posers were put to the worried official behind the grille by a none too patient public, ravenous for information :—

> If I send £14 7*s.* 6½*d.* to Greece how many drachmai and lepta will my friend in Athens receive ?
>
> Has the *Megama* sailed from Liverpool yet, and how much will it cost to "wireless" her ?
>
> What is the postage to Monte Video on 2½ lbs. of "literature for the blind ?"
>
> Say, mister, is this where I register for the unemployed money ?

Eastern Engineering gives the very interesting information regarding telephone developments in China. A sum of approximately $1,000,000 it is expected will have been expended in improvements and extensions by the end of the present year. The submarine cable across the Yangtze connecting Nanking and Pukow and only containing one pair of wires is to be replaced by a cable containing thirteen times that number of lines. The materials for the exterior and interior work are being provided respectively by the Sino-Japanese Electric and Chinese-American companies.

On Oct. 1 last was celebrated at Antwerp the 75th anniversary of the opening of the first telegraph line and office in Belgium. Administrative, Civil and Military authorities were all represented at the ceremony which included the solemn unveiling of a commemorative plaque bearing the names of those of the Antwerp staff who had fallen in the war. Mr. Kellaway, the British Postmaster-General, forwarded an aptly worded greeting on the occasion, of which the following is a copy :—

> Le Postmaster-General du Royaume uni envoye ses salutations à l'Administration et personnel du télégraphes et téléphones belges à l'occasion des fêtes pour la celebration du soixantedixcinquieme anniversaire de l'inauguration du premier ligne télégraphique en Belgique ainsi que la presentation de la plaque commémorative dediée a la mémoire des agents tombés pendant la guerre et il s'associe lui-même avec le personnel de toutes grades de l'Administration britannique dans une expression d'estime et égard à leur collègues belges.

The celebrations were continued at Brussels on the following day. M. Neujean paying high tribute to the telegraph staffs of the country.

An old friend and one-time telegraphist of the C.T.O., Mr. G. C. Mason, has been promoted to Superintendent of Wireless Telegraphy at the G.P.O. London. Those who remember the efficiency of G. C. M., either in T.S., T.S.F., or at the repeater offices, will hardly be surprised at his present advance in the new branch of the Service, and will be ready to tender him the sincerest congratulations. Mr. E. J. Ivison, late Assistant Staff Engineer, has been appointed Staff Engineer of the same branch.

The report of the *Compagnie Francaise des Cables Télégraphiques* notifies that the working of the Brest-Azores-New York cable which was entrusted to them by the French authorities, has proved very fruitful. The company has, it will possibly be recalled, already entered into agreements with the *Cie Générale de Telégraphic sans fil* for the joint working of wireless stations at Cayenne and in Northern Brazil,to which company they subscribed no less a sum than 12,000,000 francs towards the formation of the *Société Radio* of France which will operate on the American side of the Atlantic.

Fraternal sympathy is tendered to our Norwegian colleagues on the tragic death of M. Heftye, Director-General of the State Telegraphs, on the occasion of the appalling disaster at Skansen at the opening of the Dovre railway, and to our French friends by the equally tragic death of M. Carpentier in a motor accident.

The following extract from the *Electrical Review* gives perhaps one of the most curious instances of scientific development that as a result of political complexities one is likely to meet for some time. Events have resulted in an interesting electrical denouement in East Prussia, for as the new Polish "corridor" cuts off East Prussia from Pomerania a submarine cable, 170 km. long, has been laid in order to avoid any possibility of an interruption in communication between these two German possessions. This cable is to be used both for telephonic and telegraphic purposes, and contains six double-cores for the former and three single-cores for the latter. Single-core working for telegraph purposes was chosen partly on account of the limited space available, and partly to ensure due economy in copper. This choice was also largely influenced by the fact that it is now possible to reduce electrostatic and electro-magnetic induction effects, and so avoid trouble from disturbances of this character. The submarine portion of the cable passes under the Baltic from Leba to Tenkitten, and is connected at the home end with Hamburg, Stettin, and Berlin, and at the outer end with Königsberg. The telephone cores consist of copper wire 1.45 m. in diameter. and two copper strips, each 2.7 by 0.35 mm. The telegraphic cores consist of three copper wires, each 0.9 mm. in diameter. The telephonic core is wound with soft iron-wire 0.2 mm. in diameter in two layers and with three layers of paper, which bring the total diameter up to 4.4 mm. Each telegraphic core is wound with four thicknesses of paper, giving an overall external diameter per core of 5.2 mm. The cores themselves are covered with two

lead coverings, which are separated from one another by a layer of compound. The thickness of the lead is 1.9 mm., and an interesting point is that no tin has been used in its composition. The whole cable is covered with a lead sheath, which is protected against water pressure by two steel spirals. At intervals of 2 km. insulated plugs are built into the core for localising any damage that may occur. The average diameter of the submarine cable, including the jute protecting coverings, is 52 mm. Laboratory experiments, which were conducted on the cable before laying, indicated that if the lead were of sufficient thickness and were hardened by the addition of a little tin the risk of any breakdown from water pressure would be reduced to a minimum, but, even as it is, experience shows that the cable will be fully able to hold its own. It is, of course, the combination of telephone communication and telegraph communication on the same submarine cable that makes this installation interesting, and its operation under somewhat unusual conditions will therefore be watched with interest, especially now that increased telephone communication between this country and the Continent has become a vital necessity.

The Norddeutsche Seekabel Werke of Nordenham have provided nearly 3,000 kilometres of new submarine telegraph cable for the Dutch East Indies, which was delivered by the steamer *Flint* at Priok. The *Telegraaf*, the Dutch cable steamer, re-shipped cable sufficient to lay a new line between Singkel and Sibolga (Sumatra). Two others are to be laid, one between Java and Sumatra, and one from Makassar to Menado, and also from Makassar to Soerabaja.

Amongst the new patents "applied for" the following are noted:—

21,786 "Electric transmitters for automatic telegraphy." F. G. Creed and Creed & Co.

21,846 "Amplification and/or shaping of impulses in telegraphy." Eastern Telegraph Co., Ltd.

21,857 "Electric Telegraphy." Eastern Telegraph Co., Ltd.

J. J. T.

MR. LEE ON THE CIVIL SERVICE.

MR. JOHN LEE, Controller, Central Telegraph Office, delivered a lecture at the London School of Economics on Friday evening on "The Attitude of the Press to the Civil Service." Lord Riddell occupied the chair.

Mr. Lee said he thought the Civil Service had in many respects given some reason for criticism; there must be some reason for an excessive unpopularity. There was a genuine hostility against them on the part of the public at large, and it had been fed by certain writers who had chosen the fertile ground of public prejudice for their broadcast seed. The public still thought of them all as 10 a.m. to 4 p.m. men with long holidays. It supposed that incompetence did not count, and that salaries were irrespective of merit. But the attack, as an attack, did not come from the Press itself. In the main it came from a particular class who realised, quite shrewdly, that if the Civil Service was not curbed and discredited, it might become the machinery through which the consumer was safeguarded. This was a new class which had come into the possession of wealth—a class which was a problem to economists and the despair of the artistic world, and which was the greatest of all perils to social well-being. He watched on Sunday the stream of motors cars passing along a road near where he lived. It was a remarkable stream. Hundreds of well-equipped cars went by. What class owned them? Who could say? It was the problem of the hour. But it could certainly be said that they were not owned by the servants of the State. There was more public suspicion of Civil Servants' security, even when incompetent, than on any other aspect of their calling. He wished that he could plead that this was an unreasonable suspicion. Sooner or later the Civil Service of every grade would have to face that question. It was not the case that positive incompetence was as frequent in the Civil Service as in privately-owned administrations, but their machinery did not present to the public mind the means of eliminating the incompetent in such a way as to assure the public that those who remained were really competent.

A Government Department controlled the railways at a time when the central aim was that there should be fewer and fewer trains, and it came to be criticised simply because it succeeded, and the critics asked why there were fewer trains under Government management. The Civil Service had triumphed in those functions which belonged to it. Mr. Salter's book on Allied Shipping was a fine revelation of what a handful of men could do in administering what remained of the shipping world. The food supply was admittedly, on every hand, a vast success. If the world wished to do so, it could regard these precious achievements as translatable into dividends, but there was no dividend high enough for the translation. The Civil Service, founded on a basis which was the executive administration of a static condition, had been called upon to adapt itself to amazingly fluid conditions, to changes day in and day out, to a nervous and excited psychology, and to operations compared with which the operations even of the largest industry were puny and manageable. There was truth as well as error in the demand for a more business-like Civil Service. They needed to be watchful lest their methods became cumbersome and insufficiently responsive to the needs of the hour. Those of them who had had opportunities of studying industrial administration knew well that there was waste in distribution, waste in organisation, to which the Civil Service could offer no parallel. The "Popolo Romano" had remarked that "British merchants are certainly handicapped by the rate of exchange, but even more by their own methods of business." A London evening paper of the previous day had said, "If any British colliery manager got a job and attempted to run a German or American colliery for one day on his British methods, he would be dismissed within twenty-four hours." They were talking about the poor man as if he were a Civil Servant! But they were coming near the mark. England was reeking with proud and self-sufficient business incompetence. For the rest of this decade the worth of the Civil Service would be balanced against high taxation. Its mission must be to stamp itself with professional worth. It was worth while being called bureaucrats if it opened their eyes to the horror of being only bureaucrats.—(From *The Observer.*)

THE POPULATION OF THE LARGE CITIES ACCORDING TO THE CENSUS OF 1921 AND ITS RELATION TO THE NUMBER OF TELEPHONES.

WITH the introduction of the new rates in April 1921, the old telephone areas disappeared. The boundaries of these areas were curiously unequal and followed no fixed principle, with the result that whilst in most cases they included the suburbs of the town after which they were named, in others they included towns twenty miles away, which were, in fact, quite separate entities. The Chester area included Flint and Mold; the Exeter area, Exmouth, Budleigh Salterton and Sidmouth; the Chesterfield area, Bakewell and Matlock, and so on. It is necessary, however, for statistical purposes to fix some boundary for each urban telephone system other than the municipal boundary of the chief town. Salford, for example, is an integral part of the Manchester telephone system; Bootle, and one might add Birkenhead, of Liverpool; and Gateshead, of Newcastle. Instances might be multiplied; in fact, nearly all the large town-telephone-systems include more than one borough and its closely associated urban districts.

It would be scarcely more satisfactory to define Liverpool for telephone purposes as included in an arbitrary boundary comprising the boroughs of Liverpool, Birkenhead and Bootle only, or Newcastle as comprised in the boundaries of Newcastle and Gateshead. Telephonic development is indifferent to geographical boundaries, and a populous district not included in these limits may well be served by what is essentially a Liverpool (or Newcastle) exchange, as the case may be. It is therefore necessary to seek a more comprehensive boundary in order that the relation of telephonic development to population in a given town may be ascertained, and for this purpose a radial area of 5 miles from the chief exchange has been adopted for all provincial cities except Glasgow, Manchester, Birmingham and Liverpool (where a 7 miles radius applies), whilst in London the area within a 10 mile radius from Oxford Circus has been taken to represent the telephone boundary of the Metropolis. These areas are, of course, the limits within which a local call can be obtained for 1½*d.* under the new rates from the central parts of the towns in question.

The following tables show the population of all radial areas with upwards of 100,000 inhabitants (with the exception of a few which largely overlap others), the number of telephones they contain, and the number of inhabitants per telephone. The number of telephones in 1911 and their ratio to population in the old area, corresponding as nearly as possible to the new radial area, is also shown. Only preliminary figures of the 1921 census are at present available, and hence the figures are only approximate. In an industrial area which is covered by boroughs and urban districts it has been possible to give a tolerable exact estimate of the population, but in the case of a town which only one or no other urban district adjoins, it has been necessary to add a rough estimate of the population of that part of the rural districts lying within the five mile radius. Such estimates, however, do not greatly affect the correctness of the ratio of telephones to inhabitants. The population of the town itself is usually so overwhelmingly greater than that of the outlying parts of the area, that there addition is insignificant. For instance, the population of Reading is 92,200.

10,000 has been allowed for the small surrounding places in Oxford and Berkshire, making an estimated total of 102,000. Probably the exact figures of population, if they could be ascertained, would lie between 100,000 and 105,000.

The chief objection to the adoption of radial areas as the standard telephone areas is that in many cases they must necessarily overlap. In the tables subjoined Birmingham and Wolverhampton overlap slightly, as do several of the Lancashire areas, and Newcastle and South Shields. In these cases both the population and telephones in the places overlapping had been added to the total for both areas. Oldham and Stockport have been included in the Manchester area although they were both formerly the centres of separate areas, and Tynemouth in South Shields, and so on. Some difficulty was experienced in dealing with the Birmingham district, where the areas contained within a 5 mile radius of Birmingham, Walsall, Dudley and Wolverhampton overlapped to such a degree that many places were included in no less than three of them, and for this reason Walsall and Dudley have been omitted altogether from the following list. Out of 340,000 people within 5 miles of Walsall, only 96,000 were proper to that town, and out of 378,000 within 5 miles of Dudley only 56,000 were actually in the borough of Dudley. No census of Ireland was taken in 1921 and consequently the rough estimates for Belfast and Dublin are based on the 1911 census.

All cities and boroughs with upwards of 100,000 inhabitants appear in the following table.

Croydon, West Ham, East Ham, Leyton, Walthamstow, Tottenham and Willesden are included with London.

Salford, Stockport and Oldham with Manchester.

Birkenhead with Liverpool.

Gateshead with Newcastle.

Rhondda which is not a town, but an urban district consisting of several populous mining villages has not been included.

	1921.			1911.	
	Telephones April 1921	Population 1,000's	Population per telephone	Telephones (in old area)	Population per telephone
London (10 mile) ...	330,002	7,068.5	21.4	211,341	33.8
Glasgow (7 mile) ...	43,263	1,260	29.3	40,609	28
Liverpool (7 mile) ...	38,475	1,190	31	27,995	40.7
Manchester (7 mile) ...	46,313	1,591	34.5	25,897	47
Birmingham (7 mile) ...	26,477	1,273 (5 mile radius)	48.9	15,713	72
Cardiff	9,459	240	25.5	7,077	39
Edinburgh	16,561	420	26	12,750	39.8
Brighton	6,596	206	31	6,792	32.2
Bradford	11,604	375	33	10,089	46
Aberdeen	4,985	164	33		
Bournemouth	4,322	145	34	3,321	49
Dublin (1911 census)	11,213	387	36	6,951	65
Nottingham	8,947	334	37	7,652	60
Dundee	4,768	180	38		
Huddersfield	4,962	195	39	3,359	60
Halifax	4,138	162	39	2,556	62
Leicester	6,729	268	40	4,486	60
Bristol	10,154	405	40.5	7,330	59
Leeds	12,999	536	41	9,804	59
Sheffield	11,916	505	42	9,755	71
Swansea	4,064	172	43	3,627	52
Newcastle	13,571	597	43	9,996	64
Newport	2,756	118	44	2,113	69
Norwich	3,022	135	45	1,998	70
Reading	2,181	102	47	2,077	59
Dewsbury	3,892	186	47	2,294	73
Belfast (1911 census)	8,637	410	48	7,286	64
Blackpool	2,438	120	50	2,022	53
Southampton	3,530	186	53	2,629	68
Blackburn	4,791	249	53	4,498	77
Preston	2,593	141	54	2,063	90
Coventry	2,866	160	57	1,993	94
Grimsby	2,137	120	57	1,248	84
Derby	2,502	150	60	1,898	90
Plymouth	3,691	230	62	2,867	84
Middlesbrough	3,839	237	62	2,821	88
Rochdale	2,778	180	64	1,538	101
Burnley	2,532	165	66	2,388	108
Portsmouth	4,293	293	68	7,540	41
Wolverhampton ...	3,253	225	70	1,696	107
Sunderland	2,721	198	74	2,524	93
Southend	1,586	120	75	842	112
Wakefield	1,867	140	75	1,095	164
Bolton	3,540	279	79	3,546	91
Stoke	3,683	325	88	3,135	115
South Shields	3,449	315	90	1,020	140
St. Helens	1,510	157	104	716	175
Chatham	1,409	146	104	975	157
Wigan	1,563	202	129	957	248
Barnsley	928	121	135	521	253
Merthyr	963	175	182	809	225
Corporation System (Specified Area).					
Hull	13,209	327.5	24.8	12,082	26

The comparison of the radial areas with the old defined telephone areas is necessarily inexact. In most cases the old areas were of greater extent than the new ones, but the relative positions of the areas on the list is much the same in 1921 as in 1911. London now takes first place, Cardiff the second, and Edinburgh the third, these positions being formerly held by Glasgow, Brighton and London respectively. The Hull system (now the property of the Corporation) actually holds the second place in point of telephonic development, while in 1911 it was first on the list. Portsmouth and Brighton are the only places showing actual retrogression in number, due to the gradual cessation of duplicate telephones after the acquisition of the competitive Corporation systems, the slight decline at Bolton being due to the difference in the size of the old and new areas. London (with a smaller area than in 1911) has increased from 211,341 to 330,002, and Manchester with a larger area than formerly from 25,897 to 46,313. Dublin shows the greatest percentage increase, rising from 6,951 to 11,213. Newcastle and Bristol also show very substantial increases.

The inclusion of large suburban areas in the telephonic boundaries of towns, although affecting favourably the gross number of telephones in the area has almost always an unfavourable effect on the ratio of telephones to inhabitants. The following list has been prepared to show the number of telephones within the "county" or municipal boundaries of the 20 best developed towns. Places with less than 1,000 telephones have not been included :—

	No. Telephones	Population (1000's)	Inhabitants per telephone
London	286,177	4,483	15.7
Harrogate	1,752	38.9	22
Guildford	1,085	24.9	22.9
Chester	1,738	40.7	23.5
Bournemouth	3,560	91	23.3
Cardiff	8,300	200	24
Aldershot	1,203	28.7	24
Tunbridge Wells	1,481	35.5	24
Glasgow	40,260	1,034	25
Edinburgh	16,531	420	26
Newcastle	10,585	274	26
Manchester and Salford ...	35,966	965	26.9
Liverpool	28,950	803	28
Southport	2,608	76.6	29.5
Eastbourne	2,097	62	29.6
Ashton-under-Lyne	1,462	43.3	29.6
Bradford	9.517	286	30
Brighton and Hove	6,265	189	30.1
Nottingham	8,672	262	30.3
Aberdeen	4.901	159	32

The ratio of inhabitants to telephones within the municipal boundaries of *Leeds* (12,268 telephones) is 37, of *Bristol* (9,982 telephones) 38, of *Birmingham* (23,487 telephones) 39, and of *Sheffield* (11,539 telephones) 42. The figure for the municipality of *Hull* would probably be between 20 and 25.

Out of 14 towns in Great Britain with upwards of a quarter of a million inhabitants 1 has a ratio of less than 16, 6 of less than 27, 9 of less than 31, while 4 more have between 32 and 42 inhabitants per telephone. *West Ham*, which is part of Greater London, has not been treated as a separate entity.

W. H. G.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

THE thirteenth annual session of this Society was commenced on Wednesday, Oct. 5, with the reading of the Presidential Address by Mr. M. C. Pink, who chose the subject, "The Future Development of the Telephone Service." The address began with an estimate of the probable growth of the telephone system in and around London, based on forecasts up to fifteen years ahead. The expectation of growth is surprising to those whose daily toil is in places removed from development studies and the like. Mr. Pink went on to deal with improved facilities which were expected to take shape in the not too distant future and described the advantages which would be gained by the establishment of an automatic tandem exchange for the handling of traffic which is now routed over lending junctions. The new system of operating short distance trunk calls through the newly-opened Toll Exchange was described, and figures were given in illustration of the remarkable improvement which has been effected. There followed a description of the telephone repeater and its uses and a reference to the possibilities of wireless telephony. The address concluded with a view of international telephony so far as it concerns present and future inter-communication with the British Isles.

* * * *

By the time these notes are read the next meeting of the Society will have come and gone, but the debate on Tuesday, Nov. 1, between Messrs. H. G. Corner and Horace Dive on the subject of "Has the Telephone added to the sum of Human Happiness" will doubtless still be a lively topic of conversation amongst those who were present.

On Wednesday, Nov. 30, the Society's third meeting of the session will be held, when Miss A. C. West will lecture upon "The Voice and its Effect on the Telephone Service."

* * * *

It behoves those who intend entering the Annual Competitions to get busy soon. The closing date of the first series is Dec. 31, so there is not too much time left.

The London Telephone Service Swimming Association.

The London Telephone Service Swimming Association held its Second Annual Gala at the Great Smith Street Baths, Westminster, on Friday, Oct. 7, before a crowded audience, whose enthusiasm was maintained at fever heat throughout a long and varied programme. The attendance was probably a record for the baths, and two Press representatives reported in their respective papers that it was the best attended and organised gala they could remember for the past twenty or thirty years. Such priase is indeed a credit to all concerned and especially to Miss Temme of the Trunk Exchange the hard-working Secretary, and to Mr. E. A. Pounds who was, as always, indefatigable as M.C. The starting, timing and judging of the various events was in the capable hands of prominent members of the Southern Counties' Amateur Swimming Association and of the Amateur Diving Association. The noble army of stewards and whips worked with a will and everything went with a swing.

The principal events resulted as follows:—

LONDON TELEPHONE SERVICE CHAMPIONSHIP (88 yards). (Gold Medal presented by Mrs. G. F. Preston).

First.—Miss Williams (R.E.) in 1 minute 25 seconds.
Second.—Miss Phipps (R.E.).
Third.—Miss Amos (VI.).

A splendidly contested race, won by five yards in very good time: 17 competitors started.

THE POUNDS CHALLENGE CUP. Team Race. (176 yards).

First—Gerrard (Misses H. Davis, Wilson, Burt and Robbon).
Second.—Regent (Misses Williams, Amos, Cole and Phipps).
Third.—Victoria (Misses Fern, Amos, Staig and Johnston).

Gerrard, who were the holders of this coveted trophy, succeeded in retaining it only after stalling off a serious challenge from Regent. The time of 2 minutes 44 seconds is very creditable. Twelve teams in all entered for the event.

SUPERVISORS' HANDICAP (44 yards).

First.—Miss Hare (VI.) 21 seconds start.
Second.—Miss Spalding (R.E.) 20 seconds start.
Third.—Miss Todd (MA.) 5 seconds start.

There were 17 entrants so that three heats had to be decided before the final trial. The racing was very keen and close throughout.

INTER-SECTION AND DISTRICT TRAFFIC OFFICE TEAM RACE (176 yards).

First.—Service Section (Messrs. Prossor, North, Beck and Pettigrew).
Second.—North-West District (Messrs. Dobson, Higham, Reece and Mason).
Third.—Equipment Section (Messrs. Webb, McCrimmon, Gregory and Hack).

Time, 2 minutes and 41⅗ seconds. This race introduced a new note, the previous gala being entirely feminine. It was a welcome change, for some of the mere men representatives of the Headquarter Traffic Sections and District Offices met for a trial of strength outside the field of dialectics. The first 44 yards was hotly contested by some of the veterans (in years only as it proved) and Mr. Prossor, the doyen of them all, succeeded in gaining a lead for the Service Section which they maintained to the end.

LEARNERS' RACE (one width).

First.—Miss Morris (C.).
Second.—Miss Hyne (HS.).
Third.—Miss Webb (M.).

The distance is not far when you know how, but how far off the opposite side of the bath seems when you have doubts about getting there. More pluck than was apparent was displayed in this event.

OPEN HANDICAP (44 yards).

First.—Miss Weedon (RE.) 33 seconds start.
Second.—Miss Johnston (VI.) 19 seconds start.
Third.—Miss Hawkins (PK.) 15 seconds start.

There were 56 entrants for this event and ten heats, and a semi-final had to be decided before the final. The racing was good throughout but the distance was rather too short to permit the backworkers being in at the deaths.

GRACEFUL SWIMMING COMPETITION.

First.—Miss H. Davis (G.) 71 points.
Second.—Miss Izzard (C.) 63½ points.
Third.—Miss Amos (R.E.) 63 points.

A very charming exhibition of swimming. Each competitor was required to swim breaststroke, backstroke and sidestroke.

LONDON TELEPHONE SERVICE DIVING CHAMPIONSHIP.
Gold Medal presented by J. F. Edmonds, Esq.

First.—Miss Williams (RE.) 26 points.
Second.—Miss Phipps (RE.) 25 points.
Third.—Miss H. Davis (G.) 24 points.

Another exhibition of charm and grace. How nearly equal were the exponents of the art of diving is reflected by the fact that the first three were separated from each other by one point.

LANTERN RACES.

First Race.—*First.*—Miss Jones (C.).
Second.—Miss Tuckett (CW.).
Second Race.—*First.*—Miss Williams (RE.).
Second.—Miss Hawkins (PK.).

Other items of interest included a Police League Water Polo Match and a Life-Saving Championship Match also between police teams. Special mention should be made of the exhibition of high and fancy diving by Messrs. D. H. Fairman, C. H. Bacon and A. S. Coombs, members of the Amateur Diving Association, whose efforts were most thrilling.

Mrs. Preston, who was accompanied by the Controller, very graciously presented the prizes. The staff were proud to have them share and indeed add to their enjoyment.

* * * *

By the way Gerrard were runners up this year in the competition for the London Business Houses' Team Race Competition, whilst Miss A. Davis of that exchange carried off the first prize for diving.

Langham Choral Society.

Since August the members of the "Langham" have been hard at work rehearsing for their opening concert of the season which takes place on the evening of Armistice Day, Nov. 11. The three works to be performed, Stanford's "At the Abbey Gate," Beethoven's Mass in C, and Elgar's "Banner of St. George" have been specially selected for the occasion, and it is hoped that the "Not Forgotten Association," in whose aid the concert is to be given, will benefit to a considerable extent. The soloists engaged are Caroline Hatchard, Margaret Balfour, Alfred Cracknell, Edward Dykes and Tom Kinniburgh.

Gerrard Exchange.

The patients at the "Queen's Hospital," Sidcup, were again entertained by the Gerrard staff on Saturday, Sept. 24. The entertainment was quite informal, and consisted of a sumptuous tea followed by a whist drive, dance and concert. The presence of the matron, officers and nurses lent an additional charm to the evening, which was pronounced by all to have been the success of the season.

City Exchange.

The City Exchange staff gave their first dance of the season at Stationers' Hall on Sept. 24. The Carnival spirit prevailed and a most enjoyable evening was spent. Further dances are being held at the Stationers' Hall on Dec. 3 and Feb. 25, and it is hoped they will be well attended by present and past members of the City Exchange staff. Miss Eastell of the City Exchange is the Hon. Secretary.

Trunk Exchange Bazaar.

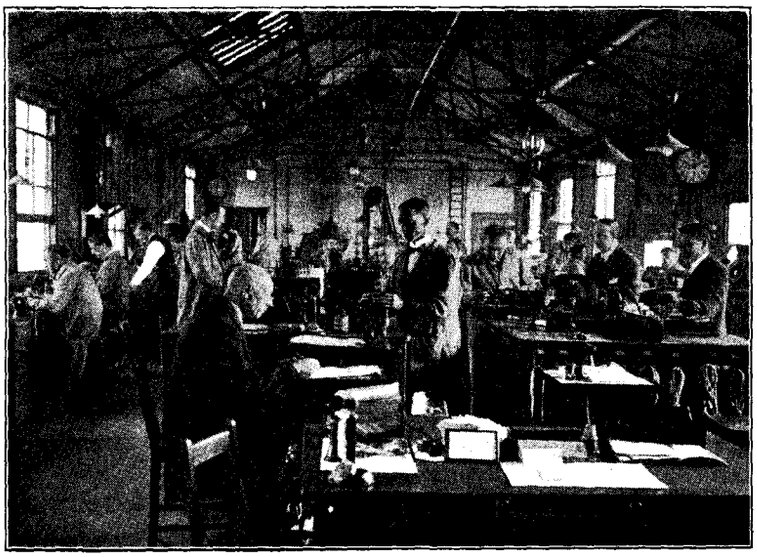
The staff of the Trunk Exchange have organised a grand bazaar to be held on Friday afternoon and evening, Nov. 18. It is confidently expected that this their third venture in aid of the War Seals' Foundation and of St. Dunstan's will be at least a successful as those held previously which resulted in goodly sums being handed over to the charities named.

THE CENTRAL TELEGRAPH OFFICE SECTION, LONDON ENGINEERING DISTRICT.

G. F. GREENHAM AND P. G. HAY.

(*Continued from page* 15)

A very interesting feature in the basement is the Chronofer for the distribution of Greenwich Mean Time throughout the kingdom. The apparatus and electrically-driven clock forming this Chronofer combine to re-transmit the Greenwich time signal at 10 a.m. and 1 p.m. There is a Sub-Chronofer in the Metropolitan Gallery, and there are others situated in various provincial towns. A large number of provincial and metropolitan offices and subscribers receive one or both of these signals.



THE MECHANICS' WORKSHOP.

The lines over which the signal is transmitted to the various offices are of course in use for telegraph purposes normally, and the method by which the time signal is distributed is briefly as follows:—

At about two minutes before the "hour" (10 a.m. or 1 p.m.) a contact on the electrically-driven clock causes a current to energise a number of relays through the contacts of which the lines are connected to their respective instruments.

A CORNER OF THE METROPOLITAN GALLERY SHOWING THE CORD CARRIERS AND PNEUMATIC TUBES.

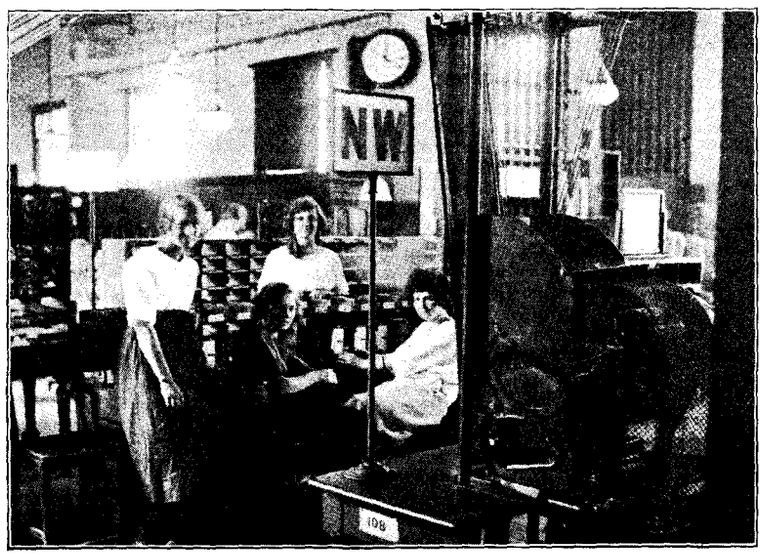
The relays, when thus energised, disconnect the lines from the apparatus and connect them to a second set of relays. From these latter relays the lines receive a positive current, which serves as a preliminary signal, but exactly at the "hour" the signal current from the Greenwich Observatory actuates the relays and reverses the currents on the various circuits. This reversal is the Greenwich Mean Time Signal. On the cessation of this signal current the line current is again reversed, and at two minutes past the "hour" the contact on the electric clock breaks and the lines are restored to their respective instruments.

Near to the test room is housed the desiccating plant consisting of a motor-driven pump—a container for the equalisation of pressure—and several cylinders containing calcium chloride for drying the air which is pumped into the air-spaced cables.

In the basement are housed the secondary cells for supplying current to the lines, local circuits, pneumatic tube signalling wires, bell circuits, small electric motors on machine telegraphs, the intercommunication switchboard, etc.

A very important adjunct to the telegraph apparatus pure and simple is the pneumatic tube service. For distribution of message forms from one point to another in the building an extensive system of house tubes is provided. The installation is worked upon a continuous vacuum system, in which there is no need for signalling apparatus, because the carriers are automatically ejected.

A carrier containing messages is inserted into the tube at the point of despatch through either a funnel or a door entrance, and is immediately caught by the vacuum and drawn to its destination, where a grid whilst allowing the "draught" of the vacuum to pass deflects the carrier through a flap and out of the tube into a receptacle beneath. The aggregate length of the house tubes in the Central Telegraph Office is four miles.



THE AUXILIARY PHONOGRAM ROOM.

In addition to the house tube system tubes are provided between the Central Telegraph Office and various large post offices and commercial offices in London, with which the traffic is very heavy. These street tubes result in considerable economy of space, time, staff, lines and apparatus. Among the offices thus served are the Western and West Central District Offices, Mount Pleasant, the House of Commons, the Baltic, and many branch offices and such commercial houses as the Eastern Telegraph Company, the Great Northern Telegraph Company, the Western Union Telegraph Company, the Commercial Cable Company and the Press Association. There are nearly fifty of these tubes, and their total length approximates to 50 miles. Inside buildings the tubes are usually of brass, but in the streets lengths of lead tubing are used, very carefully joined together so as to form a perfectly smooth passage for the message carriers, and protected from damage by being fitted into cast iron pipes. The power for driving the carriers through the tubes is in the form of either pressure, vacuum, or both, and is supplied by powerful pumping machinery driven by electrical motors. Approximately four 240 horse-power machines are available to work the system. With the street tubes wires are provided between the stations on the tubes, and fitted with signalling apparatus so that the tube attendants may signal the despatch and receipt of carriers, and in certain cases electro-mechanical devices are employed to regulate the feeding of a tube.

Another method of distributing messages within the building is by the use of mechanical conveyors in the form of band and cord carriers. The former consists of an endless band driven by a motor, which travels past the points concerned. A message is merely placed on the band and travels with it until withdrawn at its intended destination.

WHERE TO STAY.

The attention of our Readers is directed to the following list of Boarding and Apartment Houses.

EASTBOURNE.—Convalescent men not requiring nursing receive thoughtful attention at the Y.M.C.A. Hostel, Eastbourne. Moderate.

EASTBOURNE.—"The Polytechnic," 109-111, Tideswell Road Recommended by Polytechnic, Regent Street. Comfortable holiday home. Seven minutes station. Five minutes pier. Liberal table. Piano. Terms, board residence 5*s*. deposit and 2 guineas at end of week.

SHANKLIN, I.W.—Glenavon Private Hotel. Comfortable and homely board-residence Substantial cuisine (separate tables). New management. Close sea, shops. Terms 2½ guineas to 3 guineas. Mrs. M. Geere.

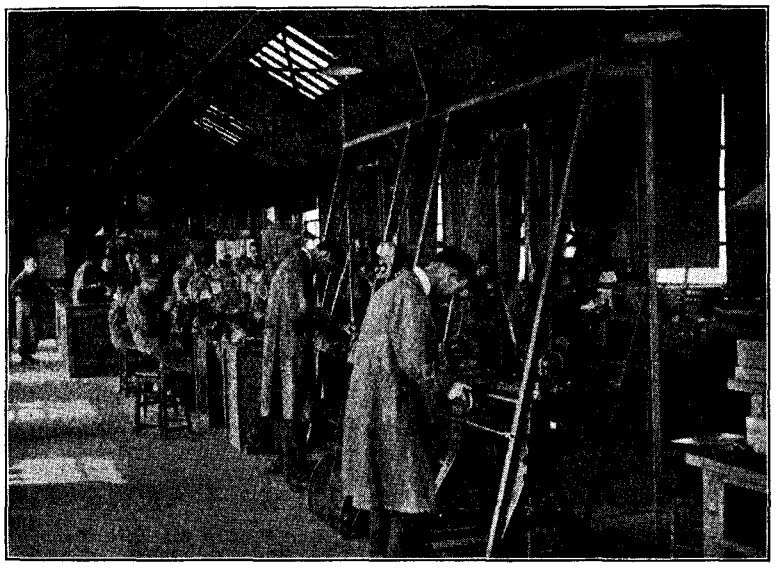
The cord carriers consist of groups of cords, seven in number, which travel in a somewhat similar manner and are actuated by rollers driven by small electric motors. The set of cords passes over rollers placed at various intervals and at the point of despatch the cords are splayed so that a message form can be interlaced with them. The cords grip the form and carry it to its point of delivery, where they are again splayed, releasing the form and allowing it to fall into its allotted space in the hollow of the framework forming the terminal of the carrier. A newer form of carrier for this purpose consists of a light rigid framework serving as a permanent way or guide rail, and a moving cord actuated by motor-driven rollers. A wire clip carried by the moving cord automatically grips the message at the point of despatch and a tripping device at the receiving station automatically effects the release of the message at its destination.

The C.T.O. Section is responsible for the maintenance of the street tubes in the London Engineering District, and for all construction and maintenance work in connexion with house tubes and telegraphic apparatus in the Centre and City Sections.

Work in connexion with extensive mechanical and electrical clock systems in various buildings used by the Post Office falls upon the C.T.O. Section. At the G.P.O. there are 15 master clocks controlling systems comprising some hundreds of dials.

To the manifold activities of which mention has already been made there has recently been added the upkeep of the automatic stamp-vending machines

G.P.O. West also houses the Phonogram Room containing the Phonogram concentration switch and its associated telephones for the distribution and receipt of telegrams, by telephone.



ANOTHER VIEW OF THE MECHANICS' WORKSHOP. [L.E.

About 200 lines are connected to the Phonogram Concentrator and serve as outgoing and incoming junctions to telephone exchanges throughout London. About 150 telephone headsets are available for use with the concentrator, and when a subscriber wishes to make use of this service to originate a telegram his call is received upon one of the incoming lines on the concentrator and plugged through to a disengaged set. The message thus received is written down by the operator, at the set allocated, and circulated to the appropriate section of the galleries for transmission to its destination. A telegram received at the C.T.O. and marked for transmission by phonogram is circulated to the phonogram room and a disengaged operator is detailed to call through the message by means of one of the outgoing lines to the subscriber to whom it is addressed.

The C.T.O. engineers' activities on the telephone side are principally confined to the official switch, which as everyone knows is a Strowger type automatic installation.

The capacity of the installation is at present only 700 lines, but its upkeep has entailed an unusual amount of work, because it has been the installation where many experiments in connexion with the development of automatic telephony have been tried out.

The C.T.O. Section also contains workshops situated at Cornwallis Road, N., wherea staff is located for doing, for the whole district, general maintenance and repair work which is beyond the power of the local staffs to undertake. The workshops comprise a Smiths' a Painters' and a Joiners' Shop.

The bulk of the work is connected with the internal sections in the London Engineering District and concerns additions, alterations, and repairs to apparatus, frames, cable racks, etc., at the London Telephone Exchanges, when such work can be carried out economically by the department's staff. The work is done at Cornwallis Road or at the various exchanges as required.

The work performed for the external sections consists principally of special fittings for subways, manholes and footway joint boxes, such as cable bearers and cantilevers of exceptional shape or size. These all have to be cut, drilled, etc., and prepared in readiness for the external staff to fit in position. The assistance given to the External Sections also includes repairs when necessary to the ironwork of the trucks in the London District. A large amount of repair work is done in connexion with exchange and private branch exchange switchboards and in connexion with the very numerous telephone call office cabinets in use in the London District. The renovation or replacement of worn plug-shelves, keyboards, facing boards, is undertaken.

The number of telephone silence cabinets in use in the London District is very great and, in addition to slight alterations and repairs which can be carried out in situ, there is a continuous passage through the shops of cabinets undergoing repairs, alteration and renovation.

The cabinets thus rendered fit for re-issue include several very old types, which, in addition to dismantling, re-assembling and re-painting or varnishing, require such improvements as additional glass panels, etc., before they can be issued to meet outstanding demands.

To meet special requirements non-standard cabinets have sometimes to be provided, and the fitting of these and of standard types, and the grouping of nests of cabinets with such incidental work as the provision and fitting of attendants' booths form no small part of the work for which the staff at these shops is responsible.

The C.T.O. Section of the London District is considered by its own staff to be the most interesting in London.

LONDON ENGINEERING DISTRICT NOTES.

Progress.

ANOTHER relief exchange—Minories—was opened at 2 p.m. on Saturday, Sept. 24, with 795 junctions and 871 subscribers' lines. The subscribers connected were transferred from Avenue, London Wall and Bank. On Oct. 1 a further 574 subscribers' lines were transferred. The exchange is located at 98, Mansell Street, Minories, E.1, and is accommodated in a temporary building constructed for the purpose by the Office of Works. The ultimate capacity of the exchange is 2,000 lines and 40 "A" and 15 "B" positions have been provided. The installation is similar in all respects to Grosvenor. The work was carried out by the District staff and, in common with that of the other relief exchanges similarly constructed, the quality is of first-class order. The external work in connexion with the transfer was carried out under exceptionally difficult conditions owing to the congested nature of the plant in the manholes in which the necessary changes had to be made, and having regard to these circumstances it is a matter for congratulation that the transfer was effected without serious difficulty.

The work in connexion with yet another relief exchange—Hendon—will have been completed by the time these notes appear in print. In this case also the exchange is accommodated in a temporary building provided by the Office of Works. Relief will be given to Finchley and Kingsbury. The equipment consists of a suite of 7 positions (C.B. 9 multiple boards) which have been installed by the District staff. The capacity of the exchange is 500 lines.

Within the next few weeks the new exchange at Clerkenwell will, it is anticipated, be brought into commission. This will accommodate the lines at present working on the temporary Clerkenwell Exchange, which will ultimately serve as a relief to the Bishopsgate locality and become known as the temporary Bishopsgate Exchange.

The work of installing the plant for the new Stratford Exchange has been commenced, and the buildings for the new exchanges at Tottenham and Wembley are nearing completion.

Alterations and extensions have been completed at Hop, Finchley and New Cross Exchanges, and similar works are in progress at Willesden, East, Hampstead, North, Avenue and Lee Green. Extensions of the Ealing and Park Exchanges and the provision of a temporary exchange at Southall and another at Kilburn are in contemplation.

Private Branch Exchange work shows no sign of abatement. Many works are in hand. The wiring of the London County Council's offices at Westminster is proceeding and, as will be judged by those who are acquainted with the building, this work is of considerable magnitude.

Engineering Offices.

Accommodation for the Post Office Engineering Department in the London area is found by the Office of Works, and this fact sometimes leads to engineers finding themselves in unusual quarters. While one of the chief Inspectors in the Centre Internal Section is contentedly at work in a room previously part of a large workhouse, the Sectional Engineer and his office staff are at present located on the ground floor of a building formerly used as an Archbishop of Westminster's Palace. This fine building has been acquired on long lease and is located in 22, Carlisle Place, S.W. It bears outside a plaque announcing the fact:—

Cardinal Manning,
1808—1892,
lived here.

The building is shared with a section of the Ministry of Labour, dealing with the industrial training of ex-Service men of Middlesex. The Ministry of Health have a pathological laboratory located in the room previously used as the Private Chapel of the Archbishop. Medical research of first importance

is now being carried out on modern lines and the good work of combating disease by prevention proceeds apace.

The particular offices occupied by the Sectional Engineer were previously in occupation by the Board of Trade Profiteering Department, whose energies have now been stopped with a following increase in prices. It is not known whether this is a case of cause and effect. The most palatial of the rooms are occupied by the Royal Commission on the Oxford and Cambridge Universities, and any fine day, distinguished visitors such as Messrs. Asquith, Bonar Law and Balfour may be met upon the stairs. The premises are only in temporary occupation by the Sectional Engineer pending the release by the Admiralty of a building in Charing Cross Road which was purchased to house him and his staff.

The completion of the new Stratford Exchange building has led to the transfer of the North-East Internal Sectional Engineer and his office staff from Dalston to Stratford. Although Stratford may not be considered a desirable headquarters from some points of view, even compared with Dalston, yet it is generally agreed that the accommodation is very satisfactory.

Retirement of Mr. G. W. Connell.

Many readers will regret to learn that Mr. G. W. Connell, Assistant Engineer, C.T.O. Section, retired on Aug. 31 on account of ill-health.

The major portion of his official career which lasted for some 38 years was spent within the Central Telegraph Office, London, and probably no one had a more intimate knowledge of the plant in that vast building. During his official career Mr. Connell took active part in several of the more important events which go to make up the history of the telegraph system.

He had much to do with the extensive re-arrangements which were needed when the sixpenny tariff for telegrams was introduced. It is unfortunate that he was compelled to retire before its re-introduction. He supervised the replacement by secondary cells of the many thousands of primary cells originally installed. He was selected many years ago when a fire occurred at the Manchester Post Office, to conduct an emergency party sent from London, and to supervise their efforts in the restoration of communications. He has watched the gradual replacement of the simpler forms of telegraph apparatus by the more complex types so much in evidence to-day. His experience was not wholly confined to telegraphs, as he was chosen to supervise the construction of the Central Telephone Exchange.

Mr. Connell has now taken up residence in Cornwall and carries with him the best wishes of his colleagues, and the hope that the rest from work will enable him to enjoy his pension for many years to come.

North External Section Outing.

On Saturday, Sept. 17, the North External Section held their first Sports Meeting at Folly Farm, New Barnet.

The programme consisted of 25 events, which commenced at 2.30 p.m. and continued until 5.30 p.m., when an adjournment was made for tea, at which 250 members of the staff and their friends sat down. The programme was resumed and completed at 7.30 p.m.

A short concert followed, and presentation of prizes was made by Mr. C. E. Tattersall, Sectional Engineer, to over 80 winners. Expressions of gratitude were given to Messrs. F. Spicer, G. Stow and J. W. D. Billson, who had devoted much time and energy in making the outing such a great success.

The principal events and winners were as follows:—

100 *Yards Scratch Race.*—A. E. Godman, Dalston.
440 *Yards Scratch Race.*—G. Green, Finchley.
1 *mile Scratch Race.*—T. H. Bell, Tottenham.
1 *Mile Walk.*—J. S. S. Ricketts, Hornsey.
Inter-Section Team Race (6 runners).—Dalston.
100 *Yards Veterans'*.—F. Spicer, Hornsey.
High Jump.—J. L. Doubrowsky, Dalston.
Tug-of-War (8 men).—Finchley.
Tug-of-War (4 youths).—Hornsey.

Clerical Staff Changes.

During the past month a number of Established Clerical Officers have been transferred from the Provincial Districts to the London Engineering District.

These officers have come from all parts of the country—namely:—Scotland East, Scotland West, South Wales, North Wales, South Eastern, North Midland, South Midland, Eastern, Northern, &c.

A hearty welcome is offered to them and it is anticipated that when they have settled down they will have no cause to regret their transfer to London.

THE FIRM OF SIR CHARLES BRIGHT AND PARTNERS.

A PARTNERSHIP is announced between Sir Charles Bright, F.R.S.E., M.Inst.C.E., F.R.Ae.S., M.I.E.E., F.I.Radio.E., M.Inst.T.; Mr. A. Hugh Seabrook, M.I.Mech.E., M.I.E.E., Consulting Engineer (late Chief Engineer and General Manager to the St. Marylebone (London), and Electric Supply undertakings; Mr. A. J. Stubbs, M.Inst.C.E., M.I.E.E. (late Assistant Engineer-in-Chief, H.M. Post Office); and Lt.-Col. H. W. Woodall, C.I.E., M.Inst.C.E. (Director and Consulting Engineer of Gas and Water Companies); under the style of Sir Charles Bright & Partners, Consulting Engineers, with offices at 146, Bishopsgate, E.C.2.

The name of Bright is known throughout the world in connexion with telegraphy and electrical engineering generally. The original Sir Charles Bright, knighted at the age of 26, was associated with the laying of the first Atlantic Cable, while the present Sir Charles—the senior partner of the firm—has been similarly active for many years in land, submarine, and wireless telegraphy. Sir Charles Bright is also closely identified with aeronautics and the Air Service. Mr. Seabrook is a Consulting Engineer, and has been for over 25 years Engineer and Manager of various electric supply and light railway undertakings. Mr. Stubbs is the recently retired Assistant Engineer-in-Chief of the Post Office and a leading authority in telephony, as well as telegraphy. Colonel Woodall, trained as an electrical engineer, is a Director of and Consulting Engineer to Gas and Water Companies.

In addition to advising upon the installation and operation of telephones, telegraphs and wireless, the firm will advise upon gas, water, electricity and colliery engineering. In view of the heavy cost of fuel, economies have to be studied to-day that were negligible before the war. The firm will, therefore, specialise in fuel conservation in relation to the design and construction of power plants—steam, gas, electric, hydro-electric and oil—particular attention being devoted to the utilisation of low-grade fuels and carbonaceous materials, hitherto regarded as waste products.

PERSONALIA.

LONDON TELEPHONE SERVICE.

The following resignations of Telephonists' took place on account of marriage:—

Miss L. A. FINCH of Bexley Heath.	Miss A. B. IVERMEE of Putney.
Miss R. E. TUCK of New Cross.	Miss I. M. BARRY of Avenue.
Miss K.M.G. HOOKER of Bexley Heath.	Miss A. GOODWIN of Avenue.
Miss H. G. WAITE, of Victoria.	Miss F. M. ASHWOOD of Avenue.
Miss E. L. WARING of Victoria.	Miss H. G. JAMES of Avenue.
Miss J. A. MORGAN of Victoria.	Miss M. D. B. MCLEOD of Avenue.
Miss E. K. FRANCIS of Regent.	Miss D. A. BONE of Hammersmith.
Miss E. G. WILKINSON of Regent.	Miss D. M. WILLCOCKS of Holborn.
Miss G. V. R. FAITHFUL of Regent.	Miss A. O. BALDWIN of East.
Miss A. M. SHEPHARD of Regent.	Miss A. A. GENTRY of East.
Miss D. DOWDY of Museum.	Miss A. M. ATTWOOD of Kensington.
Miss L. H. SIDEY of Walthamstow.	Miss M. E. GARRETT of Sydenham.
Miss F. L. COWELL of Walthamstow.	Miss A. E. DAWSON of Avenue.
Miss M. G. MEIKLE of Walthamstow.	Miss L. E. W. RICHARDS of Avenue.
Miss E. A. POPE of Park.	Miss L. M. FARLIE of Greenwich.
Miss E. L. COURSE of Park.	Miss M. E. M. GOULD of North.

RETIREMENT OF MR. W. BROWN.

MR. WM. BROWN, J.P., District Manager, Dundee, who retired in May last, was presented by his colleagues and a few friends with a handsome gold watch, suitably inscribed, as a parting token of esteem and appreciation. Mr. Macfee, District Manager, Edinburgh, made the presentation by post, as Mr. Brown was enjoying a well-earned holiday touring the country. In his reply, the recipient thanked all his colleagues for such a tangible token of regard. He always experienced kindness and helpful advice from them, and the possession of the watch would be an ever present and pleasant reminder of by-gone days—if a reminder were necessary. The perusal of the list of his well-wishers recalled incidents of intercourse—orally and written—each bearing its little quota of fellow-feeling in the difficulties attached to the trying, and at the same time, interesting nature of the public service.

These recollections would live for ever.

RETIREMENT OF MR. J. FRASER.

IN the Imperial Hotel, Aberdeen, the staff of the Post Office Engineering Department, along with their friends, entertained Mr. James Fraser, A.M.I.E.E. late executive engineer, and presented him with a solid silver tea service. Mr. F. E. W. Cowie, who succeeds to the vacant post of executive engineer, presided over the gathering.

Mr. Harvey, postmaster, spoke highly of Mr. Fraser's services and abilities, and also of the good work he has done for the service, and Mr. Smith, assistant engineer; Mr. James Kerr, chief inspector; Mr. J. G. Dean, chief clerk; Mr. J. Finlay, lineman, spoke on behalf of their respective grades.

Mr. J. D. Taylor, after reading a letter from Sir William Noble, regretting his absence on account of pressing official duties elsewhere, made the presentation.

Mr. Fraser said the wrench was great in parting with his old colleagues. He thanked the staff for their loyal support, without which he could not have accomplished so successfully the work which he had had to perform. He referred to the growth of the section and also to the large amount of important work done since he came to Aberdeen.

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CONTENTS.

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THE LONDON TOLL EXCHANGE.

BY M. C. PINK.

IT is thought that readers of the JOURNAL may be interested to see the following notes which have been prepared in connexion with the London Toll Exchange.

The completion of the line arrangements for the exchange was delayed by the difficulties experienced by Contractors in laying ducts between the G.P.O. (South) and Norwich Street. The whole of the lines proper to the Toll system cannot be transferred until this duct work is completed, but as alternative routes could be found for the majority of the lines required at the outset, it was agreed with the Superintending Engineer that the system should be brought into complete operation so far as the London outgoing work was concerned, but that 78 of the incoming Toll lines should be left working in the G.P.O. (South) building until all the necessary cables would be completed.

On this basis the arrangements for the inauguration of the scheme proceeded. The exchanges included in the Toll area were of very diverse types and the circuit alterations involved were somewhat complex. It was most desirable that the alteration should be very closely watched and that there should be no failure so far as the public were concerned. It was accordingly arranged to transfer the Toll lines to the new exchange in groups. Incoming lines were transferred in three groups with a few days' interval between each, and the public were not officially informed of the proposed alteration of procedure so far as their outgoing calls were concerned until a considerable amount of incoming traffic had been actually passed through the exchange. When it was clear that arrangements were proceeding satisfactorily, every subscriber was notified by circular of the change in practice which was to come into effect on Sept. 17. During the week ending Sept. 17 the outgoing Toll lines were transferred to the new exchange in daily batches, the particulars of calls passed by the public for the transferred routes being passed on from the Trunk Exchange to the Toll Exchange.

In preparation for the establishment of the conditions of providing service on demand, a considerable number of new circuits had been provided. Some of these were provided owing to the necessity for the entire separation, under the new conditions, of outgoing and incoming lines. Previously some of the lines had been worked in both directions. Even after the provision of these lines it was anticipated, on the basis of the theoretical investigations made in connexion with the traffic arrangements, that a considerable proportion of the calls originated would probably fail to find a disengaged toll line at the moment of the receipt of the subscriber's demand. The equipment design provided for the probability of 25 per cent. of the received calls having to be reversed to the calling subscriber owing to slight delays in the maturation of calls.

In practice, however, this percentage has not been reached. Only about 5 per cent. of the calls originated throughout the whole day in London fail to find an available Toll line and have to be delayed for later completion. In the busiest hour of the day the pressure on the Toll routes is naturally greater and the percentage of booked calls rises on some days to slightly more than 14. The cases are spread over 58 of the 71 Toll routes, but on many routes the delays are only occasional and it would probably never prove economical to provide lines to secure *absolute* no delay on all routes.

The following 12 routes account for as many as 59 per cent. of the busy period (2 busiest morning hours) delays and it is of some interest to analyse the distribution of the cases:—

Route.	No. of calls delayed owing to Toll lines not being immediately available during busy period.				
	29 Sept	4 Oct.	5 Oct.	6 Oct.	7 Oct.
Aylesbury	12	10	6	9	2
Bishops Stortford	12	5	1	3	4
Boxmoor	11	23	4	5	3
Chesham	10	6	1	6	5
Dorking	16	15	22	15	23
Gravesend	25	6	9	24	11
Hertford	10	—	4	1	1
Leatherhead	4	13	19	11	30
Stanford-le-Hope	6	4	12	5	—
Uxbridge	8	5	2	4	3
Watford	1	18	16	15	7
Welwyn	12	8	2	1	10

It will be seen that the Leatherhead and Dorking routes account for a considerable proportion of the delays. It has not been possible at any time since the opening of the Toll exchange to give a satisfactory service on these routes. Additional lines are badly required. On some of the other routes the delay condition varies from day to day. In this connexion it will no doubt be appreciated that the toll routes now have to cater for the slightest fluctuation in the public demand. Much of the inequality in calling is straightened out under conditions such as previously obtained in the Trunk exchange where the calls were lined up in the order in which they were booked. It is perhaps not surprising that it was impossible to forecast exactly how the altered conditions would affect the ability to handle traffic absolutely on demand on every route. It will be seen, for example, that on the Gravesend route the booked calls varied between 25 on one morning, and 6 on another. On the Watford route, the variation was between 18 and 1, and on the Bishops Stortford route there was only one booked call on one day, whereas on another day the number rose to 12.

The following additional circuits are on order, and their provision will assist in reducing the number of booked calls :—

Route.	Outgoing Circuits. Existing.	Additional authorised.
Ascot	4	2
Bourne End	1	2
Beaconsfield	1	1
*Boxmoor	2	1
Bushey Heath	2	1
Broxbourne	1	1
Chertsey	1	1
Chorley Wood	1	1
Caterham	2	1
*Dorking	1	2
Dunstable...	1	1
Egham	2	1
*Gravesend...	5	2
Hatch End	1	1
Hoddesden	1	1
Horley	1	1
*Hertford	2	1
Kings Langley	1	1
Lingfield	1	1
*Leatherhead	3	1
Marlow	1	2
Maidenhead	7	4
Pinner	1	1
Potters Bar	1	1
Rickmansworth	2	1
Sunbury	2	1
Staines	4	2
*Welwyn	1	1
Westerham	1	1

* Routes specially requiring relief.

Further analyses are being made of the traffic on those of the specially pressed routes for which additional circuits are not already on order. Additional lines will then be ordered as required.

The following statement shows the amount of traffic handled daily up to Oct. 5 (inclusive) from the first full day's working on Sept. 19 :—

Date	No. of Revenue calls.	No. of Through Toll calls.	Miscins. Phonogram and Service Traffic and Ineffective calls.	Total calls passed outgoing on Toll lines.
Sept. 19 ...	3,902	236	547	4,685
„ 20 ...	4,151	274	546	4,971
„ 21 ...	4,162	278	545	4,985
„ 22 ...	4,252	258	564	5,074
„ 23 ...	4,293	297	534	5,124
„ 24 ...	3,168	222	581	3,971
„ 25 ...	930	57	126	1,113
„ 26 ...	4,172	321	528	5,021
„ 27 ...	4,189	280	537	5,006
„ 28 ...	4,290	289	510	5,089
„ 29 ...	4,326	300	561	5,187
„ 30 ...	4,682	307	580	5,569
Oct. 1 ...	3,413	221	533	4,167
„ 2 ...	918	73	94	1,085
„ 3 ...	4,243	300	546	5,089
„ 4 ...	4,092	264	443	4,799
„ 5 ...	4,890	332	562	5,784

Rather less than half the miscellaneous non-revenue traffic is in respect of telephoned telegram work passed by the Central Telegraph Office to Post Offices in the Toll area. The balance consists of calls which are cancelled by subscribers after receipt of a report either of delay, subscriber engaged, no reply from subscribers, or other miscellaneous reasons.

In order that the traffic might be properly distributed and reasonable loads might be handled, it was necessary, prior to the opening of the exchange, to give provisional valuations to all the different types of calls. Detailed traffic returns have been taken, but they have not yet been completely summarised. It will be necessary to take returns over an extended period before the provisional valuations can be confirmed or modified. The present indication is that the traffic has been slightly over-valued, and that it will be possible to handle the increased load which is to be expected during the coming months without any corresponding increase in the Toll staff.

The incoming traffic reaches about 6,000 calls per day on the circuits already working direct into the Toll exchange. The total will be considerably higher when the lines at present omitted from the scheme and retained temporarily in the G.P.O. (South) building are transferred to Toll.

It was expected that there would be some difficulty in breaking subscribers of the habit of asking for Trunks when they required places in the Toll area. During the first few days after the introduction of the Toll system, as many as 900 or 1,000 calls per day (nearly 200 in the busy hour) were still being passed to Trunks instead of Toll. The process of instructing callers is being steadily pursued. By the end of September, the numbers had fallen to about 650 in the day, and 120 in the busy hour. A later record showed a total of 476 for the day, and 108 in the busy hour. It will be seen that the improvement is definite although somewhat gradual.

So far as the accuracy of the records of Toll calls is concerned, there has been no evidence so far of any attempt on the part of a caller to evade payment by deliberately misstating his telephone number when passing a call. Occasional errors in repetition have been noticed, and in some cases subscribers who rent more than one line are quoting the number of a line other than that upon which the call is actually being passed. The latter type of case does not affect the revenue. Some inaccuracy in recording will be inevitable, but every possible step will be taken to keep the errors down to an absolute minimum.

The operating instructions compiled prior to the opening of the Toll Exchange provide evidence of the amount of detailed preparatory work that had to be carried out before the new scheme could be put in operation, and there is no doubt that the amount of thought and care expended on the scheme has been fully justified by the results.

The number of complaints of Toll service have been remarkably few. One written complaint spoke scathingly of the service on the Dorking route where the difficulties were admittedly great. Apart from this instance, however, the public appear to be very satisfied.

REVIEWS.

Die neuere Entwickelung der Funkentelegraphie, ein Siegeszug der Vakuumröhre. By Dr. Heinrich Wigge. Published by the "Ingenieur-Zeitung," Cöthen-Anhalt. 2nd edition. 71*pp.*

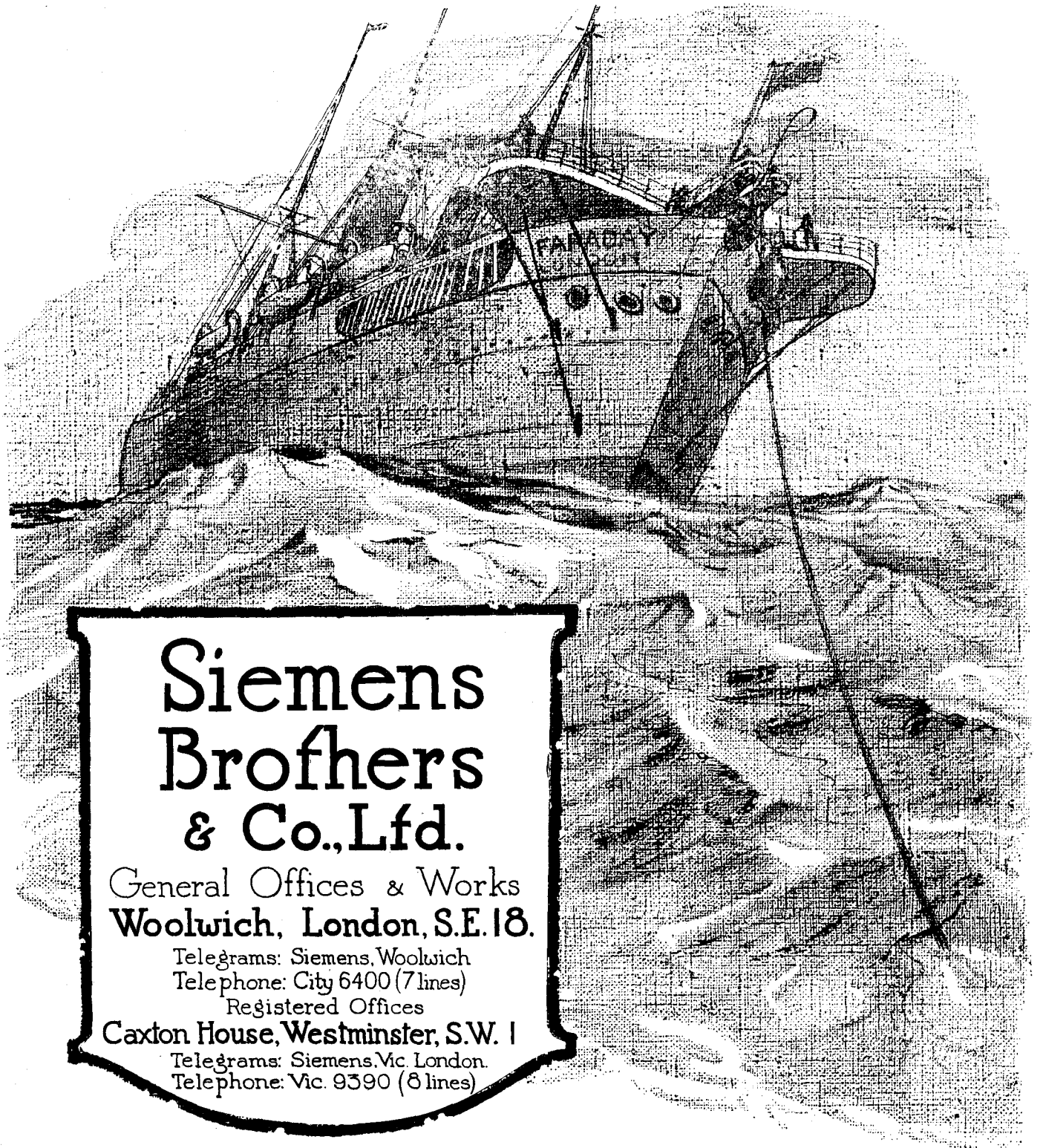
During the last few years the practice of wireless telegraphy has been completely revolutionised by the introduction and development of the thermionic valve. This remarkable piece of apparatus has already more or less completely replaced the older instruments and machines used for the production and detection of electromagnetic waves, while it has made easy other operations and methods of working which were quite impracticable before its introduction. The advance has been so great that the author of the small book under review is quite justified in calling it "a victory procession of vacuum tubes."

The book is divided into five chapters. In the first an account is given of the physical phenomena of which use is made in valves. Then follows a chapter on the different uses of valves in wireless telegraphy. This chapter is divided into six sections, in the first five of which the uses of the valve as oscillation generator, low frequency amplifier, detector, heterodyne receiver, and high-frequency amplifier respectively, are discussed, while the sixth section describes the method of joining up a complete station equipped with valves for both transmission and reception.

The third chapter deals with the manufacture of high-vacuum valves. In the following chapter the practical application of valves to stations on land, and in ships, air-craft and railway trains is discussed, together with the use of frame aerials and their application to direction finding, and of high speed receiving apparatus. The final chapter deals with the application of valves to wireless telephony.

The book concludes with a bibliography, in which is given, for each of the previous chapters, a list of references to sources of further information on the subjects dealt with in that chapter.

The book is written in a popular style, but the subject is nevertheless treated in a thoroughly comprehensive manner. In this second edition the subject matter has been revised up to the beginning of the present year. For anyone who wishes to obtain a good general view of what is certainly the most important section of present day wireless technology, we can strongly recommend it.



THE BAUDOT.—XXVII.

BY J. J. T.

THERE is yet another case of faulty reception at the *correcting* station, the cause of which is to be found at the *corrected* end of the circuit. This fault may not in any way affect good reception at the latter, but it will throw out the reception of the former even after the point of *repere* has been definitely fixed. The fault in question may arise from incorrect relationship between the brush pairs of Rings I and IV, and II and V, at the *corrected* station, which is again a fault none too obvious at first sight. Let us suppose that the normal angular distance between the above-mentioned brushes has become decreased (the brush arm possibly shifted through not being tightly screwed in position, for example), and that this decrease has taken place in their travelling direction. Remembering that the point of *repere* is a local adjustment at the *corrected* station concerning currents received on Ring I which, nevertheless, affects the moment of transmission from the same distributor *via* Rings II and V out to line, then the result of this accidental closer relationship between the brush pairs mentioned at the *corrected* station would be that the transmitted currents from Ring II *via* V at the *corrected* station would reach the *correcting* station just a fraction too soon, and reception would be *in advance*. Naturally, if the distance between these two pairs of brushes had *increased* the currents sent out from Ring II would be received at the *correcting* station a fraction too late, *i.e.*, they would be retarded.

It may be safely stated that the causes likely to vary the orientation of the *correcting* station may all be traced to the above and/or to those mentioned in the preceding article.

In dealing with electrical signals received over telegraph wires, especially those signals which are conveyed from long distances by means of mixed lines—aerial, underground and submarine, there must of necessity be times when they reach the terminal office in a distorted condition. The rise and fall of the current as it reaches its destination is rarely perfectly defined. There is always more or less mutilation.

A and B (Fig. LXXII) will show more clearly what is meant. Here we see reproductions of photographs of actual telegraph signals as they arrived at the end of a long multiple core submarine cable after having been *repeated* at the distant end by an ordinary Fast Speed repeater. The originating signals first travelled over several hundred miles of mixed land-line. Photograph A shows a couple of these signals which are practically perfect, while photograph B gives ample evidence of some disturbing influence which has badly marred the rise and fall of two others which came through immediately afterwards.

Recognising these conditions, provision is made in the Baudot system for utilising the best portion of such signals, when they arrive, and as far as possible cutting away the mutilated portions. This is the function of the small segments which, as we know, are located on Ring I, which Ring it will also be recalled takes up the incoming marking currents from the tongue of the receiving relay *via* Ring IV, and passes them through the respective electro-magnets of the receiver. In single plate simplex sets such as that depicted at the commencement of these articles, Ring I is made in movable sectors each comprising a group of five small segments.

An important part of the adjustment of the *correcting* station is that of "taking the third." This adjustment is made by obtaining the continuous transmission of the third key from one of the keyboards (preferably the first) of the corrected station and adjusting its corresponding receiving sector as follows: Shift the sector slowly in one direction until the figure 3 (or the letter Y) disappears; mark the point; now reverse the movement until the "third" disappears in the opposite direction; mark this point also; now bring the sector back to a point exactly mid-way between. We shall now have adjusted our reception to the ideal position for reception, *i.e.*, the very centre of our wave peak. In duplex installations where the small segments of Ring I are not made in *movable* groups of five segements but in one complete ring, the same adjustment can be made by similarly shifting the entire plate.

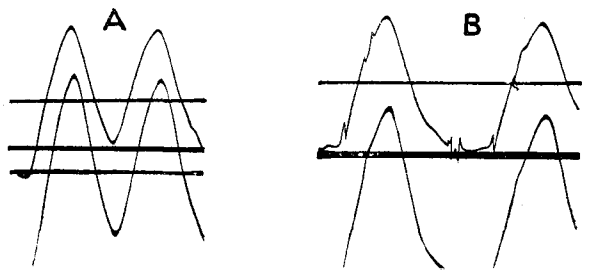


FIG. LXXII.

In this case each distributor face is fitted with a small indicator cut in equal degrees each side of a zero centre so that the exact position can the more readily be determined. These manoeuvres of the small segments therefore cut out all but the best of the arriving currents and as far as possible any variations, fast or slow, in the propogation values of the current.

Let us suppose Fig. LXXIII an experimental Baudot distributor C in which the segments of Ring I have *not* been shortened and therefore measure practically 1/24th of the circumference, instead of about 1/48th as represented by D. Let a signal now be received from the tongue of the relay on to Ring IV, destined to reach E^2

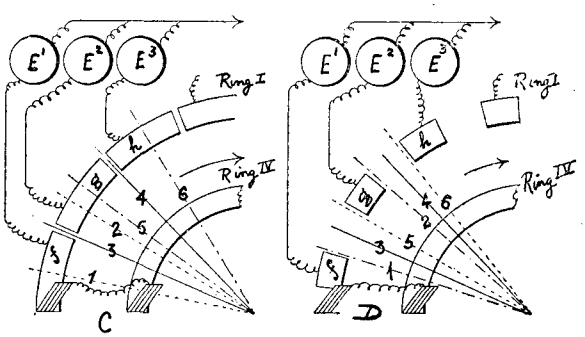


FIG. LXXIII.

by means of its corresponding segment. With so long a segment and with the most perfect of adjustments we could not be sure that the signal from Ring IV would fall absolutely in the limits of the arc 3—4, but might in fact be received in the arc 1—2, or in the opposite direction in the arc 5—6. Thus in the first case E^1, and in the second E^3 would probably be actuated as well as E^2.

Substituting small movable segments (see D) and adjusting so that the centre of our current wave, 3—4 received is received in the centre of the segment *q* (by taking the third as already explained), we shall ensure that the full height of the wave is passed into its destination, the electro-magnet E^2. This arrangement ensures that even with considerable variation of the actual moment of movement of the relay tongue the signal will be correctly received.

(To be continued.)

THE LONDON TELEPHONE DIRECTORY.

BY M. HILDA KNIGHTS (*London Telephone Service*).

To those of us who have been brought up in the London Telephone Service, there is but one *Directory*, although at times one hears faint far-off rumours of at least one other of lesser fame—Kelly!

The dictionary to which I turn in times of doubt, supplies the information that amongst other things a directory should be a guide, and I am going to attempt to show you some of the difficulties that face the Directory Section in its efforts to present a trustworthy guide to subscribers and also to give you a few items of general interest about the *Directory* and its compilation.

I shrink from the task of attempting to cater for every type of mind assembled here, but seeing that no paper is complete without at least a mention of statistics, those mathematically inclined may be interested in an estimate of the *Directory* as regards the extent of its circulation. The number of *Directories* which it was estimated would be required for the October 1920 issue, for instance, ran into more than 225,000 copies. If this does not convey to you any very clear idea of the extent of its circulation, you may be more impressed to learn that such an edition would consume paper to the weight of over 300 tons.

The *Directory* appears in a variety of bindings and in different qualities of paper. The edition which adorns *our* desks might be called the proletariat of its species, in that it altogether outnumbers its brethren, and has moreover a decidedly inferior dress, whose official name is "paper" covers. One of this class is supplied free of charge for each exchange line rented by a subscriber. When this copy is presented by the postman he holds firmly to the new one with one hand, until he is presented with the obsolete copy in the other hand—at least so a lady pathetically reported in conversation recently. It is extraordinary with what tenancious affection subscribers regard an old directory, but the Department maintains a hard and unsympathising attitude and insists on the relinquishment of the cherished book. When payment has been made for *Directories* the Department finds it difficult to recover those out of date, and these probably contribute to the number of fruitless calls made to the exchanges.

Additional copies of the *Directory* are supplied to subscribers without payment in certain circumstances, but only upon request. Copies are supplied free of charge for internal extensions only when the circuits are rented at the message rate, but an external extension invariably entitles a subscriber to another copy. Any member of the public may purchase a copy of the current issue of a *Directory* at a charge of half-a-crown, payable in advance, while an ordinary copy may be exchanged for one of a better class—at least so far as outward appearance is concerned—on payment of a shilling. This type of *Directory* boasts "stiff" covers, and has to endure more hardness than its friends in the corresponding walk of life. Yet another kind of *Directory* is that which is bound especially for use in Call Offices, and when one thinks of the rough usage to which these *Directories* are subjected, the need for strong bindings is obvious.

Some mention should also be made of the fact that a certain number of faulty copies reach subscribers. In the case of missing pages subscribers have been known to ask for those missing, in order that they may be inserted in the book. Needless to say, the Department attempts no such task; a new copy is sent with a letter of apology and an addressed envelope enclosed for the return of the faulty *Directory*.

Under the contract which has just terminated, the printing of the *Directory* was carried out by Messrs. McCorquodale, and in the editions printed by that firm there were roughly speaking three classes of type:—Firstly, the ordinary type in which the majority of names was printed; secondly, that which was known to us as "upper case" type, which was used for the first name of a group of similar names; thirdly, a larger type, for which special payment was made to the Department's advertising agents. The modest appearance of the upper case type used often to attract the notice of those subscribers who did not wish to flaunt their names, so to speak, in every eye, but who would write to say that an entry in that particular type would suit them nicely. Their accommodating manner was slightly perturbed when it was explained to them that this type was reserved for the first of each group of names, and they were still more perturbed when the larger type was offered, upon payment. Then they would hasten to assert that indeed no alteration whatever was required. Others there were who have shed their initials and asked for an entry showing the surname only in order to obtain the coveted type.

The style of printing employed in the *Directory* is constantly under revision, in order that each succeeding *Directory* may have more advantages and none of the disadvantages of its predecessors. To this end some alterations have been made in the present issue. These have been facilitated by the setting up of new type, consequent upon the Stationery Office taking over the printing and publication of the *Directory*. It will be seen that the name of the exchange is in bolder type than the remainder of the entry. This has the effect of concentrating attention on the exchange, which subscribers are requested to pass forward before the number. In addition the width of the book has been increased in order that it may not be so bulky to handle.

The daily press informed the public quite recently, that changes were to be made in the alphabetical order of names in this particular edition of the *Directory*. Unfortunately it assured the possessors of hyphenated and double names that such were no longer to be recognised and that the last surname of each name would determine the position in the *Directory*. For some time there has been a growing tendency to adopt one's mother's maiden name, or if that were not sufficiently imposing that of some family connexion. These names have consequently multiplied to such an extent that they now constitute an item to be reckoned with, and the London Telephone Service could hardly consider the possibility of ignoring them even if a daily paper had the temerity to suggest it. The immediate result of this statement in the Press was a letter from the owner of a hyphenated name with particular instructions as to which name was to be dispensed with. The actual fact is that they are no longer to be regarded as one continuous name and therefore follow closely upon the group of names to which their first name belongs. These names cause both their proud possessors and the Directory Section considerable trouble at times. I call to mind one subscriber who used regularly to request that in the next issue his name might be included under the letter S as none of his friends seemed to find him under T, and before the succeeding issue a further communication would be received (with no intimation that he had had any previous correspondence on the subject) to the same effect, only this time it was the S position that offended. One thinks of the unhappy man in connexion with those lines from Browning,

> "For whom each year we see
> "Breeds new beginnings, disappointments new."

I am glad to say he has at last found an anchor.

It is necessary to explain that a subscriber is entitled to an entry in the *Directory* free of charge for each circuit of which he is the renter, or in the case of auxiliary working lines, one insertion for each group of lines. The subscriber is supplied with a form which bears the heading, in what appears to the Department at any rate to be clear and straight-forward language: "Particulars for the *Telephone Directory*." There are one or two words of explanation added, to the effect that trading names are permitted, that description may not exceed three words, and that address should be as short as possible. After having spent a few years in the Directory Section one is forced to the conclusion that in addition to the three "R's," elementary education should include in its curriculum instruction regarding the use and abuse of printed forms. It is presumed that subscribers make some attempt to read what is required of them before they affix their signatures to such documents, but if some of the information supplied as description were imparted to the public it is at least questionable if the originator might not regard it as of doubtful benefit. The woman who *explained* herself as "married, with separate estate," or the more common "widow," would hardly wish to advertise the fact, at any rate not in a telephone directory: yet in the historic past, "widow" once appeared in an edition, and from the unfortunate woman's correspondence with the Department after the event, it would appear that the *Directory* had been mistaken for the *Matrimonial Times*.

After this small digression we return to the point at which the *Directory* form is used in the compilation of the *Directory*. To this end I must explain the preliminary steps. When a telephone agreement is signed by the subscriber, and after the necessary financial transactions, an Advice Note is prepared with particulars such as name, address, type of installation, exchange area, charges, &c. When the line has been connected and the Advice Note completed by the engineers, particulars are included on the Daily Report, which is, I believe, familiar to many of you, and the Advice Note is then started on its circulation in the office. At this point three cards of different colours are prepared for the Directory Section. These are known respectively as the numerical, street, and delivery cards: the two former are so named because the relative cards are filed in numerical, that is, exchange number order, and street order. The street card is always kept as an exact duplicate of the numerical card, so that in the absence of one card there is yet another upon which to rely. This particular index is the one to which Enquiry Exchanges most frequently turn in times of difficulty, and I believe I am right in saying that this is the only record of its kind in the Service. The ex-Directory record is not kept separately, as in the Enquiry Exchanges, but the numerical and street cards are stamped with this additional information. The delivery cards are also filed in numerical order and authorise the particular number of directories to be delivered for each line.

Upon the arrival of the Advice Note in the Directory Section, it is attached to the relative Directory form and cards which have preceded it, and the particulars are then compared and the insertion made on the special copies of the *Directory* which are prepared for the purpose and which are known as press copies. Amendments relating to changes of name or number, removal from one address to another, or recovery, are made directly from the Advice Notes.

Often the first indication that the Department has that a telephone is changing hands is the receipt of a letter asking for another name to be inserted in the *Directory*, and it frequently follows that this simple request involves the signing of a new contract.

At the time of going to press the staff employed on the Directory Section is more than doubled for about four to five weeks. During this period arrangements are made to include entries for all new lines and removals which are likely to be completed within six weeks of the publication of the *Directory*.

A temporary press copy is brought into use when the original is sent to the printers, and as this is merely an unaltered copy of the last issue of the *Directory*, the standard record in the branch consists of the information to be found on the cards in the numerical file. It is thus obvious how very important it is that these cards shall be an accurate record.

There is a feverish element in the eagerness with which a new *Directory* is welcomed in the section. It is difficult to find an altogether satisfactory reason for this, for with the pride that comes from looking on the work which our hands have made, there is also forced on our unhappy minds the truth of the adage—" Be sure your sins will find you out." There are a few subscribers who write in a calm and dignified manner and request us to be so good as to rectify a mistake in the next issue. But there are others—and with probably greater justification for annoyance—who are not so easily pacified, but one sympathises with them, for it is impossible wholly to make amends until the next issue. One might almost say that amateur detectives are developed in the Directory Section, for every error is traced to its origin, and at times this involves no small amount of investigation. There is much rejoicing and relief when a mistake can at any time be attributed to a printer's error. A special record is kept of all errors, and before the next *Directory* goes to press the proof is examined to guarantee that the same subscribers are not again penalised. I may, however, further suggest an unofficial reason for our anxiety to behold a new *Directory*. The branch which is artistic, at any rate collectively, likes to hazard opinions on the quality of the various productions of art which appear from time to time between the pages. A while ago a subscriber wrote to protest against the Department including in the *Directory* a picture which offended his moral sense and which he considered would lower the tone, not only of the publication, but of the young maidens employed in the Service. I must explain that the picture represented a lady just about to take a bath, her robe having slipped somewhat from her shoulders, which one presumed were beautiful because she had used such and such a soap—which was the subject of the advertisement. It was difficult to share the writer's concern, and it was not until it was discovered that he himself was a rival soap manufacturer that we appreciated that his motives were mixed.

That the Department maintains a fatherly interest in the morals of the community is however, evidenced by its refusal to do more than insert the fact that certain subscribers carry on business connected with the turf. Should such a subscriber ask for a large type entry, which is regarded by the Department as an advertisement, he is informed that his application cannot be entertained.

There are some subscribers who either consciously or unconsciously would embroil the Department in their small trade rivalries. To prevent this, special rules have been drawn up regarding the nature of entries permitted, and mention is not allowed of specific articles of commerce, also various instructions have been drawn up and amended from time to time relative to entries for Limited Companies. Generally speaking, a limited company must appear in its fully registered title, but there are exceptions for theatres, newspapers, hotels, &c. Old trading names also are occasionally allowed if they do not conflict with any other similar name.

Although the *Directory* is run on democratic lines, nevertheless a great interest is taken in the growth and rise of the peerage ; and the newspapers are searched daily for notification of honours conferred. In contra-distinction to this, there are those who would make the book in effect a black list. Recently a suggestion was put forward that in order to save the compilation of a special list, a star should be placed against the names of subscribers on the King's National Roll. The Department was, however, unable to approve a discrimination of this nature in an official directory, where subscribers paid equally for whatever facilities they received in exchange.

In its treatment of the public services, one sees some sense of the responsibility of the State for the well-being of its citizens reflected in the attitude of the Department. Entries referring to Hospitals and Fire Brigades—those institutions which are associated with sudden calamities—are given special consideration. Not only are insertions made under their respective headings, but an additional entry in another alphabetical position is given free of charge.

As perhaps you realise, the Department not only provides a *Directory* but attempts in the Preface and by instructional headlines on each page of the alphabetical list to educate the public in the art of using the telephone. The measure of success which attends these efforts is better known perhaps to our readers.

There is only time to mention in passing that in addition to the public *Directory*, there are also issued at intervals Government Directories containing the telephone number of all Government Departments, and official Directories in which are included all circuits connected with the General Post Office.

We are beginning to realise how closely allied is the work of the operating and clerical staffs, and some of us who are engaged on clerical work have had the privilege of visiting the exchanges with a view to gaining some insight into working conditions in order that we might be enabled to carry out our duties more efficiently.

May I hope that this paper may be a small contribution from the other side and make somewhat more intelligible the clerical work involved in the production of the *Directory*.

OUR FILM.

THE Gaumont Film Company have recently taken a complete film of the Central Telegraph Office to illustrate " The Romance of Postal Telegraphs." It is customary to be a little critical of the cinematograph. Many people are of the opinion that as a means of instruction and entertainment it is below the level of the demands of intelligent persons. On the other hand it would seem to be possible to use this science to explain to the public various industrial processes which serve them day by day but of the details of which they are unaware. There is something of the stage door attitude to life in most of us. We want to get behind the scenes and see how things are done. We are more interested in the shirt-sleeved stage carpenter than we are in the dramatic exponent. It would not be possible to show the public at large how telegraph work is done except by means of the cinematograph. The Gaumont Company is about to show to millions of the inhabitants of the world what the Central Telegraph Office is, how the work is done, and what are the details of the telegraph devices which strive to help industry and social life in the most efficient manner possible.

The film is a long one and will take upwards of an hour to run. It includes the transmission of telegrams by every known method. I am not sure of the proper technical language but in the case of some of the more interesting instruments the photographs have been taken " close up," showing the details of the machines and of the human operations. Long distance cables and wireless and multiplex routes to the provinces and to the continent were all placed under the microscopic eye of this revealer of secrets. One of the most interesting sections of the film deals with the transmission of Mr. Lloyd George's speech on the Vote of Censure. For over two hours the cameras were in place and the great " white-purple " lights were blazing. The operations were shown in detail from the acceptance of the reporters' slips to the transmission through the Intelligence Department, thence to the distribution and thence to the punching stage. Full replicas were obtained of the preliminary sheets and specimens were photographed of sheets as they would be printed by Creed and delivered at the distant offices. The operations of the Imperial Cable were illustrated, Mr. Kellaway himself being key-clerk on the occasion. A graceful message was sent to Canada, Fiji, Norfolk Island and Australia and New Zealand. to which an equally graceful reply was received. The power room and the tubes and the methods of internal distribution were carefully " pictured," if that is the word, and the intercommunication switch was given special attention. In the Phonogram Room the methods of accepting telegrams by telephone from the public and of telephoning telegrams to the public were fully illustrated and any of the public who care to watch the lights on the board as they will appear on the screen will see that a very prompt service was given.

Attempts were made to include groups of the chief officers, men and women, in the film, probably successful as regards the women and unsuccessful as regards the men. Throughout the proceedings the staff were wonderfully patient and co-operative. In many cases it was no mean ordeal to have to do one's day-by-day work with the heat close behind one and the purple-white light upon one. Yet it was done, but I have the shrewdest suspicion that if anyone thinks that in the Central Telegraph Office there are large numbers of people who want to be cinema stars and to lead the rest of their days in the blazing light from huge electric lamps and with their faces ruined of any trace of what their Victorian grandmothers would call a complexion, they are strangely mistaken. A tribute must be passed to Captain Calvert and the various officers of the Gaumont Film Company for the thoughtfulness with which the enterprise was conducted and the insight into the complications of telegraph procedure which they displayed. Many of our colleagues up and down the country will see this film and will see us working " at the other end of the wire." We think they will agree that even the humblest of us is more beautiful than he seems to be in the film.

J.L.

TELEGRAPHIC MEMORABILIA.

COMMENTING upon the recent award of £100 by the P.M.G. to Lt.-Col. A. C. Booth, M.I.E.E., in recognition of improvements in telegraph working and with special reference to the application of the Duplex principle to the Baudot system, the *Electrical Review* remarks: "In a commercial sphere the honorarium would probably have been larger by a hundredfold." It is more than probable; and it is hoped therefore that when the next "Anti-Government," "Anti-Civil Service," or "Anti-Waste" stunt commences, our worthy contemporary and other less level-headed representatives will recall the above and similar instances to mind in connexion with the services rendered to the State by its many servants and will refrain from sweeping criticisms of devoted men and women.

According to *Reuter's Parisian Trade Service*, a Czecho-Slovakian combine controlling a capital of 16 million kronen, 60 per cent. of which is subscribed by the State, has obtained orders for Telegraph and Telephone material from Belgium, Bulgaria, Russia and Yugo-Slavia. All orders in connexion with the public telephone service of Prague have also been placed in the hands of the three companies concerned (all founded since 1918) and now known as The *Telegrafia* Company.

One of the most interesting events in connexion with wireless developments during the month of October was the conference, held in Paris, and attended by representatives of Marconi, the Radio Corporation of America, La Compagnie Générale de Télégraphie of France, and the Gesellschaft fuer Drahtlose Telegraphie of Germany. It is evident that for the future this powerful combination will work in close consultation on all matters affecting mutual interests technically, scientifically, and it is presumed, financially. "A quicker Press service at reduced prices" is suggested by one Press reporter as likely to result from the combined efforts of more rational allotment of wave-lengths and the exchange of the scientific results of laboratory research.

The Italian *Gazzetta Ufficiale* notifies the coming expenditure of 150,000,000 lire upon improvements of the urban and inter-urban telegraph and telephone systems of Italy. No less an additional sum than 16,000,000 lire is to be spent on the erection and systematisation of the telegraph and telephone lines along the railway tracks in course of electrification, viz.: the Turin-Susa, Turin Chieri and Turin-Ronco, and also those lines entering Voghera. Complaints have been received from administrations outside the Italian borders which allege that much of the trouble and difficulty in telegraph working with Italy is due to the close proximity of commercial and transport high-power voltages. Doubtless the experiences gained in running high-power traction, telegraph and telephone lines through the St. Gothard tunnel, for example, will enable the resourceful Italian engineers to reduce to a minimum any possible disturbance due to the, at times, unfortunate proximity of high and low power circuits.

The extension and renewal of telegraph (submarine and land-line) communications steadily proceeds. A direct line between Athens and Broussa is reported as a *fait accompli*, and not without its importance, directly joining up as it does the Greek capital and Asia Minor at a point 57 miles south-east of Constantinople. It has been decided to lay down a new cable between America and Japan, the latest route suggested being by way of the Bonin Islands, Ladrone group, Guam, Midway and Honolulu to San Francisco. According to the *Economic Review* a direct cable may be laid from Bonin to Midway, a stretch of some 2,800 miles. Spain has voted the necessary sum for the laying of a new submarine length from Malaga to Melilla, while the new combined telephone and telegraph cable between Germany and Sweden was successfully placed only a few weeks ago. The work of laying the new cables, already referred to in these columns, as in course of being laid in the East Indian Archipelago by a German company, has also been successfully completed.

According to Signor Giuffrida, the Italian Minister of Posts and Telegraphs, the Government contemplated laying new telegraph cables between the Continent and Sicily, Ravenna and Trieste and Genoa and Nice. Possibly before these lines are in print the Yap-Guam cable will have been opened for public traffic, as it is contemplated inaugurating the Service some time during the Armaments Conference.

Wireless stations are also opening up in all directions, most noteworthy of which stands out "the largest in the world" (W Q K), or Long Island, U.S.A., the working of which was inaugurated by President Harding. From the daily press it is gathered that acknowledgment of the presidential message was instantaneously given by England and immediately followed by Germany.

According to the London *Times*, Berlin has been promised a wireless telephone news service open to all subscribers at an annual rental of £5. It is suggested that banks and newspaper offices would be specially interested. All one has to do is to listen-in at fixed times. This may prove a useful auxiliary to the tape machine and other similar systems, but it would be surprising if the result would be to oust the tape-machine itself. The writer has very direct evidence that the most valuable asset of wire telegraphy is its secrecy. More than one financial interest has complained of the use of *wireless* for the despatch of its telegrams, having very tangible evidence apparently of being preceded in the market by the broadcast nature of wireless transmission.

The *Electrical Review* mentions that the wireless station at Ain-el-Hadjar, near Saida, has just been started by French military engineers. The service will be of a military civil nature, forming a wireless link between France and her African colonies, and providing a stand-by in the event of the breakdown of the Franco-Algerian submarine cables.

A new wireless station is also contemplated for Warsaw with a range of four thousand miles. The work will be carried out by the Radio Corporation of America, and will probably be completed in 1923. Wireless stations are also to be erected at Shanghai, Harbin, Hankow and Pekin in the near future, the contract having been signed, probably by the time this issue appears. At Nijni Novgorod, the manufacture of the essential parts for installing a huge wireless station at Moscow is proceeding apace. This station is destined to signal to any part of the globe. It is also stated by the *Electrical Review* that Russia has already equipped herself with nearly six hundred wireless posts with ranges which permit of complete touch being kept with all parts of Russia, Siberia and Turkestan. The tenders have already been signed between a Melbourne firm and the Australian Navy Department for the general equipment of radio stations at Perth and Sydney. Another big wireless station which is also to be completed in 1923 is that of Katanga in the Belgian Congo, near Elizabethville, whereby direct communication will be obtained between the Congo and Belgium.

According to the South Africa *Telegraph Herald* successful tests of wireless telephony have been made between Cape Town and De Aar, and between Johannesburg and Bloemfontein. Sir Thomas Watt (Minister of Posts and Telegraphs) is reported to have said that "it is satisfactory to know that the public are making more use of wireless telegraphy, and that the system is paying its way." A small wireless station has been set up at Port Elizabeth and working in conjunction with the larger stations of Durban and Slangkop has much improved even if it has not perfected the radio coast communications of South Africa.

Now that high-speed telegraph apparatus has spread throughout the Kingdom and is still spreading, Western Electric, Creed, Baudot, Murray and what not, enquiries are sometimes heard for experienced mechanics well-versed in the intricacies of the mechanism of apparatus such as those above-mentioned. Speaking without prejudice to any other large centre and reviewing the many types of apparatus which have been tried, tested and worked under the same roof from time to time, it would indeed be surprising if the C.T.O. London could not provide the man or men for the job.

The Cable Room staff congratulates Messrs. Tarr and Mitchelmore upon their success in securing well-earned positions in the L.P.S. Messrs. Gibbs, Millett, Thomas and Williams have also been transferred, at least, temporarily, to the Leafield Wireless station.

Consequent on the flux of time the following appointments have been authorised in the C.T.O. vice retirements from the corresponding posts:—

Miss M. McLaren to be Supervisor; Misses A. M. Burrows, E. E. Smith and H. M. Miller to be Assistant Supervisors.

Messrs. J. J. Mansell, G. R. Adams and W. E. Halfpenny to be Superintendents, Section A; Messrs. H. H. Barratt, T. G. Beavis, R. C. Luttrell, and A. F. Reeves to be Assistant Superintendents; and Messrs. A. J. Condy, J. H. Deacon, D. D. Evans, E. Walton, W. K. Ware, and R. P. Mitchell to be Overseers.

The death of Mr. T. Rourke on Oct. 22, after a comparatively short, but terribly painful illness, came as a shock to his colleagues of all grades in T.S. Foreign. "Tom," as he was with the truest affection called, had distinctly an individuality. A very faithful servant of the Department, making no claim to talent or special abilities, he has left a gap which simply cannot be filled. "Always cheerful" is perhaps the simplest yet truest tribute to a sunny nature which spread its happy contagion all round wherever he might happen to be located. Wreaths were placed on the grave at the interment at Abney Park on Oct. 26 from the male and female staffs, Mr. E. Purkiss specially representing the Supervising staff on this sad occasion. A letter of condolence from the Controller was gratefully appreciated by the relatives.

There has been a courteous and informal exchange of ideas and plans between the British and French engineers on the matter of automatic Baudot signalling, the results of which should not be long in evidencing themselves on the Anglo-Continental circuits. The trials on the London-Amsterdam six-channel Baudot of the Booth-Wilmot keyboard perforator transmitter continue to give the satisfactory results expected. The last word in this direction is still to come.

This JOURNAL has rarely to cope with anything approaching severe criticism either inside or outside the Service. Indeed, the appreciation from within has always been and continues to be of the kindliest. It is seldom, however, that one obtains a frank expression of outside appreciation, and it has often been considered an interesting item if we could but "see ourselves as others see us." This opportunity has just occurred, and it comes from one of the scientific branches of the Navy, from an officer now retired, but formerly attached to that most useful but little known branch of our premier defence Service, the Hydrographic Department. During the war this regular subscriber was closely associated with Post Office officials in connexion with submarine cable laying. Writing quite recently, he says:—"Certain it is among your men there are experts of nearly every sort and capable of handling nearly every subject thoroughly. It is the exchange of ideas, exchange of knowledge, splendid spirit of loyalty between master and man which makes your paper so valuable." My correspondent has supplied me with some most interesting matter which we hope to present to the readers of the T. & T. JOURNAL at no distant date. Meanwhile, the kindly helpful spirit in which the proffered information has been placed before us simply enhances the value of our friend's gift.

It is gratifying to publish the fact that the C.T.O. collection on behalf of the Civil Service Life-boat Fund has this year increased by £14 13*s.* 0*d.* on last year. The total amount received through this source for 1921 reaches the handsome sum of £63 13*s.* 0*d.*, of which £27 9*s.* 0*d.* was collected by the ladies.

J. J. T.

SOME NOTES ON SYNCHRONISM.

ONE of the earliest printing systems is the step by step, wherein the positions of the brushes of the two distributors are kept in phase unison by sending over the line a series of reversals which cause the rotating member to step round in unison. The printing pulse takes place when the brushes pause for a definite period. The reversals actuate an electro-magnet escapement movement of the type-wheel preparing its position for the printing pulse. Here we have practically constant correction.

An improvement over this is shown in the Delany Morse multiplex system. In this system a large number of signal segments are used, having correcting segments intermediate at intervals of 60°. This provides for what might be termed intermittent correction, with the correcting impulses occupying a certain percentage of line time.

The next step is seen in the Baudot, where only one correcting impulse per revolution is used. This is an improvement over the Delany in so far as it uses less line time for correcting impulses.

The natural development of using less and less line time for correction is seen in the Western Electric system, wherein no line time at all is taken for special correcting impulses, but correcting impulses are derived from the signals themselves.

The advantage of not having to send special signals to maintain synchronism may be simply explained as follows:—Imagine a telegraph line working simplex which will just carry 1,800 reversals per minute or 30 per second. Let us find out how many words per minute can be carried at this line frequency on a system using two segments per revolution for the transmission of correcting impulses, and a system which requires no special line segments per revolution for correcting. In the case of a quadruple installation, the distributor of the first-named system (Baudot) will require 22 segments—namely, four groups of five for the four sending transmitters, and two segments for correction. Now assume that the segments are connected alternately to + and —, then during one revolution 11 reversals will be transmitted. But as the speed of the line is 30 reversals per second it is clear that the brushes must not be rotated faster than $\frac{30}{11} = 2.7272$ times per second.

In the case of a system which requires no special correcting impulses such as the Western Electric, only 20 segments are needed, giving 10 complete reversals per revolution. Therefore, in this case, the brushes may be rotated at $\frac{30}{10} = 3$ times per second.

But as each revolution of the brushes sends the same number of letters, that is words per second or per minute, in the two cases, the number of revolutions in a given time is an exact index of the carrying capacity in words per minute.

Therefore, assuming the line conditions to be exactly the same and to be the limiting factor, the carrying capacity of the two systems will be in the proportion 2.7272 : 3. That is, the Western Electric carries 3—2.7272 = .2727 more traffic than the Baudot. Now .2727 is 10 per cent. of the simplex carrying capacity of the Baudot which, as shown above, is 2.7272.

In actual practice it has been found that the Western Electric synchronism is more stable than the Baudot, and I shall endeavour to show a reason for this. With the Baudot system, a correcting impulse is received once per revolution, and if the brushes have gained slightly over those at the distant end this correcting impulse acts upon a magnet which steps back or momentarily retards the brushes. This retarding effect is the equivalent of stepping back the brushes 2° or approximately 1/10th of a segment. But now, if the correcting impulse does not arrive at the correct moment, not due to phase displacement of brushes at all, but due to a distortion of the signals, correction will take place when it is not needed, and if such a distortion takes place two or three times in succession the synchronism will be lost.

With the Western Electric method, the correcting impulses are derived from the line signals themselves at the moment when the polarity changes. Now, in this case, should the signals be distorted, we shall receive certain reversals ahead of correct time, and certain reversals later than correct time. But as correcting impulses are generated in both cases, the mean effect of these correcting impulses will be the same as if there were no distortion of line signals at all.

This factor is important, both in the case of underground and aerial lines. The high KR values of underground circuits naturally tend to produce distorted signals as the limit of speed is reached. In the case of aerial lines intermittent contacts will produce slight distortion.

Underground cables have stabilised communication between the large zone centres, but their line speeds are lower than those of the old aerial lines, and therefore, it behoves us to take advantage of every device which will increase the carrying capacity of these underground lines. It has been shown above how 10 per cent. gain (simplex working) can be made without sacrificing any other feature, but instead, actually providing a higher standard of efficiency as regards synchronism.

References have been made to the fact that with Gulstad relays higher speeds can be obtained. This is true. The Gulstad enables a higher frequency of reversals per minute or per second, but when transforming the speed of quadruple transmission in reversals per second into words per minute, the ratio 2.7272 to 3 always remains unchanged.

J. W. TEARE, C.T.O.

"POST OFFICE MANNERS."

THE above heading was given to a short article in the *Daily Mail* regarding the speech by the Postmaster-General on the occasion of the opening of the Toll Exchange. Mr. Kellaway was reported to have said: "It is not sufficient to avoid discourtesy; it is almost an equally serious defect to be off-handed" and that "a good deal of mischief is done to the Post Office by off-handed treatment." After all, off-handedness is rudeness, and now that special attention has been directed to that somewhat common failing of public officials, something may perhaps be done to remove the reproach so far as the Post Office is concerned.

In making arrangements for the staffing of positions where there is direct contact with the public, whether at Post Office counters or the Telephone Exchanges, I would make very careful selection in order to utilise staff who combine efficiency with courtesy, and I would make discourtesy a punishable offence. I do not mean to say that servility is a qualification for such positions. Servility is not a virtue: courtesy is, and should be carefully cultivated. I know that sometimes individual members of the public are very trying to one's temper, but, speaking generally, they may be appeased by the answer courteous. A soft answer turneth away wrath. If you are tempted to return like for like, hesitate and think for a moment, and ask yourself is it worth while? In nine cases out of ten the irate individual will have had the worst of it and will probably be very careful not to "show off" when he again goes to the Post Office or gets through to the exchange.

Mr. Kellaway's remarks referred principally to the experience one gets, all too frequently, from the Post Office counter staff. The counter is where the public gets its first-hand knowledge of Post Office people, it is there, therefore, that the greatest possible forbearance should be exercised. I do not claim to have an excess of the virtue I am advocating in others, but I do say this, the advice I am giving has been acted upon with the best possible results, and I can assure the readers of this JOURNAL that their fellow-humans do really appreciate small courtesies even from the much-maligned Post Office people. Further, it is not fair to those behind the scenes that others should give the impression that *all* Post Office servants are ill-mannered and cross-tempered.

My remarks are intended for all ranks, as I have known even Postmasters to be very ungracious in their manner, especially when speaking by telephone; "Well?" without the "rising inflection" sounds very off-hand on the telephone and makes one think the person speaking would have preferred to say, "Oh, well!" which also sounds funny. According to strength and inflection! The counter, however, is pre-eminently the place where this matter of courtesy requires close attention.

If I may I would like to refer to some early experiences of mine when on counter duties. The incident which first drew my particular attention to the light in which Post Offices were regarded by the public occurred when I was doing duty a branch office at the Docks. An old salt came in to do some business, in which I was able to assist him by giving information which my duty required me to do. When leaving, the old chap took my hand and shook it very heartily saying how much he appreciated my civility.

If space permitted I could relate one or two instances of by-gone days where the tables were turned on discourteous counter clerks who unwittingly were rude to Surveyors instead of the public—a case, perhaps, of entertaining angels unawares.

Now, what I have written is not of the kind we usually get in the pages of the TELEGRAPH AND TELEPHONE JOURNAL. It may, indeed, be considered by the Editor as so prosaic as not to be worth printing. However, there is this moral to be gathered from my essay: Civility costs nothing and is its own reward. Those who practise it will generally find that they derive more pleasure from their contact with the public than they would if they were off-hand or rude.

E. T.

[The point is, we think, that if all of us only realise that each act is an act of service to the public, courtesy will follow. Courtesy is the outward expression of an inward attitude.—ED.]

LUMINOUS SIGNALLING APPARATUS FOR POWER STATIONS.

MESSRS. SIEMENS BROS. have sent us a pamphlet (No. 730A) describing their luminous signalling apparatus for power stations in its most recent and improved form.

The complete equipment comprises a transmitting apparatus, a receiving apparatus and a Klaxon horn or other electric calling device.

The transmitter—which can be supplied either in a pattern designed for attachment to a wall or suitably mounted on a column is enclosed in a cast-iron case having eight circular windows, on which the orders sent appear by illumination. The transmitter is actuated by means of a movable handle.

The receiver consists of a sheet-iron case with a glass front, upon which the orders received also appear by illumination. A push button switch is provided at the side to enable the engine driver to acknowledge the signal. If desired, this switch can be installed at any convenient position apart from the receiver. An order sent by actuating the transmitter handle is immediately illuminated on the transmitter as well as the receiver, and the call will sound at the receiving end.

The luminous signal will remain visible both on the transmitter and on the receiver, and the aural signal will continue until the engine driver acknowledges the signal by operating the press button switch. As soon as this button is pressed the lamps are extinguished and the circuit to the aural signal is broken. This obliteration of the signal at the transmitting as well as the receiving end serves as an indication to the sender that the signal has been received.

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 - - - 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 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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A "LESSON."

WE must confess to some surprise on reading Mr. Ellis Barker's article entitled "The American Telephone and its Lesson" in the *Quarterly Review*. Save brevity, it lacks none of the characteristics which distinguish those articles strictly *ad hoc*—*hoc* being the disparagement of state telephones—with which we are familiar in certain morning and evening journals. There is all that careless handling of facts and figures, and all that consuming haste to judge after hearing only one side of the case. As our readers are probably well aware, essays in the *Quarterly* are usually headed with a formidable list of works of solid authority dealing with all aspects of the subject under review. What are Mr. Barker's authorities? Firstly, the annual reports of the American Telephone and Telegraph Company, naturally very unfavourable to State ownership of telephones; and from these he quotes largely. Secondly, the recent Report of the Select Committee on Telephones, from which he only quotes two pieces of somewhat hostile evidence. Thirdly, Mr. Herbert N. Casson, the quality of whose history and statistics we have criticised before.

At the outset he repeats the old mis-statement that the City of New York has as many telephones as the whole of the United Kingdom. At the beginning of this year New York had 892,000 telephones and this country 987,000. At the conclusion he states that the "dead hand of bureaucracy" has done the greatest harm to the telephone in all countries except in Sweden—an exception which confirms the rule. "The success of Government management in that country is due to the fact that a business builder of remarkable force and ability, Henry Cedergren, was given a free hand in organising the service." Cedergren, however, organised the service of the Stockholm Telephone Company, and not the State service, which it may be mentioned, owned more than two-thirds of the telephones in Sweden before it acquired the property of the Company. Again, Herbert Spencer is quoted as saying that the telephone was unknown in English cities other than London in 1882. A little research would have shown that Manchester Exchange was opened in 1879 (it is a matter of dispute whether it is the second or third exchange opened in Europe), and during the following two years Liverpool and other towns in Lancashire, Scotland, South Wales, Birmingham, and other places obtained telephone service.

Mr. Barker paints a glowing picture of the telephone in America, and we should be the last to gainsay the splendid development which it has attained in that country. He thinks this is the more noteworthy if we allow for the difficulties under which it suffers. It could well be argued, after studying the other side of the case, that England labours under greater difficulties than America. He enlarges on the exposure of telephone poles to attacks by savages, ants, bears, etc. We concede the bears, and admit that the only savages who trouble us are the "young barbarians" who shy stones at insulators. The British lineman out on the Pennines in winter may have something to fear from snowdrifts, but he is at least not in danger of being scalped. These problems, however, are trifling compared with the difficulties of telephone maintenance in the tree-girt roads and lanes of England. The open character of most American pole-routes is the envy of British telephone engineers.

The universality of the telephone in America is one of the most striking features of its development. Mr. Barker is amazed at the number of farmers on the system, but perhaps he hardly appreciates the difference between the situation of farmers scattered over vast tracts, remote from telegraph offices, and perhaps without postal delivery, and that of a farmer in this country. To the one the telephone is his indispensable link with social life and with the great world; while the other cannot be brought to consider it in this light. We are not altogether surprised to hear that it has put the telegraph in the shade, but our author omits to mention that the telegraph in America is not a State monopoly, and commercial companies are, to put it mildly, not so tender of the interests of remote villages as the State. We are told that one can telephone from one's carriage in the better class railway trains, but telephone experts of the Post Office who have just returned from America declare that this is not so, and that this facility is in the experimental stage. Mr. Barker is filled with admiration for the "particular person" call on trunk lines, but forgets to tell us that it costs 25 per cent. more than the ordinary charge.

Whilst America was at war, the Government "obeying the clamour of the ill-informed" took over the management of the telephones. All the trouble which arose from the withdrawal of telephone staff by enlistment and from the concentration of all energies on war are ascribed to this action. When we are informed that "the former excellent service became totally disorganised," we are left to infer that it was entirely due to the "dead hand."

Mr. Barker quotes a "warning" from an American report of 1912 to the effect no Government telephone system would show a

profit under proper accounting methods. Before the war, the two largest telephone systems in Europe, Great Britain and Germany, returned a profit to the Exchequer, and many countries only worked at a loss as a result of these low rates which have so often excited the unbounded admiration of our critics. All these States have since placed or are placing their rates on a basis which will yield a moderate profit or at least pay expenses.

We have perhaps quoted enough to show the kind of "lesson" Mr. Barker thinks is to be learned from America. It is, if we may assemble his well-worn epithets, that the bureaucratic tyranny of a bureaucratically-managed service leads to the strangulation of the telephone system by the dead hand of bureaucracy. It has been taught with equal impartiality by journalists who write for daily papers under a certain pressure of time and circumstance and have not the leisure for that careful research expected from a writer in a learned review. As an example of Mr. Barker's methods we may instance his quotation of Col. Laws Webb's evidence before the Select Committee concerning the ratio of telephone stations to staff. Not the least reference is made to the rebutting evidence of the Post Office witness and the correction of Col. Webb's figures which appear on page 130 of the report.

HIC ET UBIQUE.

"THE result of an experiment by a telephone subscriber in Fulham," says a Sunday paper, "was that out of 175 calls the wrong numbers were given in 70 of them, and none of them was secured in less than 2 minutes."

A man must be very unfortunate to get wrong munbers on 40 per cent. of his calls when the average for all London is about 3.5 per cent., and to suffer a delay of 2 minutes in obtaining connexion when the average time of answer from the exchange is 5 seconds and of connexion with the required subscriber 37.7 seconds; but in the absence of names, dates and details, we can say nothing

except to suggest that the figures are of little interest, unless to show how hardly fortune treated the experimenter.

THE picture we reproduce here (kindly forwarded by a correspondent) decorated the cover of a box of Christmas crackers, *circa* 1880 we should imagine, and we publish it as a sort of seasonable curiosity. Indeed, it strikes a responsive chord in the breast of the writer, whose first acquaintance with the word telephone was when his parents brought home a pair of toy telephones (probably from one of those identical boxes) from an evening party. The telephone had just been introduced into this country at that time and was pre-eminently a topical subject.

UNDER the heading "Politeness pays," the *Pall Mall* says: "A telephone operator in one of the offices in the centre of Paris is now a firm believer that "Toujours la politesse" pays. A Spanish gentleman rushed into the room the other day wanting to speak to Madrid. The operator was unusually quick in getting connexion. The charge for the call was ten francs, and the gentleman handed the operator a 100 peseta note, telling him to keep the change. When he took the billet to the money changers he got 180 francs for it, so that his tip was 170 francs!" We are afraid we can draw no moral from this, nor can we see the connexion between politeness and the fact that a trunk line to Madrid happened to be available when the Spaniard made his call. He was fortunate, but we are left doubting whether we are supposed to be instructed or amused.

IN a recent speech the Italian Minister of Posts said:

The unsatisfactory condition of the Italian telephone service was the subject of constant complaint. This used to be attributed to the incapacity of the private companies, but to-day about two-thirds of the telephones were operated by the State and one-third by private companies, and still more than half the communes in Italy were without telephonic communication.

The immediate programme of the Posts and Telegraphs administration was:—

> The completion of the automatic exchanges in Turin, Genoa, Milan, Rome and Naples; the laying of new lines to carry the increased traffic; the connexion of 409 chief towns with the trunk lines; the re-establishment of direct telephonic communication with the principal cities in central Europe; the improvement of audibility between the extremities of Italy; the completion of the laying of trunk lines cables between Milan, Genoa and Turin; and the erection of wireless stations.

The expenditure on the telephone service in 1920-21, without making allowances for depreciation, and interest on capital, was 74 million lire against a return of 68 million lire. Of the 74 million lire 65 were accounted for by staff expenses, that is to say almost 100 per cent. of the returns was expended on salaries. The telephonic charges, especially the reduced rates were to be revised. The Minister estimated the annual deficit of the Posts and Telegraphs for the last three years at about 300 million lire per annum.

"IN connexion with the working of an Imperial wireless organisation," says the *Statist*, "Mr. Donald recently outlined an interesting scheme that deserves mention. He proposes the formation of a British Radio Corporation, organised on commercial lines, having as shareholders the Governments of the States of the Empire, each represented in proportion to the capital subscribed. In addition to directors appointed by the Governments, the Corporation would have on its board representatives of the Admiralty, War Office, etc. The duty of directing the enterprise would be delegated to a small executive committee, consisting of business men, organisers, and engineers. The Corporation would build the wireless chain under contract, retain the ownership, and, after insisting on ample safeguards, lease the working of the system to a company. In this way, it is claimed, and with some reason, that while the pernicious influences arising from State management would be

eliminated, the principle of State ownership, so important in an enterprise of the kind, would be maintained."

We are comforted by the tacit admission that the presence of *pernicious influences* would not be detrimental to the work of construction. But, alas, the huge board of directors still has another chance of corruption! The large surplus of pernicious influence might be included in the *ample safeguards* on which they can insist. And what would the supermen and the shareholders do then, poor things?

And why are civil servants a pernicious influence? Many of us avoid the world the flesh and the devil!

CONTRACTS have been entered for the laying of over 800 miles of main cables, of which nearly half will contain telegraph wires. The cables will connect 69 cities and towns with the main underground trunk system, and in addition some 500 miles will be laid in connexion with the development of the local telephone system. These works will provide employment for many thousands of men and women, and thus help towards the solution of the unemployment question.

WE regret that in Mr. F. J. Brown's paper on *Imperial Telegraph Communications*, a line was dropped on page 19 after the final proof was sent to press. After the 26th line from the bottom (right hand column) following the words "stated that," it should read:

"the average load in both directions of some of the most famous foreign stations —*e.g.*, the Bordeaux station, etc."

ANGLO-CONTINENTAL TELEGRAPH COMMUNICATIONS 1914-1921.

BY F. J. BINDER (Cable Room).

IT may be interesting at the present juncture, especially to those who "think internationally," and who wonder how the great land-line communications of the Continent have withstood the vicissitudes of the last seven years, to make a short survey of present facilities and prospects as compared with those existing prior to the war, and to consider separately the position of each of the great traffic-distributing centres most closely associated with the countries affected territorially by the results of the war, and which are served generally from the British Isles by the Government cable system.

As to the types of apparatus which are emerging from the aftermath of upheaval, as worthy to play the important parts which the march of events will inevitably demand, it will be remembered that the decade preceding the events of 1914 had witnessed, especially in France, a distinct movement in favour of the Baudot as a successor to the Hughes on a large number of the more heavily-loaded lines, but—if the recent extent of its adoption is to be accepted as a criterion of its efficiency—the Siemens bids fair to become a formidable rival. This instrument has already been so extensively adopted by the German administration as to constitute it the veritable sheet-anchor of their telegraph system In addition, it is finding favour in Holland, Denmark, Norway, Poland, Austria, Czecho-Slovakia, Hungary, Roumania and Switzerland. It appears to appeal in a peculiar manner to the Teutonic temperament, while the Latins, at any rate for the present, are remaining loyal to their nursling the Baudot. The latter, however, lacks, at any rate at its present stage of development, at least one important qualification, which the Siemens possesses, viz., adaptability for automatic re-transmission. This is an advantage which its organisers well know how to exploit, and one that for geographical reasons, has a peculiar attraction for ourselves. Situated as we are, in a relatively detached corner of the Continent, and more distant from the majority of the other members of the European family than any of our competitors on the mainland, we cannot afford to ignore the obvious benefits offered by a system capable of reducing the handicap of distance to a minimum. Indeed the development of the system on these lines, considered in conjunction with a scheme of unity of control, such as enabled the Indo Company to achieve its famous conquests of mileage on the historic London—Tiflis—Teheran line, gives rise to impressions of efficiency hitherto never conceived by the most ardent optimists.

In disposing of traffic for the more remote parts of Europe over the Continental land-lines, it has been the general experience of this country, that as the more southerly latitudes are reached, the services become increasingly difficult, and in cases where the traffic is bound for destinations in the Balkans and south-eastern areas, we have been led to expect the better results, *if transit from West to East is effected prior and not subsequent to transit from North to South*; thus limiting as far as possible, the number of re-transmissions in regions of low latitude. To explain, however, why latitude should thus exercise so potent an influence over the European telegraphs, involving as it would, considerations climatic, geographical, and maybe psychological, would open up a wider field for discussion than it is the purpose of the present article to provide, but the merit of the hypothesis may be exemplified in a striking manner by drawing a line across the map of Europe, from West to East, at approximately the 46th degree of latitude, *i.e.*, from the southern part of the Bay of Biscay to the Black Sea. If the countries be then grouped according as their territory (or the major part of it) be North or South of this line, the result will be as follows:—

Northern Group.	*Southern Group.*
The United Kingdom.	Portugal.
Denmark.	Spain.
Norway.	Italy.
Sweden.	Yugo-Slavia.
The Baltic States.	Roumania.
France.	Albania.
Belgium.	Bulgaria.
Holland.	Greece.
Germany.	Turkey.
Poland.	
Switzerland.	
Austria.	
Czecho-Slovakia.	
Hungary.	

It would be obviously unjustifiable to maintain, on the basis of this partition, that the conditions in any particular country, in either group, were favourable or otherwise, but there can be no two opinions as to which group of States, considered as a whole, is the more capable of improvement.

Berlin's pre-war claim to distinction as the hub of Europe's telegraphic system appears likely to remain unchallenged. To beat her own previous record of direct line communication with 14 countries out of 19 (if Principalities &c. be excluded), would be indeed a creditable achievement, but at the present rate of reconstruction, linked with improvement, even this record appears likely to go by the board. By the end of the year, if the programme laid down be adhered to, all her former correspondents, with the two exceptions of Russia and Turkey, will have resumed direct relations with her. In addition, she can already boast of direct services with three new neighbours in Poland, Czecho-Slovakia and the Danzig Free City. Belgrade, with its recently enhanced status as the capital of a State twice its former size, well deserves the direct connexion which is in course of construction, and it is safe to anticipate that the new Baltic States will not have to wait long for the familiar "Kann Ich bringen" from the German capital.

Bearing in mind the length of the lines, Vienna maintained quite a creditable communication with London before the war, by means of two direct wires, and in many respects this city was admirably situated as a telegraph centre. For some reason, however, the old Austrian administration made no use of Hungarian territory for the purpose of effecting direct relations with countries beyond, and the result was a distinct paucity of lines in the direction of the Balkans. The few that existed straggled over circuitous routes, as was notably instanced by the line from Vienna to Roumania, which in the course of a tortuous journey traversed the full length of Galicia. It is probable that a single line from London will suffice in future for the needs of Vienna. A little of the city's old prestige still clings to it, in spite of misfortunes, and it has not entirely lost its position as a financial and banking centre. The dismemberment of the Austrian Empire, however, has left but a few small provinces to sustain the great and disproportionate capital, which is fated to suffer telegraphically as otherwise.

It is doubtful whether London will renew direct telegraphic acquaintance with Budapest, in any case the old route *via* France, Switzerland, and Austria is not thought to have been sufficiently reliable to invite reconsideration. Provided, however, a fair degree of stability could be assured, a direct communication would prove valuable, especially in furnishing sorely-needed facilities for the more expeditious disposal of traffic for the new Roumania, which country, ranking as it now does, closely after Spain in order of population, and having acquired the oilfields, wheatfields, mineral and agricultural wealth of Bessarabia, Transylvania and the Banat, finds itself in possession of several fine "plums," the picking of which, when ripe, may severely test telegraphic resources in this direction. It is open to question whether the old and interesting route to Asia Minor and what is now Mesopotamia, *via* Budapest and the Turkish land-lines, will be restored, as recent delimitations of frontiers in this area have resulted in the interposition of an additional country (Greece) and consequent higher transit rates, which would deprive the route of its former chief attraction, viz., cheapness.

Among the *nouveaux venus*, Prague (or shall we say "Praha"), as the capital of the most enterprising of the new States, is striving hard for selection as the recognised re-transmitting centre for our Balkan traffic. Not content with having established communication with Paris, Berlin, Warsaw, Budapest, Belgrade, Trieste, Oradeamare (Roumania), &c., she has succeeded in inducing her one-time guardian Austria to part with the better of her two former lines to London, and has achieved the height of a long-cherished ambition—direct working with England. With regard to this consummation, and as a matter of interest, it may be stated that a glance at the names of the offices of origin and the texts of telegrams received over this circuit, might lead the uninitiated observer to suppose, that the birth of a nation had given rise to a mushroom growth of new centres of industry, accompanied by the creation of fashionable

spas and watering-places, until it is explained that in the musical tongue and (to ourselves) unintelligible script of our Czecho-Slovak friends, Prague becomes "Praha," Brünn is rendered "Brno," and Carlsbad and Marienbad are expressed as "Karlovy Vary "(or "Karlvary "), and "Marianske Lazne" respectively.

The projected line to Warsaw, serving as it will, for the disposal of traffic for the whole of Poland, should experience but few idle moments. When it is realised that this new state is almost as large as Germany, challenges Italy for fifth place among the European powers in order of population, and contains within its borders Warsaw, the centre of administration and finance, Lodz, "the Manchester of Poland," the former Austrian industrial centres of Cracow, Lemberg (Lwow), and Teschen, together with Posen (Poznan), it will be realised that when once this vast resuscitated empire has accomplished the task of co-ordinating the various laws and systems of the three empires out of which it was formed, and has acquired industrial stability, the volume of traffic will make special calls upon all available communications. The Polish nation has an exceptional interest in the efficiency of its foreign telegraph service in one particular direction, namely, with the United States, the latter country having been the chosen destination of practically the whole of its millions of emigrants. It remains to be seen whether the facilities which the direct communication with Warsaw will have to offer, will prove sufficiently reliable to enable the British Government service to recover its share in the transmission of this traffic, which it was at one time its privilege to enjoy. It is a noteworthy fact, that economic and political pressure have contributed in a remarkable degree to the presence in Warsaw of great numbers of Jews, and no student needs to be told that any centre where the members of this remarkable race think fit to congregate, inevitably becomes the scene of extensive business transactions.

The Anglo-Russian cable to Alexandrovsk (North Russia), equipped at Peterhead with facilities for automatic re-transmission, possesses the distinction of being the longest direct Anglo-European communication. It is no longer a secret that this cable was one of our first war-prizes. It was taken up and re-laid in record time in order to provide reliable communication with our great Slav ally, who would have been otherwise practically inaccessible from the West. It is the opinion of the writer that the prompt disposal of the prodigious volume of traffic (practically all urgent Government despatches) with which the staff operating the cable were entrusted at a time of crisis, represents one of the most meritorious achievements in telegraphic history. A total of 40,000 words a day was frequently exceeded, 52,000 was reached on one occasion, while it might almost be said that the cable itself deserved a diploma. In view of the apparently desolate and inhospitable character of the country traversed by the land-line between Alexandrovsk and Petrograd, it may come as a surprise to many to learn that this particular section has been remarkably free from interruptions, and that except on the memorable occasion when Alexandrovsk was shelled from the sea, no lengthy disturbance has ever been experienced. In case of need an alternative land-line *via* Archangel is available.

It has been a matter of keen disappointment and regret that a communication of such superb carrying capacity, and possessing from a financial point of view, the potentialities of a small gold-mine, should be lying practically unexploited, solely owing to the economic stagnation which has afflicted the vast country it was intended to serve. It is worthy of mention, that the apparatus at the London end is installed as the immediate neighbour of the Imperial cable, so that when occasion demands, the Empire of the West can be provided with a new and important outlet to the East.

(To be continued.)

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E

Continued from page 21.

Turner Relay.

In the various types of receiving apparatus which have been described above, the strength of the signals heard in the telephones depends on the amplitude of the oscillations set up by the incoming waves in the aerial and the various circuits associated with it. Strong incoming signals will produce loud sounds in the telephones while weak incoming signals will only produce faint sounds. In the case of valve receivers there is a supply of energy from a local source—the high tension battery—controlled by the weak incoming signals. This causes the loudness of the signals heard to be considerably greater than if the energy given by the waves to the aerial were alone employed to actuate the telephones, as in the simple crystal detector. Such devices are called "amplifiers." The loudness of the sounds produced in the telephones when amplifiers are used is, however, still dependent on the strength of the received signals.

We have now to consider a receiving device in which the effect produced does not depend on the strength of the signals by which the device is actuated, but in which, as long as the strength of the incoming signal exceeds a certain minimum, the same effect is always produced on the apparatus by which the signals are interpreted.

Such a device is known as a "relay," and by suitable design the magnitude of the effect produced can be made very much larger than that of the cause by which the relay is actuated.

Electro-mechanical relays, in which a weak current is caused to excite an electro-magnet, and so to draw over a tongue which then closes a gap in another circuit and permits the passage of a second current, which may be much stronger than that by which the relay was actuated, are well-known in ordinary line telegraphy. We are, however, about to deal now with a device in which the incoming signal is caused to act on a stream of electrons instead of on a mechanical device. It was invented by Mr. L. B. Turner, and is hence known as the "Turner" relay.

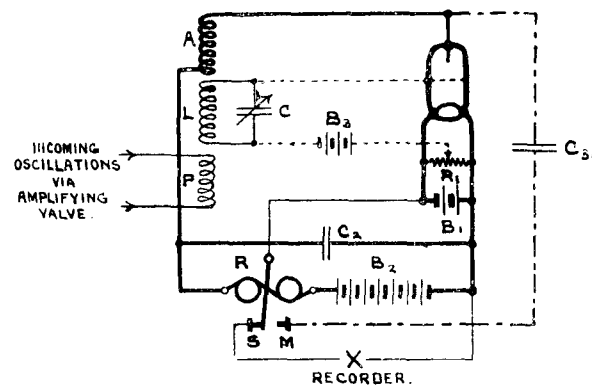

FIG. 19. TURNER RELAY.

The diagram of connexions is shown in Fig. 19. The lead to the anode of the value is taken from the positive terminal of the high tension battery B_2 through the coils of an ordinary relay R, and then through one coil, A, of a triple transformer. A second coil of this transformer, L, has an adjustable condenser, C, joined across it, thus forming an oscillatory circuit, which is tuned to the frequency of the incoming waves.

The plates of the condenser C are joined, one to the grid of the valve and the other to the filament through a potentiometer R, placed across the heating battery B_1. The battery B_3 may be ignored for the moment.

A condenser C_2 is joined across B_2 and R.

It will be seen that we have here an arrangement of circuits capable of producing continuous oscillations, if the correct adjustments be made. One of these necessary adjustments is that the potential of the grid should be brought to a value corresponding to about the middle point of the characteristic curve of the valve, (Fig. 20), already explained in connexion with the circuit shown in Fig. 14 for the reception of continuous waves. In these circumstances, provided the other conditions are suitable, any slight electrical disturbance given to the oscillating circuit LC will raise or lower the potential of the grid, which will increase or decrease the anode current. This change in the anode current will react, through the coils A and L, on the oscillatory circuit LC, and if the coils be joined up correctly this reaction will cause the disturbance already set up in LC to be increased. Each swing of the current in LC will thus cause the next following swing to be greater, and the amplitude of the oscillations will grow larger and larger, the necessary energy being drawn from the high tension battery, till the various losses in the circuit during each swing just balance the energy gained during that swing. The oscillations will then go on with constant amplitude.

Suppose now we make the potential of the grid more and more negative, adding, for this purpose, a battery B_3 in the grid circuit with its negative terminal towards the grid. The grid voltage will slide towards the left along the base line of the curve shown in Fig. 20, and finally a point will be reached at which the change in anode current, due to a slight disturbance given to the circuit LC, is not sufficient to produce sufficient reaction on the circuit LC to start the continuous oscillations. As the grid voltage is made more and more negative, a larger and larger initial impulse has to be given to the system to start the continuous oscillations. If, however, a suitably large impulse be given the grid volts will swing up high enough for the necessary change in anode current to take place to produce the required reaction effects on LC and so to maintain the oscillations. When the continuous oscillations are thus set up, the average value of the anode current will be much greater than the anode current which flows while the circuits are quiescent, as can be seen from Fig. 20. Suppose the critical grid potential, at which oscillations just start, to be—2 volts, and that the grid potential be adjusted to some value below—2 volts, say to—2.4 volts, so that the circuits are quiescent. The anode current will therefore be steady, and its value, as can be seen from the curve, will be .005 milliamperes.

If now a sufficiently strong impulse be received the grid potential will be raised above—2 volts, and continuous oscillations will be set up. The grid potential will swing up and down equally on either side of its normal value of—2.4 volts, to say,+1 volt in one direction and—5.8 volts in the other. The anode current will accordingly pulsate, rising to a maximum of .51 milliamperes when the grid potential reaches+1 volt, and falling to zero when the grid potential has any value below—2.6 volts. The average value of this pulsating current will be .09 milliamperes.

The relay R through the coils of which the anode current flows can be so adjusted that the increased current will draw its tongue over from the spacing stop S to the marking stop M, and some form of recording device placed in the local circuit of the relay may thus be actuated.

The oscillations once started by a single impulse of the necessary strength will go on continuously. For the reception of signals, however, it is necessary that the oscillations should stop when the incoming oscillations stop, and should not continue indefinitely.

This is accomplished, in the particular arrangement shown in Fig. 19, by joining the marking stop of the relay through a condenser C_3 to the anode of the valve. The tongue of the relay is joined to the filament, and so, when the relay is actuated, the valve is short-circuited by the condenser C_3 being joined directly across between the anode and the filament and thus the oscillations are stopped.

The recording device is joined to the *spacing* side of the relay. When the relay is at rest a current from the filament heating battery B_1 flows through the recording device, as can be seen from the diagram. This current is broken when the relay is actuated. The recording device is so arranged that it produces a signal on the *cessation* of the current, and ceases to record when the current flows again.

Thus directly the relay is set into oscillation the relay tongue leaves the spacing stop, and the beginning of the signal is recorded. Directly the tongue touches the marking stop the condenser C_3 is joined across the valve, the oscillations are stopped, and the tongue falls back. But if a signal is still being received the oscillations will be set up again directly the tongue leaves M, and the tongue will therefore at once be drawn back to M. This will continue for so long as a signal is being received, the tongue chattering on M, but, by suitable adjustment, never swinging so far back as to reach S. Thus during the whole of an incoming signal the current from the battery B_1 is cut off from the recorder, and, therefore, as explained above, a continuous signal is produced by the recorder. Directly the incoming signals cease the oscillations are quenched and the relay tongue returns to its spacing stop, thus allowing the current again to flow through the recorder and causing the latter to cease to indicate a signal.

(To be continued.)

LONDON ENGINEERING DISTRICT NOTES.

Institution of P.O.E.E.

A LARGE audience assembled at the Institution of Electrical Engineers on Oct. 18 to hear a paper read by Mr. McIlroy on "The Method of Accounting in the Engineering Department of the Post Office." The close attention given by the hearers was a tribute to the interest with which the lecturer had invested a subject which might, in other hands, have proved to be dry.

Mr. McIlroy dealt first with the manner in which the money spent by the Engineering Department is obtained, and then with the method by which the expenditure of this money is accounted for. After the preparation of the cost statement in the Superintending Engineer's Office had been explained, a description was given of the procedure in the Accountant-General's Department. Considerable emphasis was laid upon the importance of the primary voucher, which is prepared by the workmen and subsequently checked by the Inspector. It was pointed out that this forms the basis of all subsequent operations.

The impression created in the minds of many of the hearers was that the paper could, with advantage, be read at all the Institution Centres, and that if the information could be widely disseminated among the classes concerned in the preparation and checking of the primary vouchers and the abstraction and tabulation of the various items, the work would be done more intelligently and accurately. Moreover, interest would be stimulated, and work which hitherto may have seemed wearisome and futile would become full of meaning.

The discussion that followed was brisk and informative, and one could not help wishing that some of the newspaper critics of government methods could have been present.

It is recollected that during the newspaper agitation last year, a member of the House of Commons wrote a letter to the Department which contained certain criticisms that obviously arose from want of knowledge. An engineering officer interviewed this gentleman and described some of the features of the engineering accounting system with the result that not only were the criticisms withdrawn, but the statement was made that few commercial concerns were in possession of such a thorough system as that in operation in the Post Office, which not only ensured that the authorised expenditure was properly accounted for, but which also enabled the cost of each operation to be readily ascertained.

New Exchange.

On Wednesday, Nov. 2, 1921, the Hendon temporary Exchange was successfully opened with 124 subscribers transferred from Finchley and Kingsbury. 27 incoming and 27 outgoing junctions were provided. On the following Saturday, a further 18 subscribers' circuits were added.

The exchange is housed in an army hut at Queen's Road, Hendon, and has an equipped capacity for 500 lines. The switchboard consists of 7 sections of the P.B.X. type, each equipped with 17 cord circuits.

Two unusual features are the ringing and busy-back circuits. The ringing is obtained by transformation from the electric light supply. The busy-back circuit depends for its action on the alternate polarization and de-polarization of two electrolytic cells, each of which is made up of two iron plates immersed in a solution of caustic soda.

The power plant consists of a 1 h.p. motor, 415 volts 3 phase direct, coupled to the charging generator, two 11 cell batteries of the chloride type, and a charging panel of a type which has been specially designed for use at small exchanges.

The whole of the work of installation has been carried out by the District staff.

Special Cord Circuits for Telephone Repeaters.

A telephonic cord circuit repeater station to be installed at the London Trunk Exchange has been authorised. The switchboard equipment will provide for ten repeater cord circuits and 120 trunks, with their balances, on one section of two positions. Power and testing equipment is being provided for an ultimate capacity of twenty repeater cord circuits, to serve four positions (240 trunks).

Electrophone Amplifiers.

In October, 1919, the application of amplifying valves to electrophone transmission was discussed. It was agreed that the most suitable place to insert the valves was at the Electrophone Exchange. Experiments were carried out, which at the outset gave an amplification of 5-fold without distortion. It was, however, soon demonstrated that defective transmission at the theatre was accentuated by the use of the valve and that the maintenance of the transmitters was a matter of very great importance.

In August, 1920, amplifiers were tried which has separate output circuits for groups of lines of different lengths. A very satisfactory hearing was obtained, articulation being much improved and volume ample with 38 five-mile lines, 32 ten-mile lines and 12 of over ten miles in length on the three output circuits of one amplifier. Finally, a set was experimented with which gave every satisfaction without any special grouping of lines, and this set has been adopted.

As many as 221 subscribers have been connected to one music line at one time, and the advantage of being able to cope with heavy demands for

a particular entertainment without having to provide additional music lines, will be apparent.

Ten repeater sets—Repeaters Telephonic No. 5A—are now being installed in the Electrophone Exchange by the Department.

Phonogram Installation. C.T.O.

For some considerable time the question of equipping a complete new phonogram installation at the Central Telegraph Office has been under consideration. Details have now been settled. The whole installation comprising concentrator switchboard and operators' sets will be located on the first floor, G.P.O. West.

The switchboard will consist of four No. 10 type sections, suitably wired for the purpose. At the outset there will be 125 operating sets. There will also be three enquiry positions.

It is, of course, fairly generally known that the phonogram service provides for the receipt at the Central Telegraph Office of telegrams over telephone circuits and the transmission of telegrams by means of telephone to Post Offices for distribution. An extensive pneumatic tube system between the Phonogram Room and the various distributing points in the telegraph galleries will form part of the installation.

Awards for Suggestions.

It is pleasing to note from the latest record of awards granted for suggestions received during the six months ended Sept. 30, that several officers in the London Engineering District are mentioned. The staff at the C.T.O. invariably take a fair proportion of the money awarded. It is noticed that two suggestions in connexion with devices for sharpening punches in connexion with Kleinschmidt perforators were favourably received. One officer received an award in respect of modifications to the ring connexion of switchboard plugs. The fact that after all the years of experience of the working of switchboard plugs, improvements are still possible, should indicate to the staff generally that despite the constant standardisation of plant that takes place, finality is never reached, and that a little thought concerning the efficient operation of tools and apparatus in daily use may, under favourable circumstances, lead to a tangible result in the form of a cheque.

Foreigners and the British Telegraph and Telephone System.

From time to time foreign administrations send to this country representatives to be trained in work appertaining to the Postal Telegraph and Telephone Systems. No doubt the gentlemen selected are chosen because of their special aptitude for the work, but it is surprising how quickly they absorb the information imparted to them, when the complexity of the subject and the language difficulties are taken into consideration.

For some time past a gentlemen from China has been studying the engineering aspect of the work at the Central Telegraph Office, and the answer given below extracted to a question from a paper set with the object of gauging the progress made, indicates not only a facile command of the English language, but a keen appreciation of the ever changing needs of the service.

"*Question.*—Having regard to the trend of the telegraph traffic in Britain, what policy would you suggest to cope with it, as regards the type or types of apparatus likely to prove most suitable.

Answer.—In the light of the present high stage of civilisation, whereby all activities of the human life of all countries have become more closely related to one another, it is a matter of course that the demand for speedy means of communication to satisfy individual and commercial purposes will be ever-increasing as the time goes on.

We students of the telegraph science, are in duty bound to consider seriously the nature of this demand and to seek means to satisfy it to the greatest advantage of the public.

Thanks to the distinguished inventors who have devised various ingenious apparatus and working methods to the telegraph field with the result that we may now be able to form some definite policy to satisfy the public wishes on very economical lines.

It is indeed a great pleasure to examine the development of the telegraph science, from the rough conception of needle telegraph at the very outset to the present stage of high-speed direct type-writing apparatus and from the plain simplex to the complicated multiplex method of transmission. And it is a greater pleasure to note the manner in which the British General Post Office have collected these various systems in one organisation and applied them in their right positions to meet the various circumstances of the community at large.

However, any system which has lived out its fittest time and is no longer compatible with the new requirements created by new circumstances must die its natural death. Thus we see that the earliest form of needle apparatus has become a curiosity in the museum, while others which once played a prominent part on trunk lines have now receded into the unimportant corners.

There is no doubt that the wonderful development of the telegraph science has ushered in the vast amount of traffic; but it is also a fact that the growing traffic has made it an ever-pressing need on the part of the telegraph engineers to mete out improvements to cope with it.

The modern conditions of public resources, have, however, directed our attention to the importance of economical considerations in our fitting out of any system for the public service, while the diversified state of commercial transactions of different localities, as well as the fluctuation of demand and supply in all business centres again necessitates us to provide a system suitable to meet variable circumstances. To satisfy each and every case with the greatest success both to the public and to the management, it is obvious that the system of apparatus must be such as to involve (1) low initial outlay; (2) economy in maintenance; (3) minimum of tear and wear; (4) to provide for automatic type-printing; (5) automatic transmission; (6) means for automatic retransmission; (7) greater range of working efficiency in regard to line variations (8) to possess greater flexibility in speed and (9) to enable errors to be rectified with minimum delay.

So far as the varieties of the existing apparatus are concerned, we have as yet not had one single type that could fulfill all the conditions prescribed. However, as a policy to better meet the present traffic requirements both as regards their nature and quantity, the Baudot multiplex and the Wheatstone automatic associated with the Creed apparatus will be found to approach nearest the mark of the ideal type, pending further development of either of the two systems themselves or of the telegraph science in general.—Oct. 20, 1921."

Telegraphs.

One triple duplex Baudot set has been installed during the past month on one of the Amsterdam circuits. This now gives Amsterdam two triple and one double duplex sets. A similar set has also been provided on one of the Brussels lines in place of a double duplex.

Hughes circuits to Paris Bourse and to Amsterdam Bourse have been provided at the London Stock Exchange Office. This is an interesting note of development inasmuch as direct telegraph working to the Continent is an entire innovation at the "Stock."

Metropolitan Special Constabulary Reserve. Post Office Division.

Several members of the District staff received the long-service medal from H.R.H. The Duke of York at the Parade in Hyde Park on Oct. 2, 1921. The medals were awarded in recognition of three years' voluntary service on police duties during the war period.

Several other members of the Reserve have qualified for the medal and will receive it at a later date.

NOTE.—In the article on "The Central Telegraph Office Section London Engineering District" on page 30, the wording beneath the second and third photographs was transposed. The first represents the Auxiliary Phonogram Room, and the second the Cord Carriers and pneumatic tubes.

LONDON TELEPHONE SERVICE NOTES.

Armistice Day at the Controller's Office.

AN impressive ceremony took place at Queen Victoria Street, at 11 a.m. on Nov. 11. The idea of commemorating the occasion of the third anniversary of the 1918 Armistice originated with the London Telephone Service Whitley Committee, who were responsible for the arrangements.

Shortly before 11 a.m. representatives from all sections of the staff assembled before the Rolls of Honour in the Public Lobby. The Controller and his chief officers took up their positions on the stroke of the hour, and the two minutes' silence was observed. The tension was relieved at last by the report of a maroon, and after a short address on the significance of the solemn occasion, the Controller placed beautiful, yet simple wreaths under the respective Rolls of Honour, the wreaths being handed to him by representatives of the two sections of the staff for decorating the Women's and Men's Rolls respectively.

On the following Monday, the Controller, attended by representatives of the staff, deposited a wreath at the Cenotaph as a tribute to the memory of colleagues who gave their lives during the Great War.

An Office Match.

It is not often our pleasure to record a marriage between members of the staff, but such an event took place recently when Mr. E. H. Gimber of the Accounts Branch took unto himself Miss M. E. Grigg of the same branch. The bride was presented by her colleagues with a silver tea service, and the bridegroom with a handsome oak clock. The wedding took place at St. Luke's Church, Battersea.

City Traffic District.

The City Traffic District Office Annual Dance was held on Oct. 29 at Australia House. All the exchanges were well represented, and the Traffic Branch and Secretary's Office also provided support.

The music was of an excellent character, and a feature of the function was the energy displayed by the dancers, few of whom failed to participate in every item. The M.C.'s were Messrs. J. Webb and R. T. Gregory. At its conclusion, everyone agreed it had been a most enjoyable evening. It is unfortunate that a larger hall could not be obtained, as there was keen competition for the 280 tickets issued, and twice that number could have been disposed of. The promoters have doubtless made a note of it.

London Telephonists' Society.

The second meeting of the London Telephonists' Society was held on Wednesday, Nov. 2, when a debate was heard between Messrs. H. G. Corner and H. Dive on the subject "Has the Telephone added to the sum of Human Happiness?"

The weather capriciously chose the night in question for one of its worst exhibitions; but in spite of this, the reputation of both speakers was sufficient to draw large numbers to the debate.

Mr. Dive opened with the affirmative side; and in a brightly written paper showed, with his accustomed ingenuity, that the telephone satisfied the definition of happiness as given by such authorities as Confucius, Emerson and Dr. Johnson, while his picture of the telephone as the one thing lacking in the romance of Ulysses and Penelope and of Richard and Berengaria, convulsed his hearers even if it did not convince them.

Mr. Corner followed, and in a few moments took his audience back eight thousand years. He contended that this, the Mechanical Age, had not brought happiness in its train; that our modern inventions had brought instead destruction and disaster; that retrogression had taken enormous strides during the last 150 years as compared with the previous 8,000; and that we should not be really happy again until we got back to the beautiful and simple things of life.

It is hard to resist the belief that Mr. Dive really agreed with him. It is even being whispered that next session the two counsel will exchange briefs.

A number of speakers took part in the discussion. The Chairman summed up, and a member of the audience demanded a division. A vocal expression was invited, and although the Chairman's ruling was that the "Ayes" and "Noes" were equal, the "Noes" certainly produced a greater volume of sound.

* * * *

The December gathering of the Society takes the form of a Dance, which will be held at the Bishopsgate Institute on New Year's Eve.

* * * *

Langham Choral Society.

The Society's first concert of the season took place on Armistice Night. The programme, consisting of Stanford's "At the Abbey Gate," Beethoven's "Mass in C," and Elgar's "Banner of St. George," was very exacting, being almost entirely choral. From the artistic point of view and judged by the criticisms in the public press, the performance of these works was eminently successful, but whilst the concert was well attended, the hope that the Queen's Hall would be filled to overflowing, in view of the intention to hand the profits to the "Not Forgotten Association," was not realised.

The Society's next performance will be at Queen's Hall on Jan. 24, when "Elijah" will be sung. If this note meets the eye of any male vocalists (especially tenors), who would care to assist, perhaps they will get into touch with the Hon. Secretary, Miss W. M. Nurse, 61, Shalftesbury Avenue, who will be pleased to give them further particulars. Members of the Engineering staff will be particularly welcome.

* * * *

Culled from the Exchanges.

The collaborators in these notes have invited the staffs at the exchanges to send along items of interest with a view to having them included in these columns. This has already borne fruit, and the following items have been received:—

East Exchange.

The East Swimming Gala was held at Poplar Baths on Thursday, Oct. 20. All the events were desperately contested, and the spectators were kept at a high pitch of excitement. The results were:—

Ladies' Team Race.
London Wall Exchange beat East Exchange.

Open Team Race.
Avenue, Central, Gerrard and London Wall Exchanges, won by Central.

Men's Team Race.
Denman Street beat East.

Ladies' Club Handicap.
Miss Brinsden 1. Miss Jones 2.

Men's Club Handicap.
Mr. A. J. Woolner 1. Mr. A. Crooks 2.

Ladies' Club Championship.
Miss Jones 1. Miss Brinsden 2.

Men's Diving.
Mr. W. Crooks 1. Mr. Sinclair 2.

* * * *

Mayfair Exchange.

On Saturday, Oct. 22, Australia House was the rendezvous of those who supported the dance arranged by the Mayfair Exchange.

The dance, which was the first held by Mayfair this season, was most successful, and all who were fortunate enough to be present found everything arranged to provide for their comfort and enjoyment. The dance music provided by the excellent "Bon Accord" Band and the good floor and hall, combined to make terpsichorean exercise a true delight. The dancers were indebted to Mr. J. E. Collins, who was an efficient and amiable M.C. Another dance is arranged for Saturday, Dec. 10.

East Ham Exchange.

The following is extracted from the Annual Report of the Penny Association and Guild of Nurses, associated with St. Mary's Hospital (Plaistow) for Women and Children:—

"The staff of the East Ham Exchange, by whose wish no names are to be published—not only have they sent £25, the proceeds of their concert, but at regular intervals some of them visit the patients, and they never arrive empty handed, but are laden with all sorts of things—jellies, flowers, books, &c., all of which are most acceptable, and the patients love their visits."

* * * *

Regent Exchange.

A very interesting letter on the subject of the JOURNAL has been received from Regent Exchange, and as it contains many suggestions for including items which may tend to make the JOURNAL of greater attraction to the fair sex, it has been forwarded to the Editors. It enclosed the drawing by MR. A. E. NIBLOCK, which is here reproduced.

It is said that the following actually happened at Regent:—

SUPERVISOR (*speaking on head-set of bewildered learner*): "Is there anything wrong with your pilot?"

BEWILDERED LEARNER: "What did you say?"

SUPERVISOR: "Is there anything wrong with your pilot?"

BEWILDERED LEARNER: "Sorry, I cannot hear you."

SUPERVISOR (*with emphasis*): "Is there anything *wrong with your pilot*?"

BEWILDERED LEARNER (*appealing to the adjacent telephonist*): "What must I say? There is somebody on here asking me if I am Pontius Pilate?"

* * * *

Walthamstow Exchange.

The staff at Walthamstow made a presentation to Miss F. G. Hutt, the Supervisor-in-Charge, on the occasion of her transfer to East Exchange. The gift was a tangible form of expressing the staff's deep appreciation of the assistance and guidance they had received from their chief and counsellor.

HAS THE TELEPHONE ADDED TO THE SUM OF HUMAN HAPPINESS?—A SIDELIGHT ON THE DEBATE.

BY F. L. SANDERS.

IT will be remembered that the debate between Messrs. Dive and Corner terminated with opinion fairly equally divided, neither speaker having produced sufficiently conclusive evidence in support of his particular point of view.

It is the intention of this article to convey to those interested in the subject another and perhaps wider aspect, the argument being in favour of the telephone—and in support of Mr. Dive's contention—and based upon the plain, solid, historical fact that the telephone played a most important part in the Great War, and was in no small degree responsible for its termination, and incidentally, for the condition of peace we enjoy to-day.

The particular incident I have in mind took place somewhere in September, 1914, about the time of the Battle of the Marne. It will be remembered that French troops were rushed from Paris by taxicab to the support of our so-called Contemptible Army when it was in real danger of annihilation during the great German bid for Paris.

It is of course well known that the combatants utilised the most modern methods of mechanical and chemical warfare but, as demonstrated, it was primarily to the use of mechanical aids that the French were enabled to reach the line.

The only possible manner in which those in authority at Paris could have known in time to take adequate steps to render the necessary assistance to their British ally was by means of wireless or telephonic communication. The distance from the line was such that it would have been impossible even with existing mechanical aids to have travelled to the capital and organised a force which could have arrived in time to have saved our Expeditionary Force.

Yet it was accomplished: the French troops arriving at the psychological moment to assist in stemming the advance of the so-far victorious enemy and definitely closing the road to Paris.

Now this is where the connexion between the telephone and human happiness becomes apparent.

What might have happened had the enemy reached Paris it is difficult to say, but it has been hazarded that a repetition of the disastrous agreement of 1870 would have taken place, leaving the enemy free to devote his attention to ENGLAND—and at the same time free to perpetuate in Northern France what they practised in Belgium—Louvain, Liege, &c.

Had the German Army succeeded in the first part of their ambitious schedule and gained Paris, they would have had at their disposal a seaboard eminently suitable for the basis of submarine operations against this country. Our Navy upon which we relied as the premier line of defence would have probably found itself engaged upon tasks other than that of patrolling the North Sea and enforcing an economic blockade. In this event there would have been considerable diminution of force available for combating the "High Seas" fleet in any attempted raid on our coasts, incidents which in themselves would have been in no way conducive to the happy sense of security which we had hitherto enjoyed.

Undoubtedly the happiness of the world was in jeopardy when the Germans made their first bid for Paris, but the use of the telephone—wireless or manual—frustrated their machinations to enforce their kulture on the rest of the world, and by so doing definitely established a relationship with human happiness in the widest sense.

Is it necessary to ask then, "Has the telephone added to the sum of human happiness?" when the two are so indissolubly bound together? There can be but one answer—YES!

ABOUT STATISTICS.

BY H. MORGAN (*Contract Branch, L.T.S.*).

MOST of us are well content to let "X" equal the unknown quantity. There are, however, quite a number of the people who look upon the compilation of statistics in the light of a hobby, hence we have it placed upon record that "A stitch in time saves nine." The *modus operandi* by which the final result was obtained in this case is not stated, but the mathematical exactitude of the computation has not, so far as is known, ever been disputed by anyone except an itinerant vendor of bachelor trouser buttons.

Some statistics, like "sea serpents" and "grave warnings," run in seasons. The public thirst for knowledge in this particular direction is assumed by the journalistic fraternity to coincide exactly with a shortage of good copy, and it is in these circumstances that the assumed insatiable desire for information is generously and fully satisfied.

Statistics cover the whole gamut of commercial activity and it is therefore manifestly impossible here to do other than treat with just a few of the methods of computation more directly appertaining to the Post Office telephone system.

A large number of operations, the result of which were carefully tabulated before the war, have since been discontinued, and they have been neither missed nor mourned. Shakespeare said "Let's talk of graves," but if the telephone had been in vogue in his day, he might have said, "Let's talk of curves," for the Traffic Branch has developed curve plotting to a fine art, and can, therefore, talk authoritatively and in a clear, well-defined manner about percentages of ineffective calls, peak loads, &c., &c. One chart shows at a glance the equated calls and number of telephonists operating at any given exchange switchboard during each half-hour for the twelve hours of the day; another provides the basis for the provision of equipment, and yet another computes the absences for relief purposes and other reasons. In fact it is safe to say that the marked efficiency which characterises the administration and supervision of the Traffic Division is due in a very large measure to the definite and material facts elicited from the carefully compiled curve-plotted charts.

The contents of the card cabinets in the Contract Branch make it possible to calculate correctly the cessation cases and the number of outstanding applicants in the various areas affected by plant shortage; while the forms C.M. 25 and T.P. 1045, fearsome documents as they are to the uninitiated, make clear and plain to the Superintendent of Contracts the results of the activities of his subordinates.

Development study, which is also based upon squared maps and charted areas, has been very ably described and profusely illustrated in this JOURNAL, so needs only to be mentioned in this connexion as a further proof of the extreme value of methodical computation as a basis both for present and future capital expenditure.

In the Rental Branch where statistics of a more permanent character are essential, the Ledger or Register system obtains. In the case of outstanding amounts, however, it has been deemed advisable to plot a curve chart.

But enough has been written to show that the compilation of reliable statistics is an essential part of the routine of any Administration or Department where lucidity of operation and control, is a synonym of success.

THE "ELECTRICIAN" DIAMOND JUBILEE NUMBER: NOVEMBER 11, 1921.

SIXTY YEARS OF ELECTRICAL PROGRESS.

THE history of *The Electrician*, which first appeared on Nov. 9, 1861, and has just celebrated its Diamond Jubilee, is the history of a great change no less in technical journalism than in electrical engineering. In those sixty years it has recorded such inventions, designs and commercial enterprise as in 1880 made electric lighting possible and later spread a network of supply mains through all our large cities. In 1890 it marked the genesis of electrical traction on the City and South London Railway. It has seen the invention of the telephone and the widespread adoption of the electric motor for industrial purposes. It has recorded the pioneer work of Marconi, Hertz, Lodge and Fleming which culminated in the invention of commercial wireless telegraphy. Its pages are a chronicle of the transformation of electricity from a little understood science not only into a great industry but into a means of improving our present civilisation. For by electricity the dream of the servantless house becomes an actuality. That is a sufficient example of what it can do for everyone.

SHROPSHIRE PHILOSOPHICAL SOCIETY.

AT the inaugural meeting of the newly-formed Shropshire Philosophical Society, held at Shrewsbury on Oct. 29, Mr. T. Plummer, M.I.E.E., Superintending Engineer, North Wales District, read a paper on "Thermionic Valves as used in Long-Distance Telephony." The paper, which was fully illustrated by lantern slides and working apparatus, gave a description of the difficulties met with in long-distance telephone transmission through the attenuation and distortion of the speech currents, and how these have been mitigated by the loading of underground circuits, and, more recently, by the use of thermionic valve amplifiers in telephone repeaters. Information was given respecting the economies in cost of line plant resulting from the use of telephone repeaters, and of the extensive programme of new underground main cable routes, either completed or in coruse of construction by the Post Office.

CALENDAR OF COMING EVENTS.

Dec. 7. } —C.T.O. Benevolent Fund "Interkom Club" presents "The
" 8 } Tempest" at Guildhall School of Music on behalf of Alexandra Orphanage.

" 16.—Society of Civil Servants. "Routine and the Civil Servant," Miss Millicent Murby, Ministry of Health.

" 19.—Telegraph and Telephone Society. (1) The Telephone Service; Suggestions for Improvement, Miss A. Flanagan. (2) The Night Telephone Service: some of its problems. Mr. Ernest J. Lansbury.

FOOTBALL (CENTELS).

Dec. 8.—Notting Hill Police (Home) 1st Team.
" 22.—Ravenscourt Amateurs (Away) 2nd Team.
Jan. 5.—Harlesden Town (Home) 1st Team.

MISS BELL.

MISS DONALD.

GLASGOW.

RETIREMENT OF MISS BELL.

IT is with great regret that the retirement of Miss R. S. Bell, Assistant Supervisor, Class 1, Glasgow Trunk Exchange, on account of ill health has to be chronicled. Miss Bell transferred in 1896 from the ex-National Telephone phone Company to the Post Office Trunk Service, and she may therefore be classed as one of the pioneers in the Service. From a small beginning she has seen the Glasgow Trunk Exchange grow to its present proportions. Miss Bell was a keen and zealous officer and the efficiency of the Trunk Service was a matter very dear to her heart. In token of the esteem in which she was held, Miss Bell was presented at her home on Oct. 10 with a handsome beaded bag lined with Treasury notes. On Oct. 28, a tea party and musical evening was given in her honour in the Athenaeum by the Trunk Exchange staff at which several of Miss Bell's old colleagues who were in the service in 1896 were present. Miss Donald, the Trunk Exchange Supervisor presided and a most enjoyable evening was spent. The music was entirely sustained by the present Trunk staff.

Miss Bell carries the best wishes of the staff into her retirement, and it is hoped that she will enjoy her leisure for many years to come.

RETIREMENT OF MISS DONALD.

MISS MARY DONALD, Assistant Supervisor, Class 1, in charge of the Douglas Exchange, Glasgow, resigned the service on Oct. 20 in view of her approaching marriage. Miss Donald has had the unique experience of serving under three telephone administrations. She entered the National Telephone Company, and from there migrated to The Glasgow Corporation Telephone Department as a Supervisor. When the Government took over the Corporation telephones in 1906, she was transferred to a third Administration. Miss Donald was a very capable Supervisor and performed her duties faithfully and successfully. She was the recipient of a case of cutlery and fish servers from the Douglas staff and her old staff in the Central Exchange presented her with a case of fish knives and forks. Miss Donald carries the best wishes of the staff for her future happiness and it is hoped that she will not forget the old scenes when she settles in Shanghai.

MR. SUTCLIFFE'S RETIREMENT.

We should like to add to the account of the presentation to Mr. Sutcliffe, recorded on page 23, that besides the gifts mentioned, Mr. Sutcliffe received a handsome suit case from the Bradford engineers, together with a scroll signed by every contributor, a drawing-room easy-chair from old National Telephone friends, and from the Bradford Exchange supervisors, pipes and slippers in addition to the contribution to the general presentation.

GOLF.

SECRETARY'S OFFICE *v.* STORES DEPARTMENT.

Played over North Surrey Course, Oct. 4, 1921.

Secretary's Office.		*Stores Dept.*	
Mr. R. A. Little (3 and 1) ...	1	Mr. D. Macadie	0
„ J. D. Macnair (2 and 1) ...	1	„ A. G. Tydeman	0
„ W. E. Weston (3 and 1) ...	1	„ G. D. Adams	0
„ F. Hardwick (3 and 1) ...	1	„ P. G. Bennell	0
„ J. S. Fraser	0	Col. H. A. Mann (2 and 1) ...	1
„ P. F. Apted (5 and 4) ...	1	Mr. J. M. Rush	0
„ J. Stuart Jones	0	Major C. Wheeler (6 and 5) ...	1
„ R. W. Roadknight (1 hole)	1	Mr. J. Mairs	0

Secretary's Office won by 6 matches to 2.

PERSONALIA.

LONDON TELEPHONE STAFF.

Resignations on account of marriage :—

Miss G. E. EVERARD, Supervisor, of Bank Exchange.
Miss E. HOLLINGTON, Telephonist, of Museum Exchange.
Miss B. M. WOODHAMS, Telephonist, of Purley Exchange.
Miss M. A. DIBBLEE, Telephonist, of Victoria Exchange.
Miss M. I. L. SAYER, Telephonist, of Victoria Exchange.
Miss A. F. WRIGHT, Telephonist, of Victoria Exchange.
Miss L. E. MERMOD, Telephonist, of East Exchange.
Miss T. S. M. SANDERS, Telephonist, of Kensington Exchange.
Miss E. M. WAITE, Telephonist, of Woolwich Exchange.
Miss D. M. WALKER, Telephonist, of Central Exchange.
Miss A. A. HOGG, Telephonist, of Central Exchange.
Miss G. A. HARVEY, Telephonist, of Central Exchange.
Miss M. V. EDRIDGE, Telephonist, of Regent Exchange.
Miss E. L. POOLE, Telephonist, of Regent Exchange.
Miss W. R. L. TRINDER, Telephonist, of Hornsey Exchange.
Miss D. B. DAVEY, Telephonist, of Trunk Exchange.
Miss V. S. M. SELLS, Telephonist, of Trunk Exchange.
Miss L. M. FRANKS, Telephonist, of Trunk Exchange.
Miss D. CHEESMAN, Telephonist, of Trunk Exchange.

CENTRAL TELEGRAPH OFFICE.

PROMOTIONS.

Mr. J. J. MANSELL, Assistant Superintendent, to Superintendent, Section A.
Mr. G. R. ADAMS, Assistant Superintendent, to Superintendent, Section A.
Mr. W. E. HALFPENNY, Assistant Superintendent, to Superintendent, Section A.
Mr. H. H. BARRATT, Overseer, to Assistant Superintendent.
Mr. T. G. BEAVIS, Overseer, to Assistant Superintendent.
Mr. R. C. LUTTRELL, Overseer, to Assistant Superintendent.
Mr. A. F. REEVES, Overseer, to Assistant Superintendent.
Mr. A. J. CONDY, Telegraphist, to Overseer.
Mr. J. H. DEACON, Telegraphist, to Overseer.
Mr. D. D. EVANS, Telegraphist, to Overseer.
Mr. E. WALTON, Telegraphist, to Overseer.
Mr. W. K. WARE, Telegraphist, to Overseer.
Mr. R. P. MITCHELL, Telegraphist, to Overseer.
Miss M. MCLAREN, Assistant Supervisor, to Supervisor.
Miss A. M. BURROWS, Telegraphist, to Assistant Supervisor.
Miss E. E. SMITH, Telegraphist, to Assistant Supervisor.
Miss H. M. MILLER, Telegraphist, to Assistant Supervisor.
Miss J. WRIGHT, Telegraphist, to Assistant Supervisor.

MR. T. A. BATES TRANSFERRED TO LEEDS.

Mr. T. A. Bates, the district manager of the Post Office telephone service in Bristol, has just obtained well-deserved promotion, has taken up similar duties in the Leeds district, which contains over 33,000 telephone stations, and is the largest automatic exchange in the country. Mr. Bates, who is a Lancashire man, was educated at Uppingham and joined the Bristol district as manager in November 1915. Mr. Bates will be missed by the Bristol Musical Club, of which body he has been a member for some years. Mr. Bates will be succeeded as district manager by Mr. Crawford Millar, at present in charge at Gloucester. A large and representative gathering of members of the Post Office Telephone Staff was held to bid farewell to Mr. Bates. The chair was taken by Mr. Mayo Smith, Chief Clerk.

The chief feature of the evening was the presentation by Mr. F. C. Luke (Postmaster-Surveyor) to Mr. Bates of a gold wristlet watch suitably engraved. In making the presentation, he referred to his earlier association with Mr. Bates in Scotland and latterly in Bristol. He alluded to the happy feeling existing in all sections, and pointed out how gratified he was to be at the head of such an efficient staff. He said he had evidence of this from an important meeting held recently in Bristol by the Chamber of Commerce, who highly commended the service of the trunk and local departments. Mr. Luke then presented Mrs. Bates with a very handsome handbag. Miss Dean, a junior member of the staff, presented Mrs. Bates with a handsome bouquet, and Mr. Eldridge, superintending engineer, handed to Mr. Bates a Malacca gold-mounted walking-stick and silver pencil on behalf of the engineering staff of the district.

Mr. Bates warmly thanked those present for their kindly expressions and handsome presents, which, he said, he would ever treasure as tangible tokens of the friendship which existed between them.

THE

Telegraph and Telephone Journal.

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UNVEILING OF WAR MEMORIAL TO MEMBERS OF THE SECRETARY'S OFFICE.

A WELL-ATTENDED service was held on Dec. 1 in Christ Church, Greyfriars, in memory of the members of the Secretary's office who gave their lives in the service of their King and Country in the Great War. Following an anthem rendered by the L.P.S. Male Voice Choir, the Bishop of London gave an eloquent address on the subject of "Hope." After the service the ceremony of unveiling and dedication of the tablet which has been erected in G.P.O. North was inaugurated by a short speech from the Secretary Sir Evelyn Murray, K.C.B., who asked the Postmaster-General to unveil the tablet. The Bishop of London then dedicated it, saying

> O Lord, we beseech Thee of Thy merciful goodness to accept this offering, which we make to Thy glory, in thankful remembrance of those who, at the call of King and Country, left all that was dear to them, endured hardness, faced danger, and finally passed out of the sight of men by the path of duty and self-sacrifice, giving up their own lives that others might live in freedom; we ask it in the name of Jesus Christ our Lord. Amen.

The ceremony concluded with the Bishop's blessing, the Last Post, the Reveille and the National Anthem.

COMBINED WIRE AND WIRELESS TELEPHONIC COMMUNICATION WITH AMSTERDAM.

AN interesting demonstration was given by the Marconi Company on Sunday, Dec. 18, when telephonic communication was obtained between Marconi House, London, and the Stock Exchange, Amsterdam, by means of the land-circuits between London and Southwold and between Zandvoort and Amsterdam combined with wireless transmission across the North Sea. The writer carried on a short but very satisfactory conversation with a speaker in Amsterdam 250 miles away.

The wireless transmitting stations at Southwold and Zandvoort were equipped with valve transmitters, the receiving stations in both cases being situated adjacent to the transmitting stations, but separated by a distance of about 100 yards in order to provide effective duplex working. Speech from London reaches Southwold over a metallic circuit, placed at the disposal of the Marconi Company on this occasion by the Post Office, and is received there in a much attenuated form. It is passed through a special "bridge" circuit and then amplified by thermionic valves to its original London length, after which it is caused to control the carrier wave emitted from the transmitting station. At the Dutch receiving station the speech variations in the carrier wave are received and amplified and after rectification the speech currents are again, on a local metallic circuit, at London strength. The local circuit at the Zandvoort receiving station is connected through another "bridge" to the Amsterdam trunk line of the Dutch Government and the London-Amsterdam circuit is thus completed.

The Amsterdam-London circuit is not affected by the London-Amsterdam circuit so that conversation can be carried on to and fro in the ordinary way. This is made possible firstly by working to Holland on a slightly different wave-length to that used for the return communication and by separating the transmitting and receiving stations at each end, and secondly by the special "bridge" connexion.

Should the difficulties of extending this form of communication at each end to subscribers on the English and Dutch telephone system be overcome, some very interesting developments would result.

P.O. SANATORIUM SOCIETY.

L.T.S. CONSTITUENCY COMMITTEE.

A COMMITTEE meeting was held on Thursday, Dec. 15, at the Controller's Office, at which the members discussed with interest a proposal to raise a sum of money, which could be used to cheer our colleagues who are temporarily "off duty" owing to illness.

Early in the present year three members of the Committee had the advantage of visiting the National Sanatorium at Benenden, Kent, and of seeing for themselves how well our people are treated there. But we all know that good treatment is one thing and a little friendly cheer is another, and the L.T.S. Committee are hoping that it may be possible to do something, for example, to increase the recreation facilities of our friends at Benenden. Even such a small thing as a supply of magazines, newspapers, etc., might be a friendly link between them and their fellow workers in town. However, this suggestion and others which have been made will be discussed in more detail, when the result of an appeal, which it is hoped to make early in the New Year, is known.

The L.T.S. branch of the P.O. Sanatorium Society is one of the most recently formed, but it is also one of the largest in the country. Its membership is now about 70 per cent. of the total staff, and the Committee feel it is their duty to follow the good example recently set by the C.T.O. and several of the Postal District Offices, and to do something to really justify their existence.

They hope this foreward may awake a feeling of interest throughout the L.T.S., and that the splendid efforts, especially of the Exchange staffs, in other directions, may be turned for a short time to a fresh cause.

THIRD ANNUAL DINNER OF THE WESTERN DISTRICT CONTRACT OFFICE.

THE Third Annual Dinner of the Eastern District Contract Office was held at Pritchard's Restaurant, Oxford Street, on Nov. 18, 1921. The District Contract Agent, Mr. W. V. Pegden, in the Chair, was supported by the following guests:—Major G. F. Preston, C.B.E. (Controller, London Telephone Service); Mr. W. A. Valentine (Deputy Controller); Mr. J. Stirling (Assistant Controller); Mr. W. Bold (Superintendent of Accounts); Mr. W. F. Taylor (Superintendent of Contracts); Mr. A. J. Sharpley (Sectional Engineer, Centre External); Mr. F. J. Phillips (Sectional Engineer. West External); Mr. F. Woollard (Sectional Engineer, Centre Internal).

A most enjoyable evening was spent and an excellent dinner was followed by a musical programme contributed by members of the staff, the artistes being Messrs. W. V. Pegden, H. Neil, W. Horlock, S. W. Swain, C. F. Bradshaw, W. R. Child, F. C. Evans, and W. C. P. Barnard. A display of conjuring by Mr. J. E. Williams was also much appreciated.

Between the items the following toasts were honoured:—The King; The Western District Contract Office; The London Telephone Service; The Visitors and the Chairman. The work of the London Telephone Service during the past year, with especial reference to the Western District Contract Office, was brought under review and excellent speeches were given by Major G. F. Preston, C.B.E., Messrs. A. W. Valentine, J. Stirling, W. F. Taylor, A. J. Sharpley, W. V. Pegden and S. W. Swain.

A very successful evening closed with the singing of "Auld Lang Syne."

PRESENTATION OF IMPERIAL SERVICE MEDAL TO MR. RICE.

ON Dec. 9 Mr. S. V. Rice, formerly Adult Messenger in the L.T.S. was presented by the Controller with the Imperial Service Medal. Mr. Rice served for 35 years in the Post Office and was retired on account of ill-health in November last year. His Majesty the King has expressed the wish that the Imperial Service Medal should be presented personally by the Head of the Department in which the recipient last served, and this was accordingly done in the presence of the Controlling Officers and representatives of Mr. Rice's old colleagues.

OBITUARY.

THE LATE MR. C. W. BLACKBURN.

MR. C. W. BLACKBURN, Clerical Officer, District Manager's office, Telephones, York, died on Sunday, Nov. 13, after a few days' illness. The funeral took place at Lawnswood Cemetery, Leeds, on Thursday, Nov. 17. A wreath was sent by the District Manager and staff, and the funeral was attended by representatives from the office. Mr Blackburn joined the Telephone Service at Leeds in 1900, and was transferred to York on the re-organisation which took place in 1912. He was a man of a quiet disposition, and was greatly interested in cricket, and will be remembered by many no doubt by the interest he took in the staff cricket matches, in the Yorkshire districts some years ago. Mr. Blackburn was married as recently as June last.

It is with deep regret we have to report the death of Miss A. E. Sage, Telephonist, who passed away Nov. 20, 1921.

ANGLO-CONTINENTAL TELEGRAPH COMMUNICATIONS 1914-1921.

BY F. J. BINDER (Cable Room).

Continued from page 43.

London has now three new permanent lines, to Turin, Dresden and Berne respectively. The first-named provides an additional channel for the disposal of traffic for Italy, which country has expanded territorially by the inclusion of the Southern Tyrol and the busy Trieste area, and in addition Milan has been relieved of some of the Italian provincial traffic to enable her to handle traffic in transit for Yugo-Slavia and Fiume. Saxony and German Silesia are specially catered for by Dresden who, by virtue of proximity to the Bohemian frontier also, not infrequently, renders valuable assistance to Prague. Berne is a useful Swiss communication occupying a fine central position and offering (with Zurich) a good alternative route to Austria and Hungary in case of emergency.

Latterly Paris shares with Lyons the duty of disposing of telegrams for Alsace-Lorraine (now reconstituted as the three French departments of Haut Rhin, Bas Rhin and Moselle) and also generally assists with traffic for the new independent territory of the Sarre (or Saar).

The restoration of the communication with Magdeburg is improbable as this city has unfortunately suffered industrially and has now but little traffic.

The following list indicates the countries in the European telegraph system (including North Africa), for which telegrams, unless specifically otherwise ordered, are forwarded exclusively over the Government cables. The terminal and (where requisite) the normal re-transmitting stations are given, so that the number of transmissions required to reach any particular country is at once apparent. Where the distant terminal station indicated does not happen to be the capital of the country, one additional re-transmission normally suffices to reach it; as for example:—Zagreb—Belgrade or Zante—Athens.

Albania.
London—Rome—Valona.

Algeria.
London—Marseilles—Algiers (or Bona).

Andorra.
London—Marseilles—Perpignan—Bourg Madame—Andorre la Vieille.

Austria.
London—Frankfurt-Main—Vienna.
(The direct line London—Vienna will probably soon be available.)

Belgium.
London—Antwerp.
" —Brussels.
" —Ghent.
" —Ostend.

Bulgaria.
London—Prague—Belgrade—Sofia.

Czecho-Slovakia.
London—Prague.

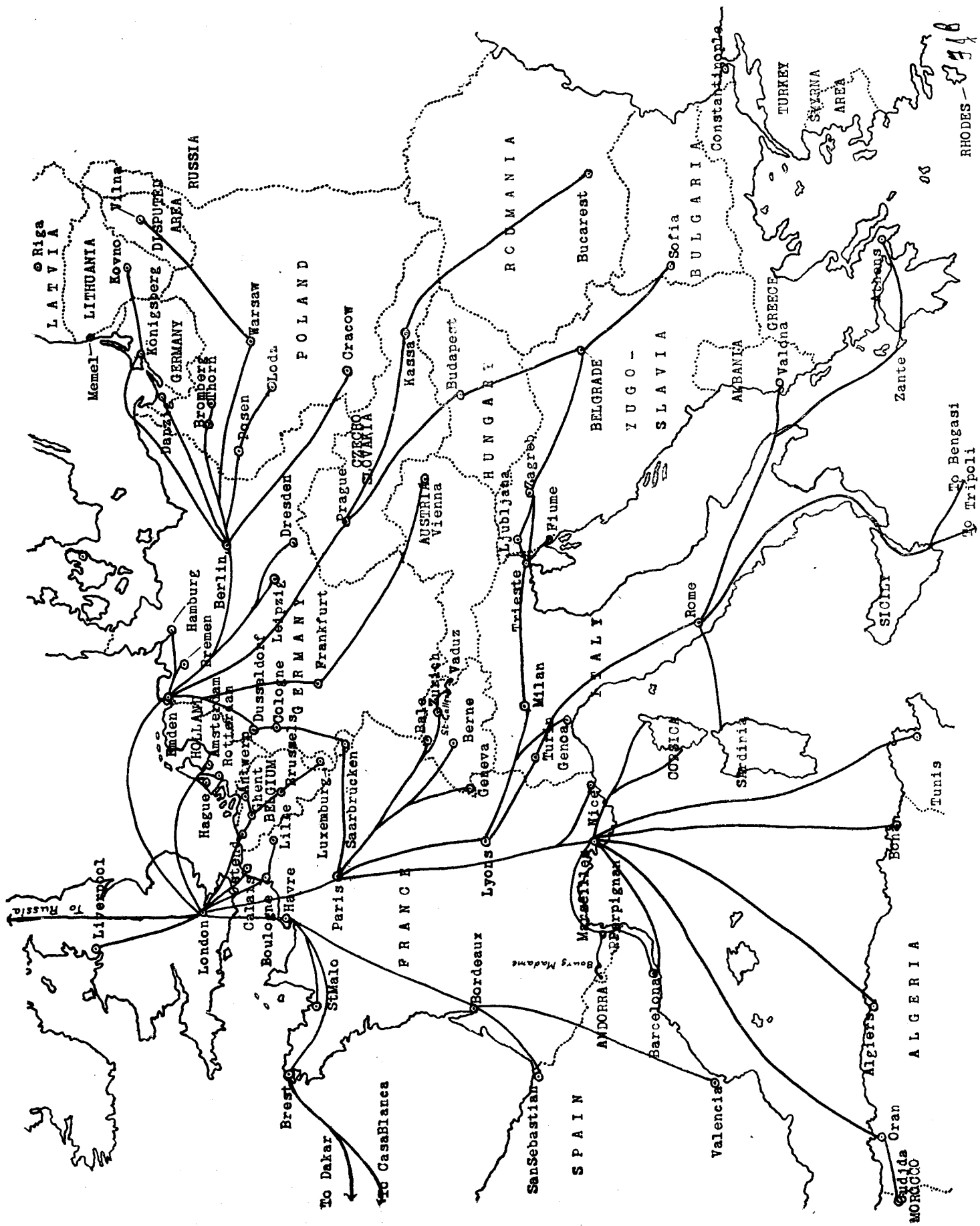
Danzig Free City Territory.
London—Berlin—Danzig.

**Esthonia.*
London—Berlin—Königsberg—Riga—Reval.

Fiume (Independent City).
London—Milan—Trieste—Fiume.

France.
London (or Liverpool)—Paris Central.
" —Paris Bourse.
" (or Liverpool)—Havre.
" —Bordeaux.
" —Boulogne-sur-mer.
" —Calais.
" —Lille.
" —Lyons.
" —Marseilles.
" —Nice } Seasonal.
" —St. Malo }

* The services to Esthonia and Latvia by means of the Government cable system were introduced during the preparation of this article. The references relating thereto have been duly included in the foregoing table, but it has not been found possible to revise the accompanying map accordingly, upon which a line should be shown from Königsberg (East Prussia) to Riga (Latvia) and thence northward in the direction of Reval (Esthonia) thus indicating the direct communications Königsberg-Riga and Riga-Reval as given in the table.



This map indicates the geographical position of the chief terminal and normal retransmitting offices engaged in the Anglo-Continental telegraph service. The approximate direction normally taken by the traffic to the various countries is shown, but no attempt has been made to indicate the number of lines available or the exact line-route followed.

Germany.
London—Berlin.
" —Bremen.
" —Cologne.
" Dusseldorf.
" —Dresden.
" —Emden.
" —Frankfurt-Main.
" —Hamburg.
" —Leipzig.

Greece.
London—Rome—Zante.

Holland.
London—Amsterdam.
" —Amsterdam Bourse.
" —The Hague.
" —Rotterdam.

Hungary.
London—Prague—Budapest.

Italy.
London—Genoa.
" —Milan.
" —Rome.
" —Turin.

**Latvia.*
London—Berlin—Königsberg—Riga.

Kingdom of the Serbs Croats and Slovenes (Yugo-Slavia).
London—Milan—Trieste—Zagreb (or Ljubljana).

Libya.
London—Rome—(Sicily)—Tripoli (or Bengasi).

Liechtenstein.
London—Zurich—St. Gallen—Vaduz.

Lithuania.
London—Berlin—Konigsberg—Kovno.

Luxemburg.
London—Brussels—Luxemburg.

Morocco (French Zone).
London—Havre—Brest—Casa Blanca: or
London—Marseilles—Oran—Oudjda.

Poland.
London—Berlin—Warsaw (or alternatively Bromberg, Cracow, Posen, Lodz or Thorn).
(The direct communication London—Warsaw may soon be available.)

Rhodes.
London—Marseilles (thence *via* Eastern Company's cables).

Roumania.
London—Prague—Kassa—Bucarest.

Russia (Soviet).
London—Alexandrovsk (automatic re-transmission at Peterhead).

Sarre Territory.
London—Paris—Saarbruecken; or
London—Frankfurt-Main—Saarbruecken.

Spain (Eastern part).
London—Marseilles—Barcelona; or
London—Bordeaux—Valencia (or San Sebastian).

Switzerland.
London—Bale.
" —Berne.
" —Geneva.
" —Zurich.

Tunis.
London—Marseilles—Tunis.

West Africa (French Possessions).
London—Havre—Brest—Dakar.

Traffic for the European countries and islands not mentioned in the list, viz.:—Denmark, Egypt, Faroe Islands, Finland, Gibraltar, Iceland, Malta, Norway, Portugal, Spain (Central and Western), Spitzbergen, Sweden and Turkey is at present passed almost exclusively to one of the cable companies for disposal.

It will be noticed that the only Continental countries of importance, which are not normally reached in two transmissions from London are Bulgaria, Esthonia, the Kingdom of the Serbs Croats and Slovenes, Latvia, Lithuania and Roumania, and that the only capital of any importance, in addition to those of the six countries mentioned, which is not accessible in two transmissions is Athens.

In view of the distance to be traversed, it is perhaps too much to expect that the three transmissions necessary to reach Sofia and Athens, will be improved upon in the near future. Kovno (if it remains the capital of Lithuania), Riga and Reval will probably shortly enjoy direct communication with Berlin. The route followed to Bucarest, however, is capable of improvement, and the precarious condition of the lines eastward of the Slovakian frontier, renders urgently desirable the anticipated reversion to the use of the trunk line Budapest—Bucarest. With regard to Belgrade it is understood that the present route involving four transmissions is followed owing to the slightly lower transit rates offered, but facilities are available for this city to be reached in two transmissions (London—Prague—Belgrade), and that the Serbs are keenly alive to the advantages to be derived from the use of this route is evidenced by the fact that the bulk of their traffic reaches London from this direction.

THE BAUDOT—XXVIII.

By J. J. T.

It should be profitable here to note that the process of "taking the third" mentioned in our last article should not be confused with the adjustment for obtaining the *point of repere* on a working set, as already mentioned, which latter process is particularly useful in certain circumstances such as in the case of installations utilised on circuits fitted with repeaters, London-Rome, London-Milan, London-Marseilles, &c. These are cases in which although the *point of repere* is a local adjustment and is generally to be found at a distance of about $1\frac{1}{2}$ segments from the first small segment of ring one, the functioning of re-transmitting station nevertheless *does* vary slightly and it *does* happen that at times it becomes necessary to minutely increase the distance of the movable segment, and further, that this increase itself varies with adjustments made at the repeater office. This much may therefore be written in amplification of Article XXV, with reiterated stress on the injunction not to confuse this process with that already described for adjusting the small receiving segments (Ring 1) in order to obtain the peak of the current. Before leaving this most interesting subject of the *point of repere* for which there appears to be no translatable equivalent in our own tongue and to which the Germans have given the name of *merkpunkt* it should interest students to read the following and, so far as the writer knows, the best definition of the term yet given. Mr. H. H. Harrison, than whom there is probably no greater expert on Machine Telegraphy, says: "The *point of repere* is the line marking the coincidence of the end of the time of contact with the reversal from positive to negative of the correcting impulse."

We now pass on to a few practical hints on the maintenance of the Baudot governor. The guiding rods should be perfectly parallel and the *masse* or weight M (Fig. XXI, No. 60, Vol. VI) should easily slide up and down them. To prove this release the weight by unhooking the springs from the adjusting bar, then hold the governor tilted at an angle of 45°, first in one direction then in a reverse one. The weight should glide easily up and down. If not, either the rods have become bent and will probably need workshop attention or they may need cleaning and oiling. The latter may be done by means of a clean oily rag or cotton waste. Should the movement of the weight along them still prove sluggish the application of emery paper may be advisable. In this case nothing coarser than grade 000 should be used, and the friction should be applied gently and *longitudinally, not in a circular direction.* In no case should dirt be permitted to accumulate between the weight and the fork, as this gives a tendency in the direction of stickiness which may produce a certain reluctance on the part of the weight to move outwards. When replacing the springs upon the adjusting-bar be careful that both drop into their slots and not on the edge of the hooks. Grit or accumulated dust in the holes where the springs pass through the weight will sometimes prevent the ready functioning of the springs. The normal running amplitude should not exceed more than half of the extreme possible, *i.e.*, half the diameter of the guard-ring.

The grinding rods should pass easily into the holes provided for them in the weight and *should occupy the centre of the holes* not take up a position as in M (Fig. LXXIV) a^1 with a tendency to

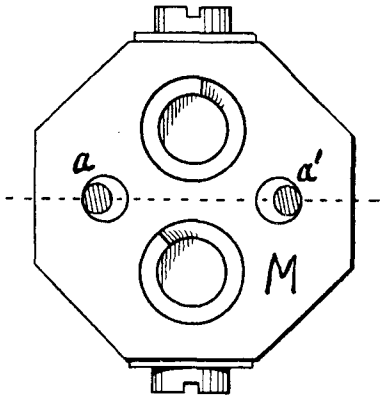


FIG. LXXIV.

press against the outer edge as there shown, or in the reverse direction towards the inner sides. To remedy this, very carefully adjust them in their position in the fork itself. This fault may present itself although the guiding rods have every appearance of being parallel.

Verify the position of the adjusting-bar occasionally. The springs may become *tired*. Or, the governor axle may, after a considerable time, show signs of undue play in its bearing B Fig. LXXV). These conditions will produce a decrease of speed

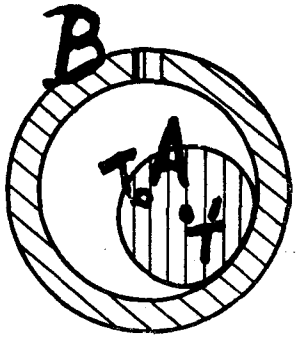


FIG. LXXV.

with a decrease of amplitude, *i.e.*, the tension zero of the springs will find itself at T^1, the centre of the axle A while the centre of rotation will be found at, say, T. The tension in this case will need to be delicately increased. It should be remembered that when in rotation, the chief wear and tear of the axle is always along one line of the circumference, and this wear is dependent upon the pressure of the revolving weight or *masse* which, thrown out by the centrifugal force developed, increases the pressure of A at the outer edge of the bearing B. The construction of the axle itself which is fitted with a limiting collar screwed on to the axle just behind the governor ensures that the friction produced by the axle shall always be at practically the same point.

(To be continued.)

HEARD DURING A VISIT TO A SUB-OFFICE.

"Can I have a dog licence, Miss?"

"Yes, what name?"

"Spot!"

TELEGRAPHIC MEMORABILIA.

As one grows older one hesitates to make new promises for a new year, realising too well the frailty of human nature and especially one's *own* human nature. Yet each opening year somehow presents itself as a clean sheet before us and there are few who do not dream or hope for higher heights, greater possibilities, more complete successes. We of the telegraphs, therefore, offer no apology for giving way to a dreaming of dreams and a seeing of *visions regarding our own particular corner of State Service.* Shall we see the steady rise of the traffic curve? May we hope for extended public services? Will 1922 see London in direct cable communication with Warsaw in a less intermittent sense than she is at present in wireless communication with Posen? How far will scientific research, discovery, and invention take us along the road to more stable telegraphic communication, both by cable and by wireless with the political and cathedral cities of Germany? Will a wire*less* telegraphic system between our metropolis and Rome, for example, become sufficiently stable to help the lame and sadly-inefficient Anglo-Italian wires in their daily task of Sisyphus of rolling the traffic stone to a destination which is never reached? Or will the close of 1922 find this particular service still engaged in its hopeless task? One's hope is fixed upon the Italian Minister's plans of improved lines and an extension of the underground system and one hopes that one is not hoping in vain. That 1922 will see many renewed attempts on the part of private enterprise, by means of wireless, to compete with State-owned and cable systems may be anticipated with no small degree of certainty for there are many signs both at home and abroad that an immense amount of private capital is being sunk in *Sans Fil.*

Shall we see before the changing of many more moons some signs of a revival of Anglo-Russian telegrams? Again one has something more than *fond hopes.* As *to the internal communications of our own land the vision* is clearer and more well-defined. By the end of the present year both the telegraph and telephone systems of the United Kingdom will surely have reached a standard of stability never yet attained. Multiplex type-printing telegraphs will make further strides, while type-writer perforating keyboards will doubtless be further standardised, adapted to the various systems, and extended in their use upon both inland and foreign circuits. So much for the writer's reading of the telegraph horoscope!

It may be the Christmas season which is hovering round us while we go to press, but a meticulous correspondent writes as follows:—

> "The *Post Office Guide*, referring to *Inland* telegrams, says:—'A receipt for the *charges* prepaid upon a telegram can be obtained for one penny.' Is not this illegal for sums over £2?"
>
> "Referring to *Foreign* and *Colonial* Telegrams the same authority states: 'A receipt for a *telegram* can be obtained for one penny.'
>
> "The actual printed receipt, however, declares that the receipt is for a telegram on which certain charges have been paid. Where are we?"

The same correspondent, still in the conundrum spirit of Noel, continues:

> "Could an individual telegraphist be successfully prosecuted for loss or damage sustained through telegraphic error resulting from: (1) proved negligence; (2) causes over which the operator had no control, seeing that the titular head of the Post Office is himself immune?"

There is at least one European country where the telegraphist may be sued under heading number one.

Still in the ghostly spirit of the Yuletide season and with due acknowledgments to our scientific contemporary, the *Electrical Review*, the following letter from a Norwich correspondent is boldly *lifted*, title and all for the special benefit of the student readers of the T. AND T. JOURNAL!

Telephony—or Telepathy.

> "I wonder if you or any of your readers can explain the following occurrence:—A lady staying at a country house, wishing to use the telephone, took off the receiver and distinctly heard a conversation between her host and his agent; thinking that they were using other 'phones on the same line, she put back the receiver and waited till later for her call. Afterwards it transpired that her host and his agent had not been on the 'phone at all, but had held their conversation out in the park, somewhere near the telephone wires.
>
> I should like to know the explanation of this; it beats me altogether."

The very thoughtful and thought-provoking paper of Mr. Winyard on the "*Possibilities of Post Office Developments*," read before the T. and T. Society of London, towards the end of November last, was worthy of a much larger audience than that which the lecturer had to face. What the former lacked in numbers was, however, compensated for in the quality and rank of the listeners and debaters. The weather doubtless prevented many of those attending who lived at considerable distances from the centre of London. The catholic spirit of the Society in opening its platform to so many phases of thought regarding Post Office activities, was ably supported by the several speakers, while the Chairman, Mr. F. J. Brown, C.B.E., with his usual grace and courtesy, paid tribute to the ability of the U.P.W. officer who perhaps for the first time before a Post Office audience, so mixed in rank, had been able to show something of the constructive side of U.P.W. aims and ideals.

Signalling by invisible rays has been mentioned in these columns on more than one previous occasion, but some interesting facts were revealed by Dr. Houston just before the closing of the 1920-21 Session of the Glasgow Radio Club. Speaking more especially on optical signalling he referred to the many methods of secret visual signalling tried and practised during the war by means of colour filters infra-red and ultra-violet rays, polarised light, &c. Standing as we do in a century with invention crowding in upon invention, science bifurcating into researches which lead along strange paths and reveal new wonders on every hand, with the strangest and newest paths themselves again forking off and plunging into a maze of still newer discoveries, who shall say which is the more wonderful, the huge pressures measured in thousands of volts with their consequent immense waves surging through the infinite ether bearing the trembling human messages through space, or the tiny light from a 1½-volt bulb, as used by Dr. Houston, together with an ordinary telescope, screening off the visible rays and projecting only the invisible across the black waters of our darkened estuaries during war-time, yet the invisible again becoming visible when dealt with by the magician who alone held the more than alchemist powers. Truly, we are in the very realms of a fairyland undreamt of by Andersen or Grimms.

One would hardly go to so practical a source of information for confirmation of our world of fairyland as *The Times Trade Supplement*, but does not the following extract from that staid and reliable source give solid proof of the statement ?

> "A wireless development of interest to seafarers has resulted from the demand for a means of controlling fog signals off the coast and at the mouths of estuaries. This afforded a somewhat unusual problem, since to be of use the receiving apparatus must be capable of functioning without any adjustment or attention for long periods. Also it must operate without fail when required, and must not be liable to accidental operation by wireless signals other than those to which it is designed to respond. The practical solution has been provided by a combination of an improved form of the otherwise obsolete coherer acting in conjunction with a tuned mechanically oscillating relay. A wireless transmitter, suitably situated on shore, is caused to send out a series of "dots" by means of a controlling pendulum to which the receiver relay is tuned. The dot signals are received upon a small aerial on the fog gun or beacon, and each dot acting on the coherer causes a local current to apply an impulse to the tuned relay and, at the same time, to operate a tapper which provides the necessary decohering action. The relay is thus caused to swing through an arc which increases with each impulse until the relay contacts meet and the gas valve or other mechanism is operated. Apparatus of this description is to be found in the Clyde, where the fog guns at Fort Matilda and Roseneath Patch are operated from Gourock Pier. It is understood that the system is entirely satisfactory and has demonstrated its immunity from interference under exceptionally adverse conditions."

Electricity gives it that the only existing regular wireless *telephone* service at present existing in this country is that between the Mersey Docks and Harbour Board offices and the Bar Lightship, situated about a dozen miles out in the Irish Channel.

A paper on "Low Voltage Overhead Distribution" was read and discussed at the last Engineering Conference of the Institute of Civil Engineers. There was a distinct tendency to point to certain conditions which were considered somewhat onerous as laid down by the Electricity Commissioners and the G.P.O. These conditions, be it understood, were laid down solely for the protection of the public and its property, and although in these difficult times the need for retrenchment is fully recognised wherever possible, such economy cannot be true economy should it result in minimising the security of human life and jeopardising public utilities. The conclusions to which the writer of the paper had apparently arrived, are summed up by our contemporary as follows :—

> "The standard of work and appearance as well as of continuity of (electrical) supply, are much higher here than in many other countries, and the author believes that ultimately the distribution in all our towns, garden cities, and large villages will be done by underground cables. *The basis for this belief partly lies in the growing practice of the G.P.O. in replacing overhead wires by cables even in country villages.*"

According to the report of the Eastern Telegraph Company, one of the outstanding features of the 1920 accounts was the expenditure of £1,476,088 on new cables, and an increase of £365,917 for salaries and wages bringing the latter up to no less a sum than £1,082,068. The cable ships fund was credited with £100,000, and after the payment of all dividends £316,479 was carried forward, a reduction under this heading in round figures of one hundred thousand pounds as against 1919.

Unfortunately Mr. George Connell's health did not permit of a visit to the C.T.O. or other *rendezvous* in order that a public presentation could be made to him of the souvenirs purchased by his many friends in G.P.O. West. It is a far cry from London to Cornwall. The gifts consisted of a most musically-chiming 8-day clock and a tasteful breakfast cruet, the special selection of the mechanics.

The introduction of automatic re-transmitters (French pattern) into the forked Baudot systems as used by the British Administration marks an economic development, the success of which should already be assured. The trial is at present being made on a Birmingham-London-Portsmouth combination, six-triple duplex. The Liverpool-London-Paris-Lyons (triple duplex L.V.-T.S.F.-Paris) arrangement still continues to give satisfaction though hampered at times by the unstable line conditions abroad. In this case the London re-transmission is arranged by means of P.O. standard relays.

According to the *Tidens Tegn* it is proposed to lay two new telephone cables between Norway, Denmark and Germany. No. 1 cable would be laid between Arendal and Hirtshals or Fredriksvaern and Hirtshals. In either case the distance would be well under one hundred sea miles. The communication would, it is stated, give three telephonic and one telegraph connexion. The cable between Arendal and Germany would also give the same number of telephonic and telegraphic circuits. It is further stated that these proposals have already been submitted to the Norwegian Board of Telegraphs, and it is calculated that owing to modern developments the German cable will permit of telephonic communication between Scandinavia and Holland, Belgium, France, Switzerland, Italy and possibly beyond. Yet another proposal, not yet submitted however, is the laying of a 500-kilometre telephone cable between Stavanger and some point in the British Isles.

The *Daily Telegraph* is responsible for the statement that "the Commonwealth Government of Australia is likely to assent to the principle of duplication of the Pacific cable." It is understood that the decision had been postponed owing to prolonged consideration of wireless schemes. The proposal, it would appear, is for a modification of the existing route for the direct line *via* Auckland and Suva instead of Norfolk Island and, also *via* Fanning Island and Honolulu, instead of Bamfield. From Honolulu the present cable would be used to San Francisco and then would be utilised for American traffic only, while the Canadian route would be devoted to traffic for the British Isles and Europe.

In addition to a submarine telegraph cable with Argentina and Brazil the Italian Government, in granting a concession to a national company for this purpose, have apparently also included direct submarine cable communication between Italy and Spain and Italy and Greece. The Government has agreed to subsidise the Company for ten years contingent upon a fixed minimum of words being carried by each cable. The name of the corporation is understood to be the *Compagnia Italiana dei Cavi Telegrafici Sottomarini*. The radio service at Vinga (Sweden) is now giving bearings to ships on demand to facilitate entrance into Gothenburg harbour and the rounding of Skagen point.

The month of November saw the statement in the daily press that the Australian House of Representatives at Melbourne had laid on the table the draft agreement with the Amalgamated Wireless Company for a direct wireless service between this country and the Antipodes. The charges have been fixed, according to the London *Times*, and all that remains is the Parliamentary approval of the document. Following on these announcements wireless test messages were sent direct to Australia from Carnarvon, the correct reception of the same being acknowledged by cable both from Sydney and Melbourne. An interesting photograph of the battery of 56 valves used with this last experiment appeared in last month's issue of the *Wireless World*.

It is equally interesting to be able to state that the British Government news telegrams from their station at Leaffeld have been repeatedly received at Perth, Western Australia, though the wave-length used is quite a modest one. At times these "broadcast" telegrams contain from 400 to 500 words. It is not, however, claimed by Leafield that, "the message took one-sixteenth of a second in transit" as has been stated by the chaperons of another press telegram transmitted by another wireless system.

Meanwhile there appear to be two rival wireless private systems having schemes before the Australian Government for the exploitation of a British-Australian Service. The Federal Parliament, according to *The Times*, has referred the matter to a joint committee.

The *Electrical Review* of Dec. 9 states that: "The Director of the Telegraphic Services at Amsterdam announces that direct telegraphic communication has been established between the C.T.O., London, and Amsterdam. It is permissible to correct our contemporary. Direct telegraphic communication between Amsterdam and London has been established to the writer's knowledge for at least 40 years ! The communication referred to by Amsterdam is probably the recently inauguarated extension of telegraphic facilities between Amsterdam Bourse and London Stock Exchange, direct telegraphic communication being thus established between the two Stock Exchanges during "Stock" hours. The Paris Bourse and the London Stock have similarly been connected for many months past. Structural restrictions in the London building for the present prevent any extension of these much-appreciated facilities.

The Annual Report of the Pacific Cable Board for the year ended March 1921 is interesting reading. Naturally the world slump had its effects upon the Board's finance, nevertheless the gross receipts amounted to £633,343. The Sydney-Auckland cable was out of commission for one day and the Bamfield-Victoria cable from Nov. 27, 1920, to Dec. 19, 1921. Alternative routes were however available. The land lines in Canada, leased from the Canadian Pacific Railway worked well, and leases of the lines between Montreal and Bamfield and between Vancouver City and Victoria have been renewed for a period of ten years on favourable terms. The Board's cable repairing steamer, the *Iris*, has been occupied on Admiralty contracts during the past year.

From the *Electrical Review*, Dec. 2, 1921, "The Eastern Extension results are handicapped by the taxes of £666,000, being £250,000 larger than those for the previous year. The depreciation-of-investments account gets nothing this year, as against £200,000 a year ago, and the company carries forward the small amount of £80,000. The results are good enough, considering the times through which industry is passing, and submarire cable stocks are amongst the very few which have shown hardly any depreciation during the trade slump throughout the world.

Marconis have gone back to 1½, and the wireless group is very quiet."

The Shipbuilder gives a photograph and description of a new cable steamer which was christened the *All America*. She has been built for cable-repairing apparently being practically a *replica* of the cable steamer *Guardian*. Her overall length is 295 feet, and her breadth 37 feet. The total coiling capacity of her cable tanks is about 14,000 cubic feet. The cable machinery was supplied by the Telegraph Construction and Maintenance Co. She carries three-bow sheaves forward and one aft and is fitted with oil fuel bunkers of large capacity to enable her to keep at sea for long periods. The vessel was built and engined at the Neptune Works of Messrs. Swan for the All America Cables Incorporated Co.

The launching of this vessel may have some connexion with the statement made by the *Costa Rica Official Gazette* to the effect that a contract was signed on Oct. 9 between the Government of Costa Rica and the All America Company for the establishment within 18 months of a direct cable service between Costa Rica and foreign countries. Port Limon will be connected by cable with the Isthmus of Panama and this with the All America Cables Incorporated Company's network, late The Central & South American Telegraph Company.

Mr. B. J. B. Salmon of the Cable Room has been promoted to the class of Overseers in place of Mr. Gaisford, retired owing to ill-health. All colleagues of both of these officers while congratulating the former, express the sincerest regret at the physical causes which have operated in curtailing the service years of the latter.

Quite as an experiment readers will find that the writer, tired of his own scribbling, is introducing every month and as a termination to these particular columns, at least one quotation from a literary, scientific, or philosophical source. Thus, A. C. Benson in *From a College Window*: —"I have always believed that it is better to stimulate than to correct, to fortify rather than to blame. If there is one attitude that I fear and hate more than another, it is the attitude of the cynic. I believe with all my soul in romance, that is in a certain high-hearted, eager dealing with life, . . . I have grown to believe that the one thing worth aiming at is simplicity of heart and life; that one's relations with others should be direct and not diplomatic; that power leaves a bitter taste in the mouth: that meanness and hardness and coldness are the unforgivable sins." J. J. T.

LONDON ENGINEERING DISTRICT NOTES.

FROM the staff of the London Engineering District to all co-workers—Greetings. May the year 1922 prove a happy and prosperous one to all engaged in the gentle arts of providing, maintaining and operating lines of communication.

Let the fact never be lost sight of that evil communications corrupt good manners.

Looking beneath the Surface.

In most operations there are some phases that are more spectacular than others and which appeal to the casual observer as the most important. Those who do the less conspicuous but nevertheless highly important work may not do it less efficiently because they are not constantly in the limelight, but they certainly will take greater interest and pride in their daily toil if they know that its importance is appreciated by those whose opinion they value. For this reason the jointers working in manholes in some busy city streets were gratified to receive a visit recently from Sir Evelyn Murray, and to note the keen interest that he took in the work they were doing. As pairs in cables which had been teed in readiness for a large exchange transfer were being cut away and joined through to other pairs our engineering readers will realise that the Secretary saw some typical examples of complicated operations that must perforce be carried out in confined spaces. It is unfortunate that it is not practicable for the Department to extend the scope of its invitation to the public and allow them to visit the jointers in their underground chambers and see how the lines from the subscribers' premises are carried through to the exchange.

If would-be subscribers realised what is involved in planning and providing the line plant in a city such as London, they might be more patient when told that the stage when any demand can be met practically at once has not yet been reached. It is not lack of will that prevents the immediate gratification of this desire. The good work is going on and the promised land is now in sight.

Telegraph Installations in Newspaper Offices.

All newspaper offices in London of any pretensions have their own telegraph circuits to the Central Telegraph Office. Until recently the current for working these was provided either from primary batteries on the premises or over individual power circuits from the C.T.O. power plant in G.P.O. West. The fact that the principal offices are located in or near Fleet Street has rendered it economically possible to lay a special ring main from the C.T.O. from which tees are taken into the offices *en route*. The main consists of a cable with 6, 7/16 cores, each insulated with vulcanised rubber. The voltages connected are 40, 80 and 120 positive and negative. At certain offices the cable is looped in and terminated in a convenient manner for testing. Considerable economies in maintenance are anticipated as in addition to a number of individual power leads, some 6,000 dry cells have been recovered.

Accidents.

The possibility of accidents to persons and plant is the cause of a great deal of worry to the Engineering staff, both to persons whose duty it is to carry out work in subscribers' premises and those employed in installing and maintaining the line plant, whether overhead or underground. A fitter has to be very careful to avoid puncturing gas or water mains when plugging walls; every fitter knows that his first task is to enquire whether there are likely to be any pipes hidden in the wall to which he is about to fix apparatus. Often wire has to be run in such positions that a tool dropped accidentally might do considerable damage. It is not always possible to get fixtures moved, and the risk of breakage must be taken; in such cases, the responsibility rests with the subscriber, if, after being warned, he fails to take the necessary precautions to safeguard his property. Effect does not always follow close on the heels of cause: recently a claim was made against the Department for damage to a wall mirror, some considerable time after the installation of a telephone on the premises. Investigation showed that the fitter had driven a screw through a partition and the back of the mirror just far enough for the point to touch the glass but not to break it; subsequent expansion of the screw, due to change of temperature, however, caused a fracture with the result that the Department was mulcted for damages.

External workmen have ample opportunities of causing damage but are more often the sufferers through the carelessness of others. Many drivers of vehicles seem to have a grievance against the Post Office and to vent it by upsetting, despite the red flag that decorates each end of them, those gothic structures, described by a London magistrate in a recent communication to the Post Office as "wigwams." It is curious what a penchant some pedestrians have for tripping over footway box covers, but, when one individual is found to have made no less than 3 claims in connexion with such accidents, the Department may be excused for suggesting that the supposed sufferer, like the man who married 3 times, had contracted a bad habit.

Occasionally accidents affecting life and limb occur, but, thanks to the extraordinary precautions taken by the Department, such are rare and are invariably due to neglect, on the part of the workman affected, to carry out some important instruction framed for his benefit.

Fire Alarms.

The ideal of the Fire Brigade Authorities is the annihilation of time between the notification of a fire and their arrival at the premises affected; hence the replacement of horse-driven vehicles by motor pumps and escapes. The last pair of horses has just been withdrawn from service. The Fire Brigades are chiefly dependent for the notification of fires upon the fire alarm systems which, in most cases, are installed and maintained by the Post Office Engineering Department. The importance of maintaining the lines and apparatus in efficient condition is fully realised by the Engineers responsible and special attention is given to this duty. Very close co-operation exists between the Brigade Authorities and Post Office staff, and there is reason to believe that the former have every confidence in the latter. A number of linemen are scheduled for duty in the event of faults showing up after the normal working hours so that at any time, day or night, prompt attention is guaranteed.

Possibility of Post Office Development.

During the discussion of Mr. Winyard's papers at the Telephone and Telegraph Society's Meeting on Nov. 21, some of the speakers suggested directions in which the Engineering Department might extend their activities.

One was that they should take over the supply of electricity throughout the Kingdom. If this service ever does become nationalised, it will be of sufficient magnitude to justify being dealt with by a separate department and not by the Post Office. It may be that the speaker had in mind the possibility of using the telephone wires for the additional duty of supplying current for lighting and power purposes to subscribers' premises. Perhaps a wireless system of supply might be more effective.

Another suggestion was that in cases where groups of houses are being built, the Post Office should put down plant in the newly-formed streets and wire every house for the telephone. Unfortunately, it has not yet been made an offence to be without a telephone, as it is to be without water. The person who made the suggestion may rest assured that the telephonic needs of these sites are not overlooked and that plant sufficient to meet the probable needs for many years to come is installed in the streets and that, in the interests of national economy, any underground plant required is placed in position before the roads are made up and not afterwards

New Type of Message Carrier.

At the new Golders Green B.O. a message carrier of a new type has just been installed by the Gipe Company. The special feature of interest in this carrier is that the small carriage holding the message form is propelled rapidly along the supporting wires by the sudden divergence of the pair of wires at the despatching end. A similar installation is working at another London office.

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 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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POST OFFICE DEVELOPMENT.

THE Post Office has been well-named the "handmaiden of commerce." Its functions are manifold and its activities extend to every corner of the country and affect every member of the public in greater or less degree. The future will, no doubt, see considerable development and extension of these functions and activities, widespread though they are at present, but it will tax the enthusiasm of the most confirmed advocate of Post Office development to give support to all the proposals made in the very interesting paper which Mr. A. C. Winyard read before the Telephone and Telegraph Society of London and which appears elsewhere in our columns. Mr. Winyard has all the courage and audacity of the ardent reformer. He sees nothing fearful in the Post Office, apart from its existing responsibilities, becoming a bank of such magnitude that every existing banking institution would be a pigmy in comparison, or in its developing of an insurance business which would out distance all competition, or in its taking charge of all foreign cables, or in its assuming house-to-house delivery of newspapers. These suggestions leave one breathless. Mr. Winyard conceives a Post Office grown to such dimensions as to be beyond the grasp of the ordinary mind and one can only pity the men whose unfortunate lot it would be to administer so gargantuan a business.

We will leave the proposals which concern matters other than the telegraph and telephone services to others better qualified to consider them. As regards telegraphs, apart from the question of operating all foreign cables, Mr. Winyard's suggestions come under three heads (1) whether there is a case for urgent and non-urgent telegrams with a differentiated tariff; (2) the introduction of deposit account telegrams, ; and (3) the anomaly of a Flat Rate Tariff.

The first and third suggestions are old friends. The traditional attitude of the British Post Office is that all telegrams are urgent, and facilities, both as regards plant and staff, have been provided to ensure rapidity of service. A marked differentiation between urgent and non-urgent telegrams in respect to quality of service, such as would justify a differentiated tariff, could be secured only by holding up non-urgent messages, as it is certain that members of the public would not be prepared to pay a higher tariff for urgent telegrams if their transmission were hastened only to the extent of a few minutes. In Continental countries the proportion of urgent telegrams amounts to only 3 or 4 per cent. of the whole. There is no reason to suppose that it would be appreciably higher in this country, and, unless the present tariff became the non-urgent rate and a higher rate were imposed for urgent telegrams, the proposal would result in a considerable loss of revenue which the telegraph service certainly cannot afford.

The Flat Rate system of charge may seem anomalous, but, with the transfer of the great bulk of short-distance communications to the telephone service, there are not such wide variations in the wire mileage of telegrams as one might suppose. The operating charges per telegram remain fairly constant whatever the mileage, and the charge for the use of plant, which is covered by the tariff, is comparatively small. The Flat Rate system of charge has become so integral a part of the British telegraph service that very strong reasons would be required for departing from it. Mr. Winyard does not furnish details of how the deposit account system, which he suggests, would work, but it would seem to involve a complicated method of accounting, and one may doubt whether much use would be made of such a system if it were introduced.

The Editing Committee take this opportunity of wishing all readers at home and abroad a Happy and Prosperous New Year.

Suggestions have been made by our readers from time to time that a column of "Answers to Correspondents" would be a desirable feature in the JOURNAL. The Editing Committee therefore invite enquiries on telegraphic, telephonic and kindred subjects which they will be glad to answer so far as lies in their power.

POSSIBILITIES OF POST OFFICE DEVELOPMENT.*

A. C. WINYARD (C.T.O.)

I WAS informed in the communications which passed respecting to-night's meeting that the subject was regarded in some quarters as of a controversial character, and confess I was somewhat surprised. I imagine, however, the controversial side of the subject is bound up with the question of the *advisability* of Post Office development rather than with its *possibility*. I suppose even in this year of grace, 1921, differences of opinion still exist as to the desirability of Post Office extension, either in competition with, or independent of, private enterprise, and there are possibly a number of individuals in all ranks of society who look upon new forms of State trading whether in the Post Office or elsewhere as inventions of the devil.

In this connexion we are irresistibly reminded of the dictum of a former Postmaster-General when he laid it down "that any scheme involving an extension of active competition on the part of the State with work already done cheaply and efficiently by private enterprise would have no chance of receiving the assent of Parliament." Possibly some of us would be inclined to agree if the reference was to the present House of Commons, but the Postmaster-General who gave utterance to such a declaration made it clear that it was his personal opinion only. Other times, other manners, and one has more than a suspicion that the past few months have brought a new orientation to St. Martins-Le-Grand.

The ink was scarcely dry on the portentous declaration of policy just mentioned, when the Post Office announced the initiation of that great scheme of Imperial communication, the State-owned cable across the Atlantic. That was an anti-climax indeed. A step which has been of inestimable benefit to this country and the Empire, not only during the war period but since the advent of peace. The opponents of State trading nowadays are not in a very happy position. In all phases of commercial life, and in all classes of society the principle of State or municipal enterprise is steadily gaining ground and obtaining recognition. It is sapping and mining in all directions under the trenches of private profit, and infiltration is proceeding at such a rate that it is only a question of time before a flood-tide sets in.

That well-known writer, Emil Davies, in his interesting work entitled "The Case for Nationalisation," doubtless familiar to many present, has so admirably illustrated the position that I make no apology for quoting his word-picture. He sums up as follows:—

> "Eliminating the element of time in getting from place to place it is already possible for a man in any civilized country to be brought into the world by a State doctor or mid-wife, reared in a State nursery, educated, clothed and doctored at a State school, and, if needs be, fed at the cost of the community during his school days. He can earn his living in Government employment in any country. In most big towns he can live in a municipally-owned house. In New Zealand the Government will lend him money with which to buy a house, and it will also lend him, free of charge, the plans on which to construct it. If sick, he may be treated by a State doctor, or in a State hospital. He may read at the State or municipal library until he goes blind, when the State will take him into a State blind asylum, or until he goes off his head, when he will be cared for in a State lunatic asylum. If unemployed, the State endeavours to find him work. In most of the towns in Italy or in Budapest, he can buy his bread from the municipal bakery, and in other countries he can get municipally-killed meat from a municipal butchery, and flavour it with Government salt after having cooked it over a fire made with State-mined coal. Or he can partake of this meal in a municipal restaurant, drinking municipal brewed beer, wine from the State vineyards or State spirits. He then lights his State-made cigar with State-made matches, and can read a municipally-produced daily newspaper. By this time, feeling more cheerful, he can draw some more money from his account at the State or municipal savings bank, and can visit the municipally-owned racecourse, where he gambles with the State or city, and can end up the evening at the State or municipally-owned theatre. If he likes he can even take a municipal ballet girl out to supper, after which he may, if he feels so inclined, confess to a State-supported priest. Then, if he can afford it, he may go to recuperate at a State or municipal water spa, or bath in France, Germany or New Zealand, after having insured his life with a State Insurance office, and his house and furniture with the State fire department.
>
> By this time if a strong individualist, in despair at the encroachments of the State and municipality in every domain of life's activity, he can buy State gunpowder at a State shop and blow his brains out; or if he likes to blow out some one else's, the State, having brought him into the world and made him what he is, will finish the job and kill him, this being a monopoly jealously guarded by the State except in war time.
>
> In Switzerland, Paris or many another city, the municipality will bury him. There is no time on this occasion to follow him beyond this stage, except to mention that the Public Trustee in most countries will probably look after the deceased's affairs much better than he himself did during his lifetime.

It is difficult to resist the conclusion from such a summing-up, that however disastrous the Russian experiment may have been, as indeed all drastic and extremist steps are bound to be under such circumstances, by gradual processes, the doctrine and the practicability of State or municipal enterprise is fermenting the Western nations.

Suggestions for the extension and development of Post Office services are by no means novel.

They were first put forward several years before the war, by the various Post Office Trade Unions, and in that campaign, what was then known as the United Kingdom Postal Clerks Association, played a prominent part. A comprehensive booklet on the question was published by that organisation, which in the main covered the majority of the proposals since discussed in a wider sphere.

A number of deputations have visited the Postmaster-General, and articles have appeared in the Service journals dealing with various phases of the question; the most recent instance being the publication in the "Post Annual" of an interesting description of the Postal Cheque System. One cannot, therefore, in any shape or form claim originality for the proposals adumbrated, nor will it be possible to go fully into details. They are of such an extensive character and cover such a wide variety of subjects that to-night it would merely fog the issue, and one can only hope to present the skeleton or framework of the development theory.

The suggestions which have been advanced from time to time for Post Office development are based mainly on the broad ground that the Post Office with its extensive network of offices, stretching like tentacles throughout the whole of the United Kingdom, possess an unrivalled and unique organisation for enlargement and extension of services— an organisation the equal of which does not lie in the possession of any private company, however powerful and far-reaching it may be. The staff and machinery are there, and it should be a comparatively simple matter to superimpose upon that organisation, other services of a remunerative character, without unduly increasing the necessary standing charges. A close consideration irresistibly drives one to the conclusion, however, that future Post Office expansion is inevitably bound up with the question of international relationship, remote though the connexion might at first sight appear.

If this country in common with others, is to be engaged in another world war before many decades or even years are past, then future development must be viewed from an entirely different angle to what would be possible if a pathway to peace became visible. There are only two possible channels. One was being traversed when the flood-tide of August 1914 burst upon us. It is labelled "Militarism," and carries its attendant implications. If such be the chosen pathway of mankind in the time to come, then the British Post Office would have one, and only one duty before it—however much as individual members of that Service we might deplore the position—and that duty would be to develop still further, these war-time activities in which it excelled so greatly, in order to be adequately prepared against the future tide of war. All question of development tending towards the encouragement of peaceful industry in such circumstances would rightly be excluded.

I trust and believe, however, that the pathway of humanity is set in the other direction—the channel leading to disarmament, and the encouragement and development of the arts and industries of peace—then indeed, a new orientation will open—and the future development of Postal Services can, and must be, viewed from quite a different standpoint.

We are sometimes apt to forget that even in the past the Post Office has developed—and developed at an extraordinary pace—but even so, it has been a development arrived at by force of circumstances, rather than of will, and it has taken place in what can only be described as an atmosphere of doubt and distrust with the possibility of war always looming on the horizon. Remove that dread spectre, bring security to industry, and we shall see such a trade revival, such an increase of industrial and commercial prosperity, as the world has seldom witnessed. I am an optimist in this matter. I believe we are on the eve of a revival of this nature, and without indulging in metaphors concerning "rainbows" and "sunshine over the Welsh mountains," we can yet see a new era opening before stricken humanity. In the coming commercial expansion the Post Office will doubtless share, but it indicates that the problem must be faced from a fresh point of view, and with a recognition that in the new circumstances a far heavier responsibility than hitherto will rest upon the shoulders of Postal administrators. The Post Office has always been, in a limited and restricted sense, the hand-maiden of the people. In the industrial revival it should strive to attain that ideal in a very real and comprehensive sense; until it would really become in the best meaning of the term, the "People's Office."

Perhaps for a few moments I may be permitted to refer to the attitude, the traditional attitude, of the Treasury and the Department towards the question of development. One of the chief difficulties has been that of Treasury control, for it can be said with a good deal of confidence that scarcely any industry in the country would be able to register a success under the financial restrictions and supervision imposed by Whitehall.

The actual attitude of the Treasury towards extension, is perhaps not quite identical with that of the Government. The latter are influenced by factors which do not, except indirectly, touch the former. Politics being what it is—Big Business, Political Expediency, or any old thing which affects votes—those supremely important factors in a modern democracy—will

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

always play some part in the attitude of a Government, and, we cannot reasonably expect it to be otherwise while the present system remains. The Treasury should certainly not be influenced by any of these considerations, and yet as far as the outsider can discern it views Post Office expenditure almost as though it was a non-revenue producing Department; and seems to ignore the fact, that the income is derived from transfer of goods and services, which, sold in the Post Office shop, are always good value for money

Whatever other changes are made in Treasury control, and such are quite possible—given altered methods of presenting accounts to Parliament—it is obvious that a complete differentiation should be drawn between the expenditure of a department like the Post Office, and that of departments which are administrative only. With control exercised as it has been in the past, it is a distinct tribute to Post Office management that it is such an outstanding example of successful enterprise; successful financially in peace, giving a service and supply unsurpassed in efficiency and quality and withstanding war shocks in a manner unrivalled by private firms. It has emerged from the struggle—a struggle which saw private industry rocking to its foundations—with its reserves almost untouched, its morale unimpaired, and ready to take its place in the coming commercial expansion with credit to the Empire—if the Government and Treasury but permit.

What better instrument could we have than such a stable institution on which to build, broad as its own foundation, an organisation of public service, instinct with initiative and enterprise, and inspired by the glowing ideal "for the good of the public."

It has been the accepted theory in some circles, that the conservative attitude adopted by the Post Office has been to some extent dictated by fear of press criticism if it ventured at all into domains hitherto sacred to private enterprise. If the Department was ever under the impression that the adoption of a negative policy would save them from criticism in the press, surely recent events have undeceived them.

When one discovers that newspapers with views not usually favorable towards public enterprise, begin criticising the Post Office, not because of the establishment of a new Service, but because that service—the air mail to Paris—is in their opinion insufficiently advertised—then it is time to sit up and take notice.

A policy of audacity as the Prime Minister would say, always pays, even for the British Post Office when facing press criticism. Those who are most opposed to the development policy are moreover in no sort of doubt as to the attitude of the staff.

The Post Office Trade Unions have carried resolution after resolution at their annual conferences endorsing the policy, and this represents the considered attitude of the great majority. There is a desire, a very natural and proper one, amongst those likely to be affected by development proposals for due recognition to be accorded, of added responsibility which fresh service entails.

But a State service is not alone in that respect—employees of private firms take up inevitably a similar and in some cases a far more definite attitude. Fresh services hve been added in considerable variety during the war, and it would be quite easy to argue that in such circumstances, employees of private companies would have put forward much greater demands.

One has only to contrast Postal work, as it exists to-day, with the position as it was in the early days of its establishment, to realise the great changes which have taken place.

The Post Office commenced its work as a carrier for the common people but a haphazard selection of present day services is almost startling in its wide variety. Let me recapitulate a few at random. They comprise: Life Assurances, Annuities, Telegrams, Telephonic communication, Pensions, Savings bank, Cablegrams, Wireless, Air Mails, International Coupons, Railway letters, Postal Orders, Money Orders, Licences, Patent Forms, National Savings Certificates, Government Stock, Express service, etc.

Speaking generally existing Post Office services respond in a marked manner to the outside industrial atmosphere. The ebb and flow corresponds to the fluctuations in trade, for the Post Office is a very sensitive industrial barometer.

It may be said that the fluctuations are not quite so violent, nor are they so disastrous in effect, as are those in outside industry. This is due not only to the inherent stability of State trading, but to higher efficiency in comparison with the average business firm. Nevertheless, the condition of industry generally, reacts on the Postal Services inevitably, whether in a favourable or unfavourable direction.

The flow of telephonic traffic was reduced by war-time restrictions, such as the limitations on racing. The increased cost of paper during the war, automatically reduced posting, quite apart from the increased postage rates which were imposed, and so forth and so on. instances could be multiplied almost indefinitely. The real lesson to be learnt is, that even from self interest the utmost possible should be done by the Post Office to help and encourage trade, for it encourages thereby its own prosperity.

Advocacy of banking developments from a Post Office point of view does not commit one necessarily to the setting up of a National Bank controlling credit. That would be the function of the Bank of England in any case, and if nationalisation of Banking was aimed at, there again it would inevitably fall to the Bank of England to control and direct operations.

One is confined, therefore, in this review to a consideration of the facilities for deposits and transfer of money, or in other words, an extension and development of the Postmaster-General's present powers until he could really be termed the banker of the people. Many years ago the Postmaster-General opened a banking shop, and straightway announced to all possible customers that he would do only a little business, just a little, with each customer.

It would be difficult, if not impossible to find a similar situation in the industrial world. A greengrocer might just as logically open his business and announce to his clients that he could only sell them a pound of applies or two pounds of potatoes. No more—oh, no, it would not be good for the seller and the buyer. All big orders must go to Mr. Smith the big greengrocer a mile away. Happily for our reputation as a trading nation, we do not find the greengrocer or the butcher committing hari-kari. If they did, the undertaker would soon have an opportunity accorded him of doing unlimited business, and it is almost time that in a nation of traders the Postmaster-General, as a banker should set his house in order, and cease to send potential customers to Mr. Smith or Mr. Barclay round the corner. The restrictions which have hedged the British Post Office Bank round and about ever since its inception should be swept away definitely and for ever.

Owing to war emergency those restrictions have been modified, but in this instance war-time emergency is identical with peace-time necessity, and there seems no reason why the loss of deposits to other savings banks, not subject to restrictions should be continued. The loss to the State is definite and yet preventable, and no manager of a private concern would long retain his post, who allowed such a leakage to continue. But the restrictions which operate in the case of the savings bank are not the only instances in which the Postmaster-General figures, functioning in his capacity as a banker.

There would seem to be no reason beyond the antagonism of the great joint stock capatalist banks, why one could not open an account with the Postmaster-General's bank, and pay bills by cheques, in precisely the same way as one can with an ordinary private bank.

A number of so-called banks have failed during the past few years, and on each occasion, we have had an outcry in the Press against the looseness of the system, and pointing out the ease with which a bank so-called can be set up, and allowed to accept the money and deposits of the public. On the other hand we have the Post Office with its unrivalled network of offices in every town and village, with machinery for dealing with such a business, unexampled in the history of the world, refusing to satisfy a crying need in our vast and complicated modern industrial world. Some of the organisations which have failed, have had none too savoury a reputation, and their appearance in the bankruptcy court has caused unutterable distress and misery to thousands of widows and orphans. Has it no moral responsibility in this matter, when the machinery is ready to its hand?

The managers of defaulting concerns had the acumen to discern what appealed to the small depositor, to the members of the lower middle class, or the better paid artisan class. Thousands upon thousands of small men would be only too glad to open an account at the Post Office Bank, if they were accorded the opportunity, and perhaps members of this Society would not be altogether absent in the rush which would take place. The announcement of the initiation of such a step would cause a run of quite a different character to that usually experienced by banking institutions and it cannot be alleged that predecents do not exist for such a step. Even in Austria, to take one instance alone, an account can be opened, with a minimum of £4 in the Austrian Postal Bank and bills can then be paid by cheque. The extension and development of the Post Office Banking system should not stop even with the adoption of the reforms indicated.

We have lately heard a good deal and are likely to hear a good deal more, about the Postal Cheque system.

It is a matter of some surprise, and illustrates to what an extent we are dominated by financial interests, that the Continent is so far ahead of us on this question. It has long been adopted and worked with a maximum of success by almost every Continental country, and some of the latest figures which are available are startling in their revelations of the extent and ramifications of the Postal Cheque system abroad.

In SWITZERLAND at the end of 1919 *account holders* numbered 33,780, the *turnover* was 16,700 mill. francs, *international transactions* were 12,169, and orders were issued for 1,700,000 francs.

In GERMANY at the end of 1919 there were 437,667 accounts. At the end of 1920, 622,343: an increase of 42 per cent. over 1919. *Turnover* 1920 683,900 million marks; 187 per cent. increase over 1919. *Capital* of account holders. 1920 7,600 million marks; 123 per cent. increase over 1919. *International Service* 1919: Transfers on Hungary 90; reverse direction 80. Transfer on Switzerland 4,890; reverse direction 9,160. Transfer on Belgium 30; reverse direction 140.

In CZECHO-SLOVAKIA Started 1918. At the end of 1919 the *account holders* numbered 42,995. Capital 1,402 million crowns. *Transactions* 1918 866,741; 1919, 19,948,496. *Net Profit* 1919, 9,885,160 Crowns.

Such figures are startling in their implications, and it must not be forgotten that our network of Post Offices is far superior to that of the majority of Continental countries in many respects.

It needs, therefore, little effort of the imagination to visualise the extensive ramifications and wide organisation of the system which would in a short time be elaborated if it were adopted in the United Kingdom. It would simplify accounts, do away with an enormous number of duplicate calculations, and as far as the country post offices and agricultural transactions are concerned, it would be an immense help in encouraging and stimulating by ease of settlement, all the work of the busy country side, whether conducted by farmers or smallholders. I do not think I should be justified in wearying an audience

of this character with a close exploration of the details of the Postal Cheque system, but perhaps a brief sketch would be useful.

If I possess a postal cheque account and desire to send a remittance to an individual who also holds an account, I simply fill in a form, hand it over the counter at any Post Office, or forward it by letter in the ordinary way. The necessary amount is transferred forthwith from my account to his. Even in cases where the sender has no postal cheque account the system operates, for upon payment of a small poundage the money is transferred to the necessary account. Take a practical case. If I desire to pay the rent, or the doctor's bill, I should simply fill up a form for the necessary amounts to be transferred from my account to those of the landlord and physician. It saves an infinitude of trouble and is a godsend to those, who, not having the means to keep a large account, standing in a private bank yet desire the convenience of paying their accounts by cheque. Amounts can also be withdrawn, and paid in by means of the money-postman at a private address. Perhaps the Post Office will explore this side of the development question as one factor towards solving the problem of part-time labour.

When an account under the Postal Cheque system has been credited with a particular amount, the payee is notified, and the sender can always obtain confirmation from the Post Office of the transaction if he should chance to lose his official receipt. The system is unquestionably of great utility to societies of all kinds.

In the majority of Continental countries members of societies or Trade Unions can pay their subscriptions at any Post Office in the sure and certain knowledge that it will be transferred at once to the account of their societies. It can be seen at a glance what an enormous saving of typing, duplicating, letter writing and accounting this means. The only objection which can in all seriousness be urged against the system is that the revenue is diminished from money and postal orders, etc. This is perfectly true, but the profit from the system itself is proportionately so enormous that, from the unanimous experience of countries that have adopted it, one can safely say that where a penny is lost, a shilling is gained.

Continental societies of all kinds, business firms, and hundreds of thousands of individuals, use their Post Office bank, and it is time that Britain ,the workshop of the world, followed suit. The real obstacle to the institution of the machinery in this country, however, is, as everyone knows, opposition from private and joint-stock banks. On this phase of the question, the effect of the institution of a State bank is, I believe, somewhat exaggerated.

For a period of time following the initiation of the experiment it is probable the result on the turnover of the private banks would not prove to be as great as might be anticipated. The first effect would be the exploitation of what has hitherto been an almost untapped field ; untapped, that is, except by bogus and mushroom concerns, and the mobilization of previously unattached financial resources would be of distinct benefit to the nation.

A new factor too, has supervened in recent years, a factor to which, sooner or later—and the sooner the better—the Government must give serious heed. I am referring to the extensive amalgamations of banking interests which have been continuously proceeding for some time past. We have a situation emerging in which the financial position is largely dominated by a few huge joint stock concerns of tremendous wealth and potentiality. Hitherto they have been conducted, as far as one can gather, in a manner comparatively restrained, and with a good deal of regard for the interests of the nation as a whole.

That statement, however, contains no guarantee for the future, and it may be that the Government of this country at some time or other, will find a situation arising in which the existence of a stable, well developed, extended Post Office bank will be not only an indispensable supplementary to the National Bank of England, but also the only possible guarantee against a financial attack on the State.

The institution of the penny post has always been regarded as something which the service had every reason to feel proud of, and the public in time came to regard it as one of those good old British institutions which had come to stay. Scarcely one of the innovations which the war brought in its train caused so much regret generally as did the disappearance of the penny post.

The cost of living is now showing an appreciable drop, we are within hail of the penny fare on the 'buses, tubes and trams, and an increasing desire will certainly manifest itself for the reinstitution of the penny post.

One is aware of the almost insuperable difficulties standing in the way, but immediately the condition of Post Office finance allows, the service will heartily join with the general public in a desire for its re-introduction, even in a modified form. This would be by far the most desirable development of Post Office services on the purely postal side that could be accomplished for some time to come. The resultant increase in traffic would be of such a character as to contribute its own quota towards the diminution of unemployment, and increased prosperity both postal and national.

There are, however, a number of comparatively minor reforms which even now could be considered for adoption on the postal side. Taken separately they may not perhaps be estimated to be of prime importance, yet taken in bulk they would prove of great utility to the nation. The majority have succeeded abroad and in this category can be placed automatic stamp-machines. Surprise is occasionally expressed that this comparatively recent innovation of the Post Office has not been adopted more extensively.

A reason which would be somewhat difficult to explain to the public undoubtedly exists, but adjustment should certainly not be impossible, nor a departmental difficulty allowed to stand in the way of the adoption of a public benefit.

One contrasts the facilities which are offered to the public for writing purposes abroad, with the miserably meagre opportunities in Great Britain. It is perhaps a question of economy, yet the experience of Continental countries leads to the belief that expenditure incurred thereby is returned a hundredfold, and this lesson some of our great multiple concerns have learned and applied.

On long-distance trains the absence of letter boxes is an anachronism. It would be of great benefit to business men who frequently deal with their correspondence whilst travelling, from the saving of initial delay, and the earlier reply.

Newspaper delivery through Post Office agency is one other source of profit not yet exploited, and its initiation would save the wasteful spectacle of different news lads, or girls, distributing papers in the same street and covering precisely the same ground with the concomitant loss of time, labour and money.

Advertisements and advertisement revenue is another item which has received but tardy attention. It is capable of infinite development and if tackled in an artistic spirit the Post Office of the future might become not only very different to the average drab appearance which now confronts us, but something of positive attraction. On the practical side it can be said with logic and reason that advertisements would bring in a large additional revenue without substantial increase of cost.

There was almost as much satisfaction on the telegraph side of the service on the institution of the sixpenny telegram, as existed on the postal side at the introduction of the penny post. We seem to have travelled a long way since it was possible to send a wire for the nimble tanner, and perhaps the the best that one can wish for in the way of development for the telegraphs is the speedy advent of that time when the readjustment of prices and costs will enable that happy position to return, even if only in modified form. We shall then witness not only a reversion to the pre-war flow of traffic, but a considerable increase on those figures, the period coinciding in all probability with a substantial trade revival. That would indeed be a welcome development, but pending the millenium arriving it is perhaps permissible to wonder whether the full possibilities of urgent and non-urgent telegrams as traffic and revenue producing agents have been fully explored. Joint departmental and staff consideration of such a potential subject is certainly desirable.

On the subject of deposit account telegrams, too, the view is sometimes expressed that perhaps an extension of the system might be adopted. In the case of a commercial traveller on his round representing a large firm, it is often the fact that the decision as to whether a wire or letter should be sent is one of personal convenience. There should be no great difficulty in allowing the deposit system to function in these cases within fixed limits. The question too, whether a flat rate for telegrams is not an anomaly, and whether some modification of the system is not desirable whether in the direction of a zone system or in othe ways, is surely ripe for consideration.

On this subject the question should be tackled jointly by the staff organisations and the department, for the possibilities from all points of view, are manifold.

The Washington Conference has just adopted a far-reaching and sensational principle on the question of disarmaments—a step which we all, I believe, in this country rejoice, and rejoice whole-heartedly to see taken. But I am not sure that all the implications of the step have been recognised. It has been argued that one of the logical outcomes of the naval decision is the complete international control of communications. Without committing oneself to such a far-reaching theory, it yet would seem that there is a good deal to be canvassed in the suggestion. Arrangements will have to be made by the States concerned to see that the agreement arrived at is faithfully carried out.

It would be unthinkable that States which are loyal to the pact should be exposed to sudden and treacherous attack by unscrupulous neighbours. The best method of guarding against such an eventuality remains to be considered, but control of communications, or oversight of communications would certainly fall within the ambit of consideration. This country found that the method was of incalculable benefit during the progress of the war, and the records of the censorship would doubtless reveal the story of many surprise attacks being happily frustrated.

It is to be hoped that the Government from an imperial view will take a definite stand and that the extension of wireless schemes will be completely under the control of and managed by the State.

One cannot praise too highly the enterprise which initiated the Imperial Transatlantic Cable, and the excellent results which have flowed directly from that work. But here again the Government must make up its mind precisely in which direction it is going. It cannot embark on such an enterprise and continue as an ordinary competitor with private capitalistic concerns in the same line of business. Such a condition of affairs could not go on indefinitely. Sooner or later influences would arise, governmental or otherwise, which would seriously affect the stability of one side or the other. If the Government remains in the business it must remain in as the supreme factor as far as Great Britain is concerned.

The after-war allocation of cables has presumably not yet been settled and it is conceivable that diplomatic and financial considerations may make the public consideration and discussion of such a subject inadvisable. One is, therefore, debarred from touching on what perhaps is the most interesting phase of the development question on the telegraph side of the service.

It is permissible, however, to express the hope that if the subject be considered of such paramount importance as to merit discussion at the

Washington Conference, that our delegates take the strongest possible line. One may hope though not perhaps indulge in expectation that the two English speaking countries would mutually agree that all wireless and cable working should be under national and international control.

The naval situation provides an opportunity which is not likely to recur and administrations will be weighed in the balance and judged by future generations according to their acts and decisions at such a golden moment.

The Insurance business of the Post Office is surely in as curious a position as could well be imagined. We possess a system with such adequate machinery for extension and amplification that it could be made to embrace the whole insurable population of the country. The actual position, however, is that the very existence of a Post Office insurance business is almost unknown. It is probable that a large proportion of the population of this country are not even aware that one can insure through the medium of the Post Office.

It is also probable that those who are aware that a scheme exists, have but the faintest notion what particular form of insurance it embraces. There is something inherently wrong for such a condition of affairs to be in existence and it is not a matter for wonder that it was possible for the Parmoor Committee in 1920 to damn the management of industrial assurance with faint praise when a State insurance department almost fails to function.

Insurance is such a recognised element in modern social and industrial life that its existence is regarded as axiomatic. The public take it so much for granted that its relevance and fitting place in the scheme of things receives little attention.

The enquiries which have been made, however, indicate, as might have been expected, that the defects of management by private undertakings are numerous and varied. So obvious, and outstanding are the faults as revealed by Lord Parmoor's Committee that the State should seriously consider whether the whole of the insurance business should not be monopolised under State management.

There are about 18 companies engaged in industrial insurance and some of these are enormous concerns, one company possessing funds of £90,000,000.

In 1918 the total premiums received by industrial companies was over £25,000,000, there being 51,000,000 policies in existence. In carrying on the business of these companies there is an immense amount of overlapping and duplication in machinery, involving a tremendous waste both of time and money. Armies of collectors are kept at the labour (unproductive in the proper sense of the term) of collecting weekly sums and canvassing for fresh customers. Rival agents often traverse the same streets and compete for new policies. The financial part of the business is even more staggering. Management expenses, including commissions and dividends, reach an astounding figure, about 44 per cent. of the total premium income going in such expenses. Of £25,000,000 per annum received in premiums £11,000,000 is utilized for expenses, and only £14,000,000 received in benefits.

Perhaps the worst features of the system are the number of insurance policies which lapse, giving the policy holders absolutely nothing for their money. In 1913 nearly 5,000,000 policies lapsed, of which nearly 4,000,000 had only been taken out in 1912-13. About 4,000,000 policies taken out in any given year lapse in that year or the year following.

It may be argued that if a policy drops it is the fault of the policy-owner in not keeping up the necessary payments. That, no doubt, is true, but under the present system we find that agents often do not call for premiums for weeks at a time. It is not difficult to realise the position in many homes when eventually he does call. The system of commission on new business does not tend to prevent this happening. There is no remedy for this condition of affairs as long as the employment of numbers of competing agents working on a commission basis for competing companies continues.

There are perhaps several reasons why the Post Office insurance system has comparatively speaking failed.

First and foremost comes the question of publicity.

For practical purposes one can say this does not exist either by way of advertising or canvassing. As far as can be ascertained the insertion of a leaflet in Post Office savings bank books is the only effort that has been made. The principal reason for the timid policy pursued by the Government in regard to insurance is not in doubt. A deputation from the Postal and Telegraph Clerks' Association in 1917 urged the Postmaster-General to popularise the insurance section, and he then declared frankly that the opposition of the companies prevented him from acting. In face, however, of the Parmoor report can that attitude still be maintained ?

The Postmaster-General could now approach the problem from a fresh position and in view of the findings of that report he would discover that public opinion was on his side. The advantages of State insurance are (1) avoidance of wasteful competition caused by commissions, multiplication of offices, staffs, agents, directors' fees and dividends. (2) Avoidance of high proportion of lapses. (3) Decreased premiums or increased benefits due to the operation of (1).

In almost all sections of its organisation the Post Office attitude in the past and as far as one can judge in the present also is timidly to draw back from embarking on fresh undertakings, which would be of great advantage to the nation.

One hopes that in the future a different view will be adopted for it is inconceivable that so vast a business organisation with its branches and agents everywhere should permanently be debarred from indulging in these supplementary forms of enterprise which, apart from the benefit they would confer would bring in an additional income without materially increasing the present standing charges.

Proposals for the development of the Post Office as of any other business undertaking are bound in the nature of things always to be of a fluid character. Business, industrial life and national expansion are ever and always changing and development plans must be adopted and fitted to the fluctuating and kaleidescopic circumstances of the time.

It would be folly to lay down fixed and rigid plans and an excellent proposition at a given time might be altogether unsuitable five or even a less number of years later. One does not, therefore, either criticise or welcome development in a particular section of the service from a settled angle. Rather is the broad point of view the only one possible in the circumstances, *i.e.*, that the Post Office organisation and machinery is far-reaching and unrivalled, and on it, therefore, it is possible to erect other public services of utility and benefit to the nation. Each particular suggestion must be examined necessarily in the cold light of fact and practicability.

That is all those who believe in the possibility of development have ever asked or suggested except that on this, as on any other principle that might be advanced, there is a psychological moment for advancement. I have little doubt that the course of a few years will see the time arrive when the moment is favourable if indeed it is not almost upon us now. A great deal will then depend upon the attitude of those in whose hands the decisions will rest.

Only time will tell, but whatever the course taken one can hazard the prophecy that in the future as in the past the Post Office will take its share in the industrial development of the nation.

Whether that will be carried out from force of circumstances, or whether such a movement will be initiated, guided and encouraged into the most useful channels will be for Post Office administrators themselves to consider and decide.

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(*Continued from page* 44.)

Transmission.

In the preceding pages the various arrangements used at a receiving station to indicate the passage of electric waves have been described.

We will now consider the means by which these waves are produced.

It has been explained above that a transmitting station, in order to produce a signal, may either send out a series of detached trains of waves with the amplitude of the separate waves in each train gradually decreasing, as shown in Fig. 5 ; or the waves may be sent off steadily and with constant amplitude during the whole signal.

The first type is known as "damped wave transmission" or "spark transmission." The second type is known as "undamped wave transmission" or "continuous wave transmission" (contracted to "C.W.")

Spark Transmission.

The arrangement used for the production of damped waves is shown in Fig. 21.

In this diagram A represents an alternator which is joined to the primary coil P_2 of a step-up transformer. The Key K is inserted in the leads between the alternator and the primary of the transformer. The secondary coil S_2 of the transformer is joined through the two inductance coils L_2 L_2 to a "spark gap" G. This latter, in its simplest form, consists of two insulated metal rods or balls placed near to one another. These are called the "electrodes" of the gap.

Across the spark gap is joined the condenser C_1, the primary coil P_1, of an oscillation transformer and an adjustable inductance L_1. The Secondary coil S_1 of the oscillation transformer has one end joined to earth through a current indicating device I, while the other end is connected through the adjustable inductance L to the aerial.

We thus have an open oscillatory circuit consisting of the aerial, the adjustable inductance L, the secondary coil S_1 and earth, coupled to a closed oscillatory circuit consisting of the condenser C, the primary coil P_1 and the adjustable inductance L_1. The spark gap G in the closed oscillatory circuit is automatically closed when oscillations are taking place, as will be explained later.

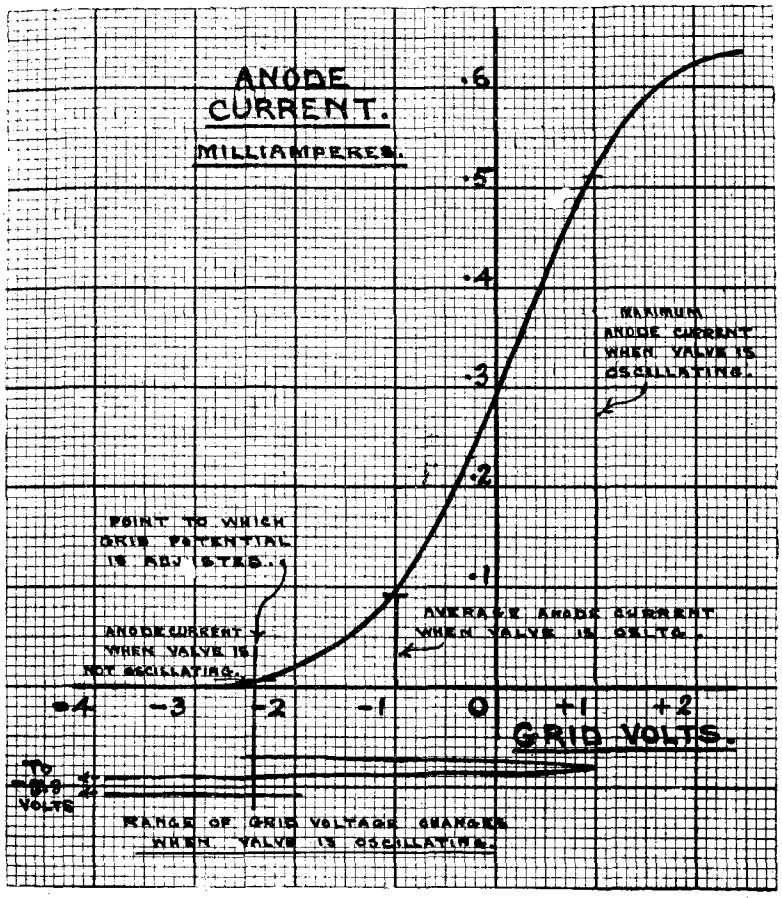

FIG. 20.—VALVE CHARACTERISTIC CURVE SHOWING THE PRINCIPLE OF THE TURNER RELAY.

Both these circuits are adjusted to have the natural frequency corresponding to the wave-length which it is desired to transmit. For instance, if the desired wave-length be 600 metres, the circuits must be adjusted so that their natural frequency of oscillation is 500,000 periods per second.

The frequency adjustments are made by chosing suitable values for S_1, P_1, and C_1; the final adjustments being made by varying the inductances L and L_1.

When the key K is depressed the low-voltage current from the alternator A is allowed to flow through the primary coil P_2 of the transformer. This sets up an alternating current at high-voltage from from the secondary coil S_2. This high-voltage current flows through the inductance coils L_2 L_2, the inductance coil L, and the oscillation transformer primary P_1, into the condenser C_1. As soon as the potential to which the condenser is charged reaches a sufficiently high value the air between the two portions of the spark gap G is broken down and a spark passes. This renders the space between two electrodes of the gap conducting, and the condenser consequently discharges round the circuit C_1, P_1, L_1 with oscillations, these oscillations gradually dying away as explained in the early portion of these articles.

By reason of the coupling between P_1 and S_1 the oscillations in the closed oscillatory circuit set up similar oscillations in the open oscillatory circuit, and consequently a train of damped electric waves is sent off from the aerial.

After the condenser has discharged itself in this way it is re-charged by more current flowing into it from the secondary S_2 of the transformer, and when it is charged sufficiently another spark occurs at G and another train of waves is sent off.

Thus, as long as the key K is held depressed, sparks will occur at G, and a succession of trains of damped electric waves will be sent off from the aerial.

The function of the inductance coils L_2 L_2 is to prevent the oscillations in the closed oscillatory circuit from passing back into the transformer P_2 S_2, and possibly causing damage. These coils allow the passage of the slowly alternating current from the transformer without difficulty, but offer great opposition to the passage of the exceedingly rapid oscillations from the condenser circuit.

The current-indicating device I, known as the "aerial ammeter" which is joined in series with the aerial, enables the magnitude of the current flowing in and out of the aerial to be ascertained. Since the amplitude of the radiated waves depends upon the value of the current in the aerial, the readings of the aerial ammeter are also an indication of the strength of the signals which are being sent out.

If the closed oscillatory circuit has been properly adjusted, the indications of this instrument can likewise be used to ascertain when the aerial is properly tuned, because when this is the case the current flowing in and out of the aerial will be a maximum.

With the spark gap described above there is no necessary relation between the frequency of the current from the alternator, and the frequency with which sparks occur at G. The sparks will occur more or less irregularly, and consequently the sound produced in the telephones at the receiving station will be merely an unmusical noise. By the use of a special form of spark gap, however, in which, by means of a star-shaped disc rotating between two fixed points, the size of the gap is reduced at regular intervals to the distance across which a spark can pass, but at other times is too wide to permit the passage of a spark, the sparks are made to occur at regular intervals and a musical note is produced at the receiving station.

In the earlier form of rotating spark gap the rotating portion was driven by a small separate motor at any convenient speed, and the frequency with which the sparks were produced, and consequently the pitch of the musical note heard at the receiving station had no relation to the frequency of the alternating current used to charge the condenser. The sparking was not quite regular, as, owing to the alternating supply to the condenser not being in step with the periods of closing of the spark gap, the voltage of the condenser when the spark took place was not always the same, and, if the gap happened to close just at the instant of the reversal in the alternating supply from the transformer, a spark would be missed.

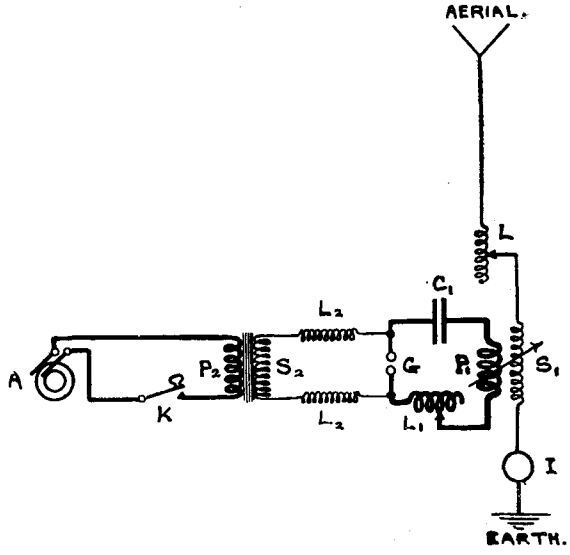

FIG. 21.—APPARATUS FOR SPARK TRANSMISSION.

Such an arrangement was called an "asynchronous spark-gap." An improvement has been made by mounting the rotating disc on the shaft of the alternator, and, by suitable adjustments, arranging that the gap is closed at the instant when the condenser is just fully charged by the pulses of current, alternately positive and negative, from the transformer.

By this means the spark does not take place till the maximum charge has flowed into the condenser, and the discharges are perfectly regular, so producing a pure musical note at the receiving station. Since one spark occurs for each positive or negative pulse of charging current, the pitch of the note so produced is double the frequency of the alternating current used to charge the condenser.

It is now necessary to consider more in detail the actions which take place when a spark-transmitting set such as that just described is in action.

The condenser C_1 is gradually charged up, until the voltage between its plates, which is also, of course, the voltage between the electrodes of the spark gap, rises sufficiently high to cause a spark to break across the gap. When this happens the gap is rendered conducting and the condenser discharges with oscillations round the path C_1, P_1, L_1, G. These oscillations are damped, as there are not only the losses which occur due to the various resistances in this path, but also, at each oscillation, a large amount of energy is transferred to the aerial through the coupling between P_1 and S_1. When the oscillations in P_1 start the aerial is quiescent. The first swing in P_1, however, starts a swing in the aerial, and since the aerial circuit and the condenser circuit are adjusted to have the same natural frequency, each subsequent swing in P_1 occurs at just the right instant to help the oscillations already set up in the aerial. These oscillations consequently get bigger and bigger, energy being drawn from the condenser circuit, until the oscillations in that circuit are completely damped out. When this occurs we have all the energy which was originally stored in C_1, with the exception of that lost in the various resistances, transferred to the aerial circuit, in which it now exists in the form of electrical oscillations.

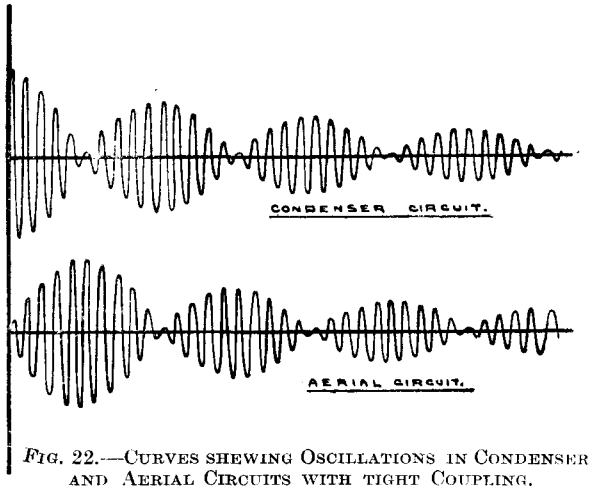

FIG. 22.—CURVES SHEWING OSCILLATIONS IN CONDENSER AND AERIAL CIRCUITS WITH TIGHT COUPLING.

The spark gap G does not immediately return to its original non-conducting state. At the instant when the oscillations in the condenser circuit stop, therefore, we have the aerial circuit in strong oscillation coupled, through S_1 and P_1, to a closed oscillatory circuit, the condenser-circuit, the spark gap in which is still in a more or less conducting state. Unless the coils S_1 and P_1 are widely separated, so as to weaken the effect of oscillations taking place in one of them upon the other, or, as it is expressed technically, unless the coupling between these coils is "weak" or "loose," similar actions to those just described will take place in the reverse direction, the oscillations in the aerial re-igniting the spark and gradually building up oscillations in the condenser circuit. The energy in the aerial circuit is thus gradually transferred back to the condenser circuit till at last the oscillations in the aerial are entirely damped out. The condenser circuit is then again in full oscillation, although the oscillations are not so strong as at first, because in addition to the various resistance losses, a considerable amount of energy will have been radiated away from the aerial in the form of electric waves, which, of course, is the object aimed at.

The oscillations which are now taking place in the condenser circuit again set the aerial into oscillation, and the same series of actions takes place. Thus, at each spark, the condenser circuit and the aerial circuit are alternately set into oscillation, these oscillations getting weaker and weaker, as the energy is gradually dissipated either in the various resistances or by radiation from the aerial, until ultimately they cease. The oscillations set up in the condenser and aerial circuits for each spark are therefore as shown in Fig. 22.

(To be continued.)

LONDON TELEPHONE SERVICE NOTES.

Standard Expressions.

FROM time to time there is heard a murmuring of protest against the use of set operating expressions and it may be well to pen a few notes on the subject. The extreme views are, on the one hand that set expressions can be constructed and should be used to meet all conceivable circumstances; whilst at the other end of the scale it is contended that there is no need at all for standardisation, and that telephonists should be left free to invent phrases. The proper course to follow probably lies somewhere between these expremes, but just where it is difficult to determine. If the "go as you please" method prevailed there is small doubt that set forms of words would become customary in certain well-defined circumstances so that the champions of freedom of expression would by practice become converts to the set-expressions even if it were not actually accepted as the standard.

It is generally conceded that some form of set expression is justified, especially when it is considered that the various circumstances which call for speech on the part of the telephonist, can be accurately predicted. The great advantage of having standard expressions is that particular circumstances can be associated with a particular phrase, with the result that the remark is readily understood over the telephone, if it is not always appreciated. In ordinary conversation, lip reading plays a big part in understanding what is spoken. This advantage is lost in telephone conversations, and unfamiliar words are not infrequently misunderstood, whereas the set form of words is grasped immediately; indeed, before they are completed. Standard expressions should pass three tests, in the first place they should be explicit; secondly, they should be brief; and lastly they should not be liable to confusion with other phrases.

The real question seems to be, not whether set expressions should be used, but whether those in use are the best that could be devised. Most of them have stood the test of time, but it is sometimes stated that others have not. In the latter category, to give an example, is the expression "They will probably call you again, will you please replace your receiver." This expression is used following a complaint of premature disconnexion, where it is not possible to re-establish the connexion. Does it pass the three tests? It certainly is explicit; there may be doubts about its brevity, but it is not likely to be confused with other expressions. Who is the judge? Some will say the telephonists who use it; others, the subscribers who suffer (?) it, and still others who will say the observers, who are non-interested parties and can, therefore, judge impartially. A consensus of opinion gathered from all quarters, if it could be obtained, would be extremely interesting and useful. So far as the first-named are concerned, perhaps these notes will provoke correspondence on the subject, which will be welcomed.

London Telephonists' Society.

On Wednesday, Nov. 30, Miss A. C. West's paper "The Voice and its effect on the Telephone Service," was very ably read, on Miss West's behalf, by Miss Webb.

The Chairman referred to the regrettable absence of Miss West on sick leave, and asked for an expression of sympathy, which the audience tendered unanimously.

Miss West, in her paper, emphasised the importance of correct pitch, resonance and articulation, and reminded her audience of the necessity for particularly careful enunciation on the telephone, not only because of the mistakes which must inevitably be made when telephone speech is slovenly: but also because the person addressed has nothing but the voice to express the personality of the speaker, and receives an impression, favourable or otherwise, accordingly.

The paper was followed with keen interest, to which the unusually large number of members taking part in the discussion bore witness.

It is hoped that Miss West's paper will appear in print, as it should prove extremely valuable from an educational standpoint.

On Wednesday, Feb. 18, 1922, the prize-winning competition papers will be read, and a large attendance is confidently expected.

Langham Choral Society.

The Society's next concert, the second this season, is fixed for Tuesday, Jan. 24, when "Elijah" will be performed. A particularly strong combination of soloists has been secured, including Elsa Stralia, Margaret Balfour,

Alfred Cracknell, and Joseph Farrington. The last named created quite a furore when the same work was performed last year, giving a fine rendering of the Prophet's part and singing from memory throughout. Mr. Cracknell, a member of the Traffic staff, is promoted this year from the quartet to the principal tenor part, and his colleagues in the Choir wish him well in the ordeal of singing in company with prominent vocalists.

The Langham Choral Society is proud of the fact that, although choral performances are said to be unattractive, they have paid their way. This is due almost entirely to the support received from within the service. There are, however, large numbers of the staff who have not attended one of the Society's concerts, and as it needs a large circle of admirers to enable three concerts at the Queen's Hall to be given each season, they are urged to make a special note of Jan. 24.

The Honorary Secretary, Miss W. M. Nurse, will be happy to forward posters, hand-bills, or tickets, especially tickets, to anyone interested if they will apply to her at 61,3, Shaftesbury Avenue.

Lotos Swimming Club.

Following the Traffic Officers' Team Race at the last London Telephone Service Swimming Gala, a swimming club has been formed in the Traffic branch. A membership of 60 is assured, so that the club should have a useful start. A Committee has been appointed under the chairmanship of Mr. L. Prossor of the Service Section and Mr. J. North of the same section as Honorary Secretary. By the time the spring comes round, it is hoped to have everything organised for a buoyant season in divers ways at Great Smith Street Baths, Westminster.

Culled from the Exchanges.

Trunk Exchange Bazaar.—"One 'Take this' is better than ten of 'God help you.'" It is in the spirit of this old proverb that the Trunk Exchange staff approach the problem of assisting those who suffer as the result of active participation in the Great War. The Trunk Exchange Bazaar has come to be regarded as an annual event, yet so far from that fact reducing the interest taken in it and the effort expended on it, the contrary is the case, and each year's success is capped by an even greater success, in its successor. The prime object in 1921, as formerly, was to benefit "St. Dunstan's" and the "War Seal Foundation," and it would be difficult to find any cause that makes a stronger appeal. The staff of the Trunk Exchange do not do things by halves and they evidently carry into their after office hours' pursuits the same keenness, the same exactitude and the same skill as they give to their daily telephone duties, with the result that Friday, Nov. 18, saw set out at the Memorial Hall such an assortment of useful and beautiful articles as would satisfy the needs and artistic aspirations of the most exacting of purchasers.

It is the privilege of the Trunk Exchange to serve all ranks of Society, from highest to lowest, and the staff are used to carry on business as usual when their hive of industry is visited by the cream of the social world, but not hitherto in their efforts outside the exchange have they been honoured by the presence of one related to the Royal House. That, however, was their good fortune on this occasion when Her Highness Princess Marie Louise opened the Bazaar and the Press photographers made a permanent picture record of Her Highness examining a silver box presented by Her Royal Highness Princess Mary which realised £10 17*s.* for the funds.

The Princess, who set an example of punctuality not to be improved upon by the telephone staff, who have a reputation in this respect, was received by Mr. Preston, the Controller of the London Telephone Service, and several members of the staff were presented to Her Highness who entered at once upon a discussion of telephone matters. In a well-delivered speech, she declared the Bazaar open and indicated the real interest she takes in both the organisation which benefited by the Bazaar. Mr. Preston expressed to her the thanks of the Trunk staff and his thanks were supported by Mr. Roberts, the Secretary of the War Seal Foundation speaking on behalf of the two beneficiaries, and the Princess then paid a visit to each stall and partook of tea. She was presented with two lovely bouquets—one from the Trunk staff, and one on behalf of Sir Oswald Stoll. There was universal regret that Mrs. Preston was unable to be present owing to indisposition.

The sale went fast and furious, and as will be seen from the Balance Sheet below, the total raised exceeded a thousand pounds. It is a truly magnificent achievement, and in the circumstances, we may perhaps forgive those who in the pressure of other interests, forgot to prepare the data which would have been necessary to indicate the precise limits of the Bazaar busy hour and the total sum collected therein. We shall have to do without it now.

The Committee responsible and the staff of the Trunk Exchange are to be congratulated on a striking achievement. If one were not privileged to have met them in their work one might hesitate to believe in the reality of the achieved result, but knowing them one could be certain they would achieve anything they set their hands to. They said "We will raise £1,000." They raised it, with a margin over to make sure! They wish especially to acknowledge their indebtedness to

The staff of the Victoria Exchange for the loan of the sweet stall and to the Victoria Engineers for fitting it up.

The staff of the Nottingham Trunk and Local Exchanges for a donation of £10 to the sweet stall.

The Edinburgh Central Exchange and Traffic staff for a "Hielan Laddie" doll which realised £11 6*s.*—and a cake—35*s.*

Lady Stoll for a donation of £2.

Mr. Wood, who was unable to assist with his weighing machines, sent a donation of £5.

The Trunk Exchange Orchestra who supplied such admirable music in the Refreshment Room. The Orchestra organised by Miss Willis (Supervisor) was conducted by her father.

Mr. Mordaunt (Trunk Night Telephonist) and to Mrs. Mordaunt who, in addition to gifts, procured the services of her Grafton Orchestra and herself took an active part. The Orchestra was excellent, and was much appreciated by all in the Bazaar Hall. Mr. Mordaunt supplied the printing of tickets without charge, and in addition obtained the assistance of Capt. Barry Briant, who, not only designed the very artistic cover for the programmes, but assisted by rendering musical items in the Concert Room.

All friends and colleagues (Engineering and otherwise) who assisted to obtain so splendid a result.

Trunk Exchange.

Balance Sheet for Bazaar, Nov. 18, 1921.

	£	s.	d.
Staff Collections ...	34	0	6
Staff Savings ...	101	6	6
Donations	7	4	0
Sale of Tickets ...	46	13	7
Stall Takings ...	731	11	6¼
Refreshments ...	78	5	3
Concerts	13	0	11½
Other Monies ...	24	0	1½
St. Dunstans—goods sold	45	14	0
Programmes	2	16	3
	£1,084	12	8¼

	£	s.	d.
Hire of Hall ...	15	15	0
Fire Insurance ...	0	10	0
Hire of 3 pianos ...	3	3	0
Hire of practice room for Orchestra ...	4	0	0
Printing	1	15	6
Assistance to Stall Holders	3	0	0
Miscellaneous Expenses	5	2	0
Stationery and Postage	0	6	6½
	33	12	0½
Balance in hand ...	1,005	6	7¾
	1,038	18	8¼
Paid to St. Dunstan's	45	14	0
	£1,084	12	8¼

£500 sent to St. Dunstans.

£500 sent to War Seals Foundation.

The remaining £5 6*s.* 7¾*d.* will be passed to the fund for providing children of Canning Town with a Xmas Tea.

City Exchange.

The second dance of the season was held at Stationers' Hall on Saturday, Dec. 3. Friends and acquaintances from other exchanges and offices made the large gathering a representative one, and a merry evening was spent with Mr. J. Webb again acting as M.C. The third and final dance of the season will be held at the same hall on Feb. 25, and as the number of tickets is limited, it is advisable to make early application to Miss Castell of City Exchange.

East Ham Exchange.

Ever energetic in the sweet cause of charity, the East Ham Exchange staff organised a bazaar in aid of the funds of the local St. Mary's Hospital. The result more than justified the endeavour and the organisers were able to send a cheque for £26 to the Hospital.

Central Exchange.

By means of weekly collections, the staff of Central have been able to celebrate the season of goodwill by forwarding the sum of £50 to the War Seals Foundation Fund to augment the £40 they sent at Easter.

INSTITUTION OF POST OFFICE ELECTRICAL ENGINEERS.

THE Council is pleased to announce that Lt.-Col. Booth has handed over the sum of £100 awarded to him by the Postmaster-General "in recognition of his invention and services in connexion with improvements in telegraph working" (Booth-Baudot duplex) to be utilised at the discretion of the Council in annual awards for the best improvement in telegraph land-line apparatus or systems.

An annual award of £5 (to be known as "The Booth-Baudot Duplex Award") is therefore offered for the best improvement in telegraph land-line apparatus or systems, to be governed by the following conditions:—

1. British subjects only, employed by public telegraph administrations throughout the world, will be eligible to compete for the Award.

2. Applications for the Award to be received between January 1 and Mar. 31 of any year, such applications referring to improvements made, or suggested, during the twelve months prior to Jan. 1. referred to above.

3. At the discretion of the Council of the Institution of Post Office Electrical Engineers an award may be withheld in any year, if, in the opinion of the adjudicators appointed by the Council, after full consideration of the applications received no Award is warranted.

4. Applications for the Award, accompanied by full details of the improvement should be addressed to THE SECRETARY, Institution of Post Office Electrical Engineers, G.P.O. West, London, E.C.

CORRESPONDENCE.

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

In the leading article (December) "A 'Lesson'" you say *inter alia* "Again Herbert Spencer is quoted as saying that the telephone was unknown in English cities other than London in 1882. A little research would have shown that Manchester was opened in 1879 . . . and during the following two years Liverpool and other towns in Lancashire, Scotland, South Wales, Birmingham and other places obtained telephone service."

With a view to strengthening your argument and rendering our historical records as correct as possible, may I remind you that in my serial articles on "The Dawn of Telephony in Birmingham" which commenced in the "T. & T. J." in November 1915, I pointed out that the Birmingham Exchange was opened in 1879, and one at Wolverhampton in 1880. I also referred to these in a letter on "The first Telephone Exchange in Europe," which appeared in the issue for December 1917, in which I quoted also a paragraph appearing in a circular issued by the Midland Telephone Co. Ltd. in October 1880 which ran as follows:

> "Over 60 firms in Birmingham (as will be seen by the annexed lists) are availing themselves of instantaneous communication with each other by means of this Company's telephonic exchange. The London Exchange has over 800 subscribers, Liverpool and Manchester about 300 each, besides an increasing number at Glasgow, Sheffield, Bristol, Dundee, Leeds, &c."

ARTHUR E. COTTERELL.

Dec. 7, 1921.

LONDON TELEPHONE SERVICE DINNER.

UNDER the auspices of the London Telephone Service Supplementary Clerks' Association, a Dinner and Concert took place at the Dean Hotel on Nov. 23. There was a large muster of members and the guests included Mr. G. F. Preston, C.B.E., Controller, Messrs. J. F. Stirling and J. F. Edmonds, Assistant Controllers, Mr. H. G. Trayfoot, Headquarters Traffic Dept., and others. A letter of regret for inability to be present was read from Mr. W. A. Valentine, Deputy Controller. Mr. C. W. Muirhead, Chairman of the Association, occupied the chair.

Major Preston, in responding to the toast of the London Telephone Service, referred to the magnitude of the service and congratulated the members on the manner in which the gigantic task in connexion with the revision of the tariff had been carried out. In London, despite the difficulties which they had to encounter, they had one of the best telephone systems in the world. It was necessary for them, in order to be of the greatest possible use to the Service, to acquire knowledge of other departments than their own and he believed that the Whitley system would help in spreading such knowledge. Staff Associations could be instruments of great benefit in this respect.

Mr. Stirling, in proposing the toast of the Association, said that such Associations could do much to foster and encourage a spirit of mutual helpfulness within the Service. The discussions which took place between the representatives of the Association and the Controlling Officers tended to better understanding and the well-being of the Service. Associations, like individuals, must put before them high ideals—they must have moral as well as material platforms. No Association with the best will in the world could give its members equality of mental endowment but it could endeavour to obtain equality of opportunity so that the best men could have a chance of coming to the front. He advocated a pride not only in the service generally, but in the Department to which they belonged, a belief that they were giving to the public a service of which they had reason to be proud. Every member should be an apostle of that belief. He wished the Association prosperity and success. Progress sometimes seemed slow but it was more important to have that progress sure and within it the elements of stability.

Mr. Muirhead in reply, after referring to the happy and sympathetic way in which the toast had been proposed, said that their Association was something more than what was the popular conception of a Trade Union. They sought, it was true, to obtain better conditions of employment and to secure the redress of such grievances as might exist or arise. These were worthy and legitimate aims but they had other aims as well. They sought, equally with the official side, to improve organisation and machinery and to promote efficiency. Referring to their relations with the three Whitley bodies—the National Council, the Departmental Council and the Office Whitley Committee—he believed that, notwithstanding the criticisms of Whitleyism, criticisms mainly confined to its working and not to the thing itself, Whitleyism had been, and would be still more in the future, productive of great benefit to the Service and to the State.

Mr. Hinshelwood, Secretary of the Association, in proposing the toast of the Guests, referred briefly to the better understanding which had arisen as the result of frank discussion on staff questions and Mr. Trayfoot, in reply, expressed his pleasure at meeting with old colleagues and referred to the growth which had taken place in the London Telephone Service during the last decade.

An enjoyable musical programme, under the direction of Mr. W. R. Bourchier, was carried out, the artistes including Mr. Willoughby Walmisley, pianist (from Queen's Hall), Mr. Hugh Williams, tenor, Mr. E. Jacob, baritone, and Mr. E. Widdup, humourist. Mr. A. H. Harris officiated at the piano.

PERSONALIA.

LONDON TELEPHONE STAFF.

The following resignations took place on account of marriage:—

Miss O. E. YOUNG, Assistant Supervisor, Class II, of Paddington Exchange.
Miss F. M. JARVIS, Assistant Supervisor, Class II, of Trunks.
Miss M. A. LOHAN, Telephonist, of Paddington Exchange.
Miss A. C. COLLINS, Telephonist, of Trunk Exchange.
Miss B. L. MERRITT, Telephonist, of Regent Exchange.
Miss M. FOWLER, Telephonist, of Regent Exchange.
Miss W. KNIGHT, Telephonist, of Putney Exchange.
Miss G. L. BETTS, Telephonist, of Gerrard Exchange.
Miss D. M. ARMITAGE, Telephonist, of Gerrard Exchange.
Miss G. D. SMITH, Telephonist, of Sydenham Exchange.
Miss G. F. WARDLE, Telephonist, of Central Exchange.
Miss F. E. WEIMAR, Telephonist, of Central Exchange.
Miss. F. E. WEST, Telephonist, of Central Exchange.
Miss D. G. SHUTTLEWORTH, Telephonist, of Central Exchange.
Miss S. TRUSCOTT, Telephonist, of Victoria Exchange.
Miss W. E. HENDERSON, Telephonist, of Victoria Exchange.
Miss H. BILSBY, Telephonist, of Avenue Exchange.
Miss A. D. CHALLEN, Telephonist, of Avenue Exchange.
Miss L. W. HILL, Telephonist, of North Exchange.
Miss E. SUCH, Telephonist, of North Exchange.

PRESENTATION TO MR. P. F. CURRALL.

AN enjoyable social gathering of the Brighton District Post Office Telephone Staff at the Old Ship Assembly Rooms, Brighton, on Nov. 24, was the occasion of a presentation to Mr. P. F. Currall, District Manager, Telephones, on his transfer to Birmingham.

Mr. F. W. George, Contract Manager, asked Mr. Horn, the Postmaster of Brighton, to make the presentation on behalf of the staff of a silver cigarette box to Mr. Currall and silver entree dishes to Mrs. Currall. Mr. Horn, in expressing the general feeling of appreciation for the recipients, traced Mr. Currall's career from Birmingham through Plymouth, Dublin, Newcastle-on-Tyne, London and Brighton, back to Birmingham. He knew that Mr. Currall would leave behind him in Brighton many good friends who wished him health and prosperity in his new business sphere.

In responding, Mr. Currall said in his 5 years at Brighton he found the work congenial and the staff loyal. When he first came to Brighton the district contained 74 exchanges with approximately 10,000 telephone stations. There were now 149 exchanges with approximately 23,000 telephone stations, the Brighton district ranking seventh in size in the United Kingdom. Trunk lines had been largely increased and many exchanges had been enlarged and remodelled. His thanks were due to Mr. Horn and his staff for the pleasing associations they had had, and to Messrs. G. Stevenson, A. Lumsden and F. W. George, the controlling officers of the accounting, traffic and contract sections and their staffs. He was proud of the honour which had been conferred upon him and the gifts would always remain with him as an appreciation of their good-will and kind remembrance.

CALENDAR OF COMING EVENTS.

Jan. 16.—"Printing Telegraphy in America," Mr. H. H. Harrison (Automatic Telephone Co.).

CENTELS FOOTBALL CLUB.

Jan. 5.—Harlesden Town. Home.
„ 12.—Brentford Thursday. Away.
„ 19.—Cricklewood General. Home.
„ 19.—*Aylesbury. Away.
„ 26 London Electric. Away.
„ 26.—*Ravenscourt Amateurs. Home.
* Second Team.

C.T.O. DIVISION LEAGUE.

Jan. 10.—A. & B. *v.* E. T.S.F.B. *v.* F.
„ 17.—A. & B. *v.* T.S.F.B.
„ 24.—E. *v.* T.S.F.B.

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All correspondence relating to advertisements should be addressed to MESSRS. SELLS, LTD., 168, *Fleet Street, London, E.C.*4.

TELEPHONE SUPERVISION.

SOME IDEAS OF THE DUTIES OF A TELEPHONE SUPERVISOR.

THE duties of a telephone supervisor might readily be considered from the following four points of view—not necessarily in order of importance: firstly, to the subscriber; secondly, to the staff; thirdly, to the department; fourthly, to herself.

To the subscriber, by seeing to it that his calls are answered promptly; that his complaints receive attention, that the cause is fully investigated and faults are removed as early as possible; that repeated complaints of a similar nature are followed up, and special action is taken in cases where they appear to be such as should be avoidable and prevented. By seeing to it that verbal complaints receive attention equally with written complaints. The supervisor should realise that if a subscriber learns that his verbal complaints are properly treated, written complaints are prevented, with resultant economy in administration charges. By seeing to it that monitors and telephonists deal tactfully with subscribers. A supervisor should assume that a subscriber who complains has good reason for doing so, and that, if he appears to be irritated and unfairly blames the operating staff for his troubes, this is due to lack of knowledge of the working conditions. It however, seems impossible to satisfy a certain type of subscriber, but these instances are rare and a supervisor should not allow them to outbalance her perspective of the proportion of complaints which are legitimately made. The supervisor herself should deal with the subscriber tactfully, as, if this is done, he is likely to be satisfied that his complaints and troubles will receive due attention, and this leads to a good feeling which reflects itself in the dealings between the subscriber and the staff generally, as well as giving the subscriber confidence in the management of his exchange. It seems to me that much depends upon the treatment of the subscriber by his own exchange staff, as opinions of the service are often framed on the goodwill which exists between him and the exchange officers. It is a mistake for the supervisor to take up an attitude of defence when dealing with complaints. Much better results are obtained when these are listened to attentively, and when it is assumed that they are not made without cause. Above all, the supervisor should deal with the subscriber in an able and business-like manner, otherwise she will unintentionally give him the impression of inefficiency. If a subscriber requires information, the supervisor should answer at once and as directly as possible. If the information required cannot be given, no hesitation should arise in informing the subscriber of the facts, as known, with a promise to furnish the information, if possible, later. Although rules and regulations exist to cover most cases with which a supervisor is called upon to deal, it should be borne in mind that, in cases of doubt, it is her duty to use discretion; to apply a broadminded view to any case, and, in those which appear reasonable, to err on the side of the subscriber, because, after all, the department is in the position of a seller and should encourage business with its customer, the subscriber, by treatment such as would be extended to him in purchasing goods in the usual way of business.

To the staff the supervisor's duty is to see to it that they are comfortable; that their rooms are kept clean, ventilated and orderly; that they are released from duty promptly; that their meal reliefs

are given promptly, and that rest reliefs are given when business permits. By seeing that each officer receives similar treatment; that privileges extended to one are not refused to another; that supervision does not become harassing; that encouragement is given and tact used in her treatment of the staff. The supervisor should have some knowledge of the temperament of the individual officer. She should help the telephonists as much as possible, and assist them in their difficulties. She should endeavour to gain the confidence of the staff, and should be always willing to listen if approached on any subject. She should not hesitate to bring to the notice of her superior officers any grievances of the staff, and she should not hesitate herself to put forward any recommendations which she may think desirable for the betterment of the conditions at her exchange.

To the department, by seeing to it that the service is efficient in all respects, by drawing attention to shortage or excess of junctions, unequal distribution of loads, lengthy duration of faults. By seeing that exchange records are kept up to date, proper records made, and that standard markings are used, and renewed when necessary. By drawing attention to faulty maintenance of switchboard, and to parts which are reported missing or incomplete. By drawing attention to building repairs as soon as dilapidation is apparent, and by seeing to it that the exchange is worked economically; that artificial light is not used unnecessarily, and that consumption of fuel is kept at a minimum. She should take an interest in the switchroom and switchboard and see that everywhere is neat and tidy. A well maintained switchroom appears to me to reflect the efficiency of the officer in charge. She should maintain a strict and impartial attitude to the staff. Irregularities should not pass un-noticed; attention should be drawn to them at once because, although they may occur infrequently at first, an example once set often spreads. By seeing to it that operators attend punctually; that standard expressions are used; that switching procedure is followed; that telephonists are in possession of staff and operating rule books, and that they understand fully the procedure set forth therein. She should endeavour to create a feeling of comradeship among the staff, to foster interest in the work with a view to the efficiency of the service generally, and that of her exchange in particular. In her supervision and training of junior telephonists and learners she should insist at all times on a strict obedience to instructions, whilst not failing to let them understand that she is willing to help them when trouble or difficulties arise. She should be patient with the learner, and give encouragement when this is merited. She should not hesitate to report adversely on a candidate who is not adaptable to the work. This, probably, is the most serious and difficult problem the supervisor has to meet, but her duty in this respect is beyond doubt. A telephonist who is not of average standard or lacks interest in her work is a constant source of trouble.

To herself by seeing to it that she keeps fit and well; that she maintains a cheery and alert attitude whilst on duty, that she preserves a true balance between that which matters and that which does not; that important issues are not lost sight of in minor issues. She should appreciate the fact that from time to time difficulties and troubles are inevitable in spite of her efforts, and should not allow these to worry her unduly. She should retain a keen interest in her work, and so, by example, set a standard to those whom she controls.

The ideas are, of course, applicable mainly to an officer in charge of a small exchange, yet the underlying principles embody much that is common to supervision generally and perhaps not only in respect of telephone exchanges.

"S" (Liverpool).

CONTRACT MANAGER, DUBLIN.

Mr. Fred. C. Taylor, Contract Manager, Exeter, has been appointed to the position of Contract Manager, Dublin.

THE TELEPHONE DEVELOPMENT OF THE WORLD AT DECEMBER 31, 1920.

By W. H. GUNSTON.

THE following statistics, which give the total number of telephones in the world as 20,791,000, are made up roundly as follows:—

Official figures	19,390,000
Estimated figures based on last year's figures (mostly official)	1,109,000
Conjectural figures (Russia, Rumania, Finland, Philippines, etc.) based on old official and other figures	292,000
	20,791,000

It will be seen that all but an inconsiderable number were obtained from official figures, and the total may be taken as fairly representative of the telephonic development of the world at Dec. 31, 1920. I am indebted to Mr. V. M. Berthold of the American Telephone & Telegraph Co., for some very full statistics relating to Central and South America, which supply the necessary information regarding a quarter from which it is difficult to obtain complete figures. The information relating to the eight chief telephone-using countries in the world is official, except that in the case of Japan it is based on last year's official figures and that the number of "independent" telephones in America is partly estimated. These countries are:

U.S.A.	13,411,000	telephones.
Germany	1,812,000	,,
Great Britain	986,000	,,
Canada	856,000	,,
France	458,000	,,
Sweden	390,000	,,
Japan	320,000	,,
Denmark	254,000	,,

No other State has over a quarter of a million telephones.

In the British Empire there were over two and a quarter million telephones, viz.:—

	Thousands.
Great Britain and Ireland ...	986
Canada	856
Australia	233
New Zealand	88
India, etc.	46
South Africa	51
	2,260

The tables which follow may be summarised as follows:—

	1919.	1920.
Europe	4,910,000	5,235,000
Asia	466,000	507,000
Africa	70,000	95,000
North America	13,480,000	14,355,000
South America	260,000	277,000
Australasia	294,000	322,000
	19,480,000	20,791,000

It will be seen that out of an increase of over a million and a quarter telephones in the total for the whole world, North America alone accounts for 875,000, while Europe accounts for over 300,000.

The total for 1919 has been slightly corrected, in the light of information since received, from the figure shown in the January and February issues of the JOURNAL, 1921.

Eighty-three cities possessed upwards of 20,000 telephones in 1920, 10 having over 100,000 telephones, 33 between 50,000 and 100,000, and 50 between 20,000 and 50,000 telephones. Altogether 188 cities contained 10,000 telephones and upwards, of which 100 were in the United States, 30 in the British Empire (15 in Great Britain and Ireland, 10 in Canada, 4 in Australia, and 1 in South Africa), 23 in Germany, 5 in Japan, 4 in Switzerland, and 3 each in France, Sweden and the Netherlands, 2 each in Italy and Russia, and 1 each in Denmark, Norway, Austria-Hungary, Poland, Czecho-Slovakia, Belgium, Spain, Mexico, Cuba, Argentine, Brazil, and Uruguay. Madrid, Lisbon and Pekin almost qualify for admission in the list with upwards of 9,000 stations each.

TABLE A.

EUROPE.

NUMBER OF TELEPHONES.

	Dec. 30 1920.	Dec. 30 1919.	Population Thousands.	Population per Telephone.
Austria (1919)	114,075	114,075	9,500	83
Belgium	48,943	30,383	7,500	153
Bulgaria (est.)	5,000	4,378	5,500	1,100
Czecho-Slovakia ...	78,177	—	13,000	166
Denmark (220,443) lines	254,000	239,312	2,921	12
Esthonia	3,218	1,896	480	149
Finland (est.)	40,000	35,000	3,000	75
France	458,534	418,898	41,500	90
Germany...	1,812,341	1,767,156	57,000	31
Great Britain and Ireland	986,964	911,909	45,500	47
Greece (est.)	2,000	2,000	6,000	3,000
Hungary	57,009	—	12,000	210
Iceland	2,296	2,003	(86,500)	40
Italy (June 30) ...	111,688	99,637	37,500	336
Luxemburg	5,567	5,190	(259,889)	43
Netherlands (est.) ...	160,000	142,000	6,778	42
Norway	127,709	112,395	2,611	20
Poland	70,450	36,169	30,000	428
Portugal	15,000	14,000	9,675	645
Roumania (est.) ...	20,000	20,000	17,000	850
Russia, Ukraine, Latvia and Lithuania (est.)...	200,000	200,000	—	—
Serbs-Croats and Slovenes	16,439	—	11,600	704
Spain	75,871	69,191	20,356	267
Sweden	389,830	388,794	5,522	14
Switzerland	152,336	138,843	3,877	23
Turkey	7,298	6,078	2,000	274
Total ...	5,235,000*	4,910,000	400,000	76

* With allowance for Danzig and probable increase in Austria.

Europe it will be seen, now possesses 5,235,000 telephones, an increase of about 300,000 over last year. About 260,000 of this five million odd is a conjectural figure, no recent information being obtainable from Roumania, Greece, Russia, Finland, the Ukraine, Lithuania, &c. The figure for the Russian States has been put at 200,000; it may well be 50,000 more or less than this estmiate.

The number of inhabitants per telephone in Europe is 76; but if that half of the total population of Europe which is comprised in the Northern and Western States (*i.e.*, France, Switzerland, Austria, Bohemia, Germany, Belgium, Holland, Great Britain, Norway, Sweden and Denmark) is considered separately, it will be found that 4,750,000 telephones are contained in this area, an average of one to every 40 inhabitants.

Austria.—Statistics relative to 1920 have not been received. The figures for 1919 have been adopted in the table as it is difficult to gauge the rate of development in this country at present.

Belgium.—The Belgium telephone system has almost regained its pre-war extent. There are now 16,616 telephones in Brussels, and 7,878 in Antwerp.

Denmark.—This is the most highly-developed country in Europe from a telephonic point of view. The number of lines is officially given as 220,443, which may be put at about 254,000 stations. Copenhagen and suburbs have now over 96,000 telephones.

Esthonia.—The number of telephones in the new State has nearly doubled since last year.

France shows an increase of 40,000 telephone stations. Paris has now 159,692, Marseilles 11,794, Lyons 10,937, and Bordeaux 7,347 stations.

Germany.—45,000 stations were added during the year. Twenty-three German towns have systems comprising upwards of 10,000 stations. Berlin has increased from 187,982 to 199,555 stations. Besides the cities shown in table B, Nuremberg, Mannheim, Bremen, Essen, Chemnitz, Magdeburg, Konigsberg, Stettin, Duisburg, and Elberfeld have each over 10,000 stations.

Great Britain added nearly 73,000 stations to its system in 1920. Apart from London, Glasgow, Manchester, Liverpool and Birmingham (see Table B), ten city systems contained upwards of 10,000 stations. Edinburgh had 18,089, Sheffield 14,063, Leeds 13,898, Bradford 13,864, Newcastle 13,850, Hull (Corporation system) 13,209, Dublin 12,479, Bristol 10,850, Belfast 10,437, and Nottingham 10,323.

Hungary.—Information has been obtained from this State for the first time since the War. While of course its system has decreased owing to the diminution of its territory the number of stations in Budapest has increased from 34,755 in 1917 to 37,579.

Iceland has now 2,296 stations, of which 1,229 are in Reykjavik.

Italy shows an increase of over 7,000 stations. Milan has 16,142, Rome 13,806, Genoa 7,843, Turin 7,408.

Luxemburg.—The number of telephones has increased from 5,190 to 5,567.

Netherlands.—Here an estimate has been based on the development in 1919 the progress of the telephone system in Holland being fairly uniform. Amsterdam has over 31,000 telephones; Rotterdam had over 23,000 in 1919, and The Hague 19,800. The latter has now probably over 20,000.

Norway.—The number of stations has increased from 112,395 to 127,709. Christiania has 29,754 stations, and Bergen and Trondhjem each over 6,000.

Poland has 47,450 stations on the State telephone system. The large increase over last year is due to the inclusion of the system in that part of Poland formerly belonging to Prussia. There are about 23,000 stations on the system of the Telephone Co. in Warsaw, making a grand total of over 70,000.

Portugal.—The Anglo-Portuguese Telephone Company has 13,562 stations, of which 9,829 are in the Lisbon district and 3,613 in the Oporto district. The State maintains exchanges in some of the smaller towns.

Serbs, Croats and Slovenes.—Official figures have been received from this Kingdom for the first time since the War. The system comprises 16,439 stations.

Spain.—The total number of stations has increased from 69,191 to 75,871. Barcelona has 10,971 telephones and Madrid 9,831.

Sweden.—There is but a slight increase of stations in Sweden due to the acquisition of the Stockholm Telephone Company by the State in 1918, and the resultant gradual elimination of duplicate telephones. Stockholm has actually decreased from 126,961 to 118,180 stations. Gothenburg had 23,778 and Malmö 11,708 stations.

Switzerland.—The system has increased by about 10 per cent. from 138,843 stations to 152,336. Zürich has 20,023 telephones, Geneva 13,714, Basel 11,619, and Berne 10,016.

Turkey.—The Ottoman Telephone Company has 7,298 stations in Constantinople, of which 476 are allied military lines.

(To be continued).

ANSWER TO CORRESPONDENT.

To Ajax.—Phone Voyance is the word invented by a psychist who claims to possess the power of seeing his correspondent at the distant end of the line and is able to describe him or her, the room, and at times other occupants of the house. See Chap. V. "The Beginnings of Seership," by V. N. Turvey.

COMING EVENTS.

Feb. 27.—"Women as Civil Servants" T. & T. Society. Miss L. M. Herring (C.T.O)
„ 21.—Jubilee Dinner of the I.E.E., Hotel Cecil.

FOOTBALL (W. LONDON LEAGUE).

Feb. 23.—Centels (1) *v.* Notting Hill Police. Away.
„ 9.—City & S.L. Ry., *v.* Centels (2). Away.
„ 23.—City & S.L. Rly. *v.* Centels (2) (Home.
Mar. 2.—Gower *v.* Centels (2). Away.

C.T.O. LEAGUE.

Feb. 6 F. *v.* A. & B. Feb. 7 H. & I. *v.* K. E. *v.* T.S.F.A. Feb. 14 T.S.FB. *v.* H. & I. Feb. 21 T.S.FA. *v.* K. Feb. 28 T.S.FA. *v.* K. H. & J. *v.* E.

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

By F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(*Continued from page* 62.)

A mechanical model to illustrate the phenomenon just described can very easily be made. The arrangement is shown in Fig. 23.

A piece of twine, four or six foot long, is tied fairly loosely between two fixed points at approximately the same level. Two pendulums are suspended from the middle portion of this piece of twine, the points of attachment being about a foot apart. Each pendulum consists of a length of twine about 3 feet long with any small weight as a bob. The pendulums should be of equal length, so that they each have the same time of swing.

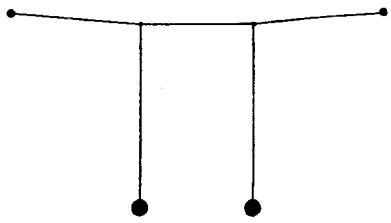

FIG. 23.—DOUBLE PENDULUM EXPERIMENT TO ILLUSTRATE EFFECTS OF VARIATIONS OF COUPLING.

If now the bob of one pendulum be drawn aside at right angles to the supporting twine (towards the reader in the diagram), and then released, it will swing to and fro, but it will be observed that the distance through which it swings gradually gets less, while the second pendulum will be set swinging, the distance through which it swings increasing as the swings of the first pendulum decrease, until ultimately the first pendulum comes to rest, and, assuming that the two pendulum bobs are of equal weight, the second pendulum is swinging through nearly the same distance as that through which the first pendulum was originally drawn aside.

It is easy to see how this transfer of the oscillations from the first pendulum to the second is brought about. At every swing the first pendulum gives a slight jerk to the supporting thread. The first jerk so given starts the second pendulum oscillating, and because the pendulums have the same time of swing each succeeding jerk from the first pendulum occurs at just the right instant to help the oscillation already set up in the second pendulum.

The energy which the second pendulum possesses by virtue of its motion is drawn from the first pendulum, so that the latter gradually loses its energy of motion and so comes to rest. When the first pendulum has thus given up all its energy the second pendulum cannot further increase its swing. The conditions are then exactly the same as at the beginning of the experiment, with the exception that the rôles of moving and stationary pendulums have been reversed. The same action is therefore repeated, the first pendulum being gradually again set swinging through almost the same arc as at first, while the swings of the second pendulum gradually decrease, till ultimately it comes to rest. This interchange of swinging between the two pendulums will continue until the energy which they possess has all be dissipated by the resistance of the air to the motion or by friction in the supporting threads.

If we imagine a pencil to be fixed to each pendulum and a long band of paper drawn under the swinging pendulums at right angles to their direction of motion, it is clear that the traces made by the pencils would be of the same nature as the curves shown in Fig. 22.

The first pendulum corresponds to the condenser circuit and the second pendulum to the aerial circuit in the electrical case. Drawing the first pendulum aside corresponds to charging the condenser and releasing it corresponds to the breaking down of the spark gap.

The coupling between the condenser circuit and the aerial circuit is represented by the connexion between the two pendulums by means of the supporting thread.

Thus with the arrangements shown in Fig. 21, if the coupling between S_1 and P_1 be "strong" or "tight" enough, we shall obtain, for each spark which occurs at G, an oscillation in the aerial which does not die away uniformly, but of which the amplitude pulsates, as shown in Fig. 22. The amplitude of the waves sent off from the aerial will of course pulsate in a similar manner.

It can be shown that such a pulsating wave-train is made up of two superimposed trains of waves differing slightly in wave-length.

The easiest method of doing this is to reverse the process, by taking two wave-trains of different wave-length and combining them. This has been done graphically in Fig. 24, in which, for simplicity, the damping has been ignored.

In this diagram the waves represented by the curve (*a*) have a slightly shorter wave-length than those represented by the curve (*b*). Since the wave-lengths are different the waves will be in step and therefore assisting one another at certain points A; while at points B half-way between these the waves will be out of step and will oppose one another.

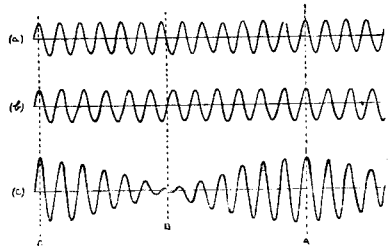

FIG. 24.—ANALYSIS OF A "BEATING" OSCILLATION INTO TWO OSCILLATIONS OF DIFFERENT FREQUENCY.

The resultant wave-train produced by combining these two wave-trains is therefore one on which the amplitude periodically rises and falls, as shown in the curve (*c*).

Hence an aerial circuit oscillating as shown in Fig. 22 can be considered as radiating two trains of waves differing slightly in wave-length.

This is a disadvantage, as only one of these radiated wave-lengths can be fully utilised for actuating the receiving apparatus, while the energy radiated in the form of the other wave-train is more or less wasted, and, further, the second wave-length may disturb some other receiving station.

By reducing the coupling between P_1 and S_1 the rate at which energy is transferred from one circuit to the other is reduced. It therefore takes longer for all the energy to pass out of the condenser circuit into the aerial, or *vice versa*, and consequently the period of each "beat" is prolonged.

This means that the two waves radiated are nearer to one another in wave-length. The reader may confirm this by drawing a diagram similar to Fig. 24, but with the two original waves differing in length more, or less, than is shown in that figure. It will be found that the more nearly alike the original waves are in wave-length the longer are the "beats." Since by making the coupling very loose the duration of each beat may be made very long indeed, we have then practically a single wave-length only radiated.

The reader should try the corresponding experiment with the pendulums. By increasing the distance between the points

of support on the horizontal twine the effect of one pendulum on the other is reduced, or the "coupling" is weakened. In these circumstances it will be found that it takes longer for the motion to be handed over completely from one pendulum to the other.

Thus by sufficiently weakening the coupling between P_1 and S_1 we can overcome the difficulty of the double wave. A new drawback is, however, introduced.

With a weakened coupling it takes longer for the energy to pass from the condenser circuit, where it does no useful work, into the aerial circuit, where it is usefully employed in radiating electric waves. There is therefore a longer time during which resistance losses can make themselves felt, and it may happen that these increased losses more than counter-balance the advantages gained by obtaining a single radiated wave-length.

Quenched Spark System.

To overcome the difficulties mentioned above a transmission system has been introduced in which practically a single wave-length only is radiated, while at the same time the coupling used is extremely tight so that the energy is very quickly transferred from the condenser circuit to the aerial circuit. It is known as the "quenched spark system."

Before describing this system it will be advantageous to perform yet another experiment with the pendulum. Bring the points of support fairly close to one another, or in other words, tighten up the coupling. Now set one pendulum swinging as before. Owing to the tight coupling it will quickly hand over all its energy of motion to the second pendulum and will come to rest. When this occurs, instead of allowing the first pendulum to be set swinging again, the bob of this pendulum should be taken in the hand, and lifted up so as to slacken its supporting twine.

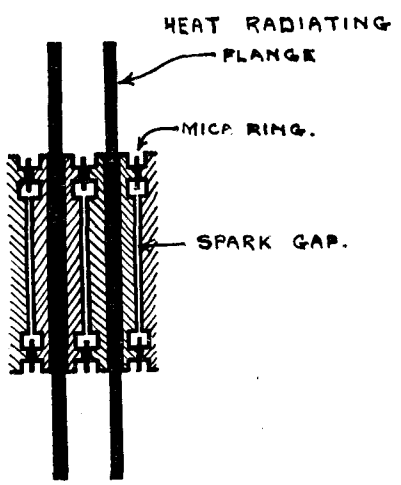

FIG. 25.—SECTION OF PORTION OF QUENCHED SPARK GAP.

The second pendulum is now left swinging by itself, and consequently it goes on swinging steadily until the various energy losses bring it to rest.

The action of the hand in preventing the first pendulum from being again set into motion once it has come to rest is imitated in the quenched spark system by the action of the special form of spark gap which is employed. This spark gap consists of a number of circular metal plates, separated by thin mica rings, and provided with flanges so that the heat produced by the sparking is rapidly radiated away, and the apparatus thus kept cool. A section of a portion of such a spark gap is shown in Fig. 25. The various parts of the gap are held in position by means of a suitable insulating frame. The number of separate gaps used depends on the voltage to which the condenser is charged. It is found that with the total spark gap broken up into a series of narrow spark gaps in this way, and kept cool, the conductivity of the gaps disappears very quickly after the spark ceases. Consequently, after the first series of oscillations in the condenser circuit, when

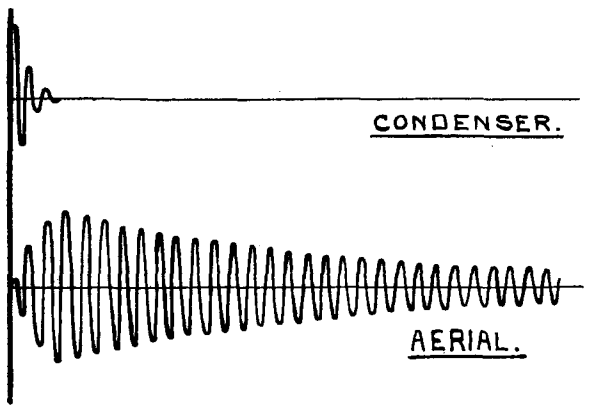

FIG. 26.—CONDENSER AND AERIAL OSCILLATIONS WITH QUENCHED GAP.

the energy has all been transferred to the aerial circuit and the spark has gone out, the loss of conductivity of the gap prevents the spark being re-formed by the reaction of the oscillations in the aerial on the condenser circuit, and consequently the energy does not pass back again from the aerial to the condenser, but the aerial oscillations continue steadily till all the energy in the aerial circuit is either radiated away in the form of electric waves or has been converted by the various resistances into heat. The condenser and aerial oscillations are, therefore, as shown in Fig. 26.

Thus by the quenched spark system the beats of aerial current, which occur when the ordinary spark gap is used and the consequent radiation of a double wave, are avoided.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

ACCORDING to a Buenos Aires authority a French engineering company has obtained a concession from the Argentine Government for the erection of a wireless station for direct communication with France. The concession is for 30 years. The Government has apparently arranged for the transmission of the telegrams exchanged over its own lines and has fixed the tariff.

Reuter's and other kindred authorities have stated that negotiations between the United States and Japan have led to an agreement being reached between them with respect to the Island of Yap and other islands in the Pacific Ocean north of the Equator. The points of the agreement are as follows :—

1. The United States shall have free access to the Island of Yap, on a footing of entire equality with Japan, or any other nation, in all that relates to the landing and the operation of the existing Yap-Guam cable or of any cable which may hereafter be laid by the United States or its nationals.

2. The United States and its nationals are to be accorded the same rights and privileges with respect to the radio-telegraphic service as with regard to cables. So long as the Japanese Government shall maintain on the Island of Yap an adequate radio-telegraphic station, co-operating effectively with cables and with other radio stations on ships and shore, without discriminatory exactions or preferences, the exercise of the right to establish radio-telegraphic stations at Yap by the United States or its nationals shall be suspended.

3. The United States shall enjoy on the Island of Yap the following rights, privileges and exemptions in relation to electrical communications : (*a*) Rights of residence without restriction and of acquisition and enjoyment and undisturbed possession upon a footing of entire equality with Japan or any other nation of all property and interests, both personal and real, including lands, buildings, residences, offices, works, and appurtenances. (*b*) No permit or licence to be required for the enjoyment of any of these rights and privileges. Each country to be free to operate both ends of its cables, either directly or through its nationals, including corporations and associations. (*d*) No cable censorship or supervision of operations or messages. (*e*) Free entry and exit for persons and property. (*f*) No taxes, port, harbour, or landing charges or exactions, either with respect to the operation of cables or to property, persons or vessels. (*g*) No discriminatory police regulations.

4. Japan agrees that she will use her power of expropriation to secure to the United States the needed property and facilities for the purpose of electrical communication in the island, if such property or facilities cannot otherwise be obtained. American property and facilities for the purpose of electrical communication in the island are to be exempt from process of expropriation.

A formal convention will be drawn up for signature and will be subject to ratification by the Senate.

The Agreement gives the U.S.A. the right to use the Yap-Shanghai cable for messages to Japan and also the use of the cable to the Dutch Indies.

During the last few months of 1921 one British firm alone supplied and laid no less than 320 miles of twin telephone cable for the British Post Office.

Should these lines meet the eyes of any British contractors whose special feature is telegraph apparatus they may be interested to know that the Madrid Telegraph authorities are asking for Hughes apparatus to the value of 350,000 pesetas.

During the first week in January the Central Post Office of Tokio was completely destroyed by fire.

Further extracts from the report of the Pacific Cable Board for the year ended March, 1921, are worthy of note.

The service of week-end telegrams between the United Kingdom and Canada on the one hand and Australia and New Zealand on the other, was reinstated early in 1921. As is well known this latter class of traffic is only carried across the Atlantic by the Imperial cable, the private companies not yet having re-introduced this privilege.

During the year over 7,700,000 paying words of International traffic (*i.e.*, traffic other than local traffic between Australia, New Zealand and the Pacific Islands) were handled by the Board. This was approximately 1,350,000 words less than the total during the previous year, when more than 9,000,000 words were carried. In addition to the international traffic, approximately 2,600,000 paying words were carried during the year between Australia and New Zealand and between those Dominions and the Pacific Islands. This was approximately 280,000 words in excess of the 1919-20 figure. The ordinary international traffic showed a decrease of more than 500,000 words, while the deferred ordinary and the Press traffic each showed an increase of more than 300,000 words. There was a diminution of nearly 1,200,000 words in the Government traffic, the total handled being less than half that transmitted during the previous year.

In this connexion the Federal Government's approval of the duplication of the Pacific cable scheme is of added interest. So also has been the exchange of correspondence in *The Times* on an Air Mail service *versus* a Cable service across the Pacific, Mr. Holt Thomas taking up the cudgels on behalf of the former and Sir Charles Bright very concisely and very effectively defending the Cable Board project. The critics of the cable scheme appeared to rail at the expense of the duplication, to which Sir C. Bright replied that there was a reserve and renewal fund of sufficient dimensions to more than pay for the duplication so that it would not be necessary "to call on any of the partner Governments for financial contribution." The cable protagonist concluded :— This position is, of course, highly satisfactory to those of us who were, at an early period, active in urging the cause of this line, despite the loud-spoken claims of interested parties to the following effect : (*a*) that it could not be successfully laid in such deep water : (*b*) that if it did happen to be laid it would not work ; and (*c*) that if laid and even worked it would be a financial failure on the basis of the proposed tariff !

From Helsingfors comes the information that a combined Russian and Finnish Commission has reached an agreement with reference to telephone, telegraph, and temporary railway communications. Further evidence of the gradual emergence of Russia into the economy of Europe may be found in the news that the transmission of telegrams between Sweden and Russia is now possible, "Radiograms," says a Stockholm informant, "having been regularly forwarded from Karlsborg to Petrograd since the middle of December." An ordinary service has been established in the direction of Russia to Sweden and one in the opposite direction arranged by the Store Nordiske Co. will probably have been established by the time these lines are in type. Telegraphists from the Great Northern Telegraph Company left Copenhagen for Petrograd one or two days before the end of 1921 in order to re-start the services suspended in 1918.

On the 18th ult. official intimation was received, just in time to insert this "Stop Press" memo, to the effect that the Company had established telegraphic communication between Petrograd and Gothenburg *via* Nystad, and that terminal traffic for Russia could therefore be accepted by this route from abroad. The delays from Moscow the following day were announced as somewhere in the neighbourhood of three hours. Those by the British Government route were considerably less.

So as to enable Chile to correspond with the principal European and American stations, the Government is accelerating the installation of wireless stations in various parts of the Republic. The total cost of this project is estimated at £1,385,000.

A liquidator has been arranged for the winding-up of the affairs of the *Societe Industrielle de Telegraphie sans fil* of Paris founded with the meagre capital of 200,000 francs. The voluntary winding-up of the Anglo-French Wireless Company is also announced by the *Electrical Review*.

The Postal Department of Turkestan has prepared a telegraphic Morse alphabet for telegrams in the Kirkgis and Usbek languages. The results on trial were quite satisfactory. Telegrams in the local languages are already being exchanged between Old and New Tashkent.

The Times records a curious and probably a unique official recognition by any Government of services rendered. Moved by the specially generous hospitality of the Ameer of Afghanistan shown to the Dobbs Mission, the Indian Government presented the Ameer with sufficient telegraph material to link up the 460 miles separating Kabul from the Indian telegraph extension at Herat *via* Kandahar.

Under the title of "Changes in Old London," the *London Times* gives an interesting account of the alterations and extensions about to be made in connexion with the premises of the Great Northern Telegraph Co., in St. Helen's Place, Bishopsgate, London. "Here," says our comtemporary, "is a bit of old London which is about to undergo extensive alterations. The Great Northern Telegraph Company have acquired from the Leathersellers' Company the lease of the land on which six old houses are built. The Place is cut off from Bishopsgate by iron railings and a pair of iron gates, and at the end is the hall of the Leathersellers' Company, rebuilt in 1878 on the site of the hall of the Black Nuns of St. Helen's. The property was bought by the Leathersellers' Company soon after the surrender of the old priory to Henry VIII. The whole of the property in St. Helen's Place thus belongs to this latter ancient corporation."

The following somewhat abbreviated extracts from the speech of Sir John Denison-Pender, Chairman of the Western Telegraph Company, at the 88th General Meeting of the Company, was held over from last issue owing to lack of space, but though somewhat belated should prove of the greatest interest to the telegraph world.

"Our new cable from Brazil to the island of Barbados is still lying idle. You will remember that this cable was laid in conjunction with the well-known American company, the Western Union Cable Company, who laid one northward towards Florida from Barbados, at which latter place they received the requisite permission to land from the British Government.

The Western Union cable is still buoyed outside United States territorial waters, and the Western Union and our own cable are still lying idle in consequence of the refusal of the Government of the United States of America to permit the landing in Florida. I hope that a decision on the matter will be arrived at shortly.

In the meantime a valuable direct cable communication between South America and the United States is being held up, and this traffic is at present mainly passing by the lines of our competitors, the All America Company, whose route from Brazil is south to Argentina over the Andes, and north up the west coast of South America.

The renewal of our older section between Lisbon and Madeira, has been effected, and arrangements are now in progress to carry out a similar renewal of the original Madeira - St. Vincent cable early next year by our cable steamer, which will, immediately after carrying out the work, continue her voyage to Brazil and lay the new cable between Pernambuco and Maranham, also other cables connecting Pernambuco and Maceio, and with Victoria and Rio de Janeiro, and a third cable between Rio de Janeiro and Santos, thus materially strengthening our coast connexions. The ship will also carry some further cable to replenish our stock on the coast of South America. This expedition will entail an expenditure of about £700,000, bringing our total expenditure since 1918 on new communications and on renewing older sections of our system up to no less a sum than £3,000,000."

On the same date the chairman of The Eastern Extension Australasia and China Telegraph Company, in reply to certain queries regarding possible developments and competition of wireless, made the following well-balanced remarks :—

"I am not going to prophesy with regard to wireless, but I will give you certain facts and you can all judge for yourselves. Germany was supposed to be well up in wireless before the war, and her only means of direct communication during the war was by wireless. That fact ought to have assisted very materially in making wireless efficient in Germany. At the present time, however, Germany is about, if she has not already done so, to enter into an arrangement with a big Atlantic company for direct cable communication with the United States. Italy is looked upon as the birthplace of wireless, yet at the present time endeavours are being made to obtain direct communication between Italy and Central and South America by cable. I give you these facts but I am not going to prophesy. If wireless communication should prove to be better than cable communication, it will cut us out, but it has some work to do before it is in that position, whatever may happen in the future."

A provisional agreement has been concluded between the United States and Japan to which the assent of Britain, France, Italy, and Holland is sought, allocating as follows the three German Pacific cables : the Yap-Guam cable to the United States ; the Yap-Shanghai cable (later to be diverted to run from Yap to the Japanese mainland) to Japan : the Yap-Menado cable to Holland. Later news adds that the five big powers have agreed to an arrangement by which Holland as well as the United States and Japan will be given cable rights on the Island of Yap.

Much satisfaction was evidenced by the appearance of Mr. F. J. Brown's name in the list of New Year's Honours. The British Post Office is proud of its representative who is once again across the Atlantic busy with certain matters in connexion with the Washington Conference—and after.

February, 1922, will be notable in electrical circles as completing the fiftieth year of what was originally known as the Society of Telegraph Engineers which held its first meeting on Feb. 28, 1872, the more comprehensive title of The Institution of Electrical Engineers being adopted some years later. The jubilee of the Institution will be celebrated by a lecture by Professor Fleming, F.R.S., on "Faraday and the Foundations of Electrical Engineering," on Feb. 21 followed by a dinner at the Hotel Cecil. On the 22nd the professor will repeat his lecture and on the 23rd certain members connected with the Institution will give short dissertations on their reminiscences of the early history of electrical supply.

Administrative representatives of the C.T.O. who on Jan. 11 were privileged to attend the private view of the Gaumont film entitled "The Romance of a Telegram" were highly pleased with the quality of the production.

The Conference at Cannes once more showed the pliability of the Baudot system. Two sectors of a Paris-Cannes Baudot were switched through automatic re-transmitters at Paris on to two sectors of one of the London-Paris Triple Duplex sets, thus giving excellent communication between the metropolis and the historic centre. Later, as the Press and Government traffic increased, two more traffic channels were added by the same means through another of the London-Paris duplexes. Eventually yet another pair of channels became necessary and these were readily provided by the French authorities. London respectfully tenders its sincerest thanks to Paris and Cannes for their excellent co-operation. In addition to heavy Government and private traffic, as much as 15,000 words of Press were dealt with in one day.

The latest innovation in the way of apparatus in the London C.T.O. is that of the Teletype, which is at present performing excellent service on the short line between London and Croydon. The system, it would appear, has come to stay.

Lake Tanganyika.—A new telegraph line has been opened between South Africa and Usumbura (Ruanda-Urundi), *via* Brokenhill and Albertville, Katanga.

Germany has established direct telegraphic communication between Koenigsberg and Riga, *via* Memel and Lithuania. This route opens international traffic with the Baltic States and Russia.

The T. and T. Society should be greatly indebted to Mr. H. H. Harrison for his specially interesting paper on "Printing Telegraphy in America," which our esteemed friend delivered before its members on the 16th ult. To a busy business man the personal sacrifice of both time and personal convenience in order to assist the educative efforts of the telegraph profession were unfeignedly appreciated by the audience, judging by the remarks one heard as the listeners left the hall. The paper will in all probability be printed in these columns, but one cannot refrain from remarking upon one surprising piece of information regarding the American telegraphist who, the lecturer remarked, "takes no interest in the technical side of his craft. I was interviewed by a journalist," continued Mr. Harrison, "who asked me why it was so many of the British telegraphists taken a keen interest in technical telegraphy. I pointed to the encouragement given to telegraphists by the British P.O. in the way of additional increments and the possible openings for the rank and file on the Engineer-in-Chief's staff."

Congratulations to Mr. A. Avery, whose paper read before the Telephone and Telegraph Society of London last session, has been translated and published *in extenso* in the pages of *Annales des Postes, Télégraphes, et Téléphones* Paris. *Les Annales* is the official journal of the French Telegraphs Administration.

Apologies are tendered for a couple of errors which slipped into last month's issue. For "six-triple," readers will doubtless have already interpreted "sextuple" in connexion with the Birmingham Portsmouth Baudot developments and in the Baudot article my friend the "comp." has again insisted that the rods of the governor are "grinding rods," I sincerely hope not! Please read "guiding."

Only a few weeks ago the lines were penned felicitating Mr. George Connell on the fact of having retired from the Telegraph Service to his Cornish home with, as it seemed, quite reasonable prospects of spending a few quiet and recuperative years away from the hurly-burly of official life. The new year had scarcely well-established itself when the sad news came announcing that our respected old friend had passed over. To his sorrowing wife and family our tenderest sympathy.

This sad note must still further be maintained in recording the loss of Mr. John Grant, retired, a much respected member of the supervising staff of the C.T.O. Mr. Grant was a man of no small talents and had been well associated with many of the C.T.O. activities, and those who knew his happy household will best realise the gap which his decease has left. It was a gracious service that Mr. Alec MacEwen rendered at the graveside by his oral tribute to an old and revered colleague.

From *All Things Considered* by G. K. Chesterton:—"In the last resort all men talk by signs. To talk by statues is to talk by signs. Pillars, palaces, cathedrals, temples, pyramids, are an enormous dumb alphabet; as if some giant held up his fingers of stone. The most important things at the last are always said by signs, even if like the Cross of St. Paul's, they are signs in heaven." J.J.T.

LIFTING THE VEIL.

(From the "Post" of Dec. 17.

"WHAT is the place like; what is the man—or maybe the girl—like at the other end?" No one who has sat working at a wire hour after hour to an out-station can have failed to dwell on the notion. Nor alone will it have been the youth of our craft—flirtatiously inclined—whose thoughts have strayed in that direction; the older and the more sedate among us have all in turn felt at times that it would relieve the tedium or perhaps ease the stress of an uncomfortable hour if the "veil between" could be lifted. The impatience to which so many of us fall victim might in that way be averted; wrath with a struggling "crampist" or novice would perhaps give place to tolerance and sympathy could but a vision be vouchsafed.

The Baudot, and even the Creed, has not destroyed completely the human element in our relationship with the distant colleague; but human though that communion undoubtedly be, it has always seemed to be like that which exists between the blind. Who can question that advantage would follow upon the gift of sight? The notion lends itself to illimitable fancy! But the days even of practical tele-photography are not yet with us.

For all we know it was reflections such as these which led to a suggestion that the walls of our instrument galleries should be embellished with views of the towns with which the C.T.O. was in direct communication. The proposal at once found favour, and at the instance of the Controller a small committee had been set up representative of the staff and supervisors.

It is an essential part of the idea that the pictures shall occupy positions as nearly as possible in the vicinity of the circuits working to the respective towns. Not less desirable is it that the scheme shall be reciprocal, and that it shall be kept on a fraternal and non-official basis.

In due course, therefore, it is anticipated that copies of typical London views or scenes, subscribed for by the TS staff, will be presented to the offices taking part in the scheme.

It is not too soon to say that the efforts of the committee appear assured of considerable success. Already pictures from the staffs at Birmingham, Brighton, Bristol, Cardiff, Edinburgh, and Liverpool have been placed in position, whilst others from Bradford, Dover, Dundee, Exeter, Newmarket, Norwich, Salisbury, Tunbridge Wells, and Weymouth have been received. A number of other telegraph staffs have signified their willingness to co-operate. Up to the present as a general rule only those offices with a considerable staff have been invited to take part, but the Secretary of the Committee (Mr. Herbert Parker) is anxious that it should be understood that a picture will be welcomed from any office which would like to be represented.

One of the most pleasing incidents has been the gift of a valuable etching from a Scottish colleague who during his career, in peace and war, has been in close touch with TS men and wishes in this way to indicate the friendliness of his sentiments towards them.

It is not contemplated that the C.T.O. will become a second National Gallery. The necessary use of wall space for official announcements, electric fittings and instrument adjuncts prevents anything like symmetry in hanging the pictures; but already there is a noticeable reduction in the "workshop" element in our surroundings which is all to the good, and much appreciation is felt at the evidences of our provincial colleagues' goodwill.

In the early stages of the experiment it was found that some of the pictures received were too small to be effective as they were dwarfed by the size of the galleries, and the committee had to ask that in the event of the suggestion being favourably considered the pictures should not be less in size than 24 by 18 inches.

It may be added that the pictures are framed after their arrival at the C.T.O. as it is advisable to conform in some degree to a standard pattern, although in one case the donors made arrangements for framing and handing over direct. In every instance the frame bears a plate indicating by whom the picture was presented.

AUTOMATIC EXCHANGE FOR "LIVERPOOL COURIER."

On Jan. 16, Sir Wm. Noble, the Engineer-in-Chief of the Post Office, opened an automatic telephone exchange at the office of the *Liverpool Courier* connected with the public service and affording intercommunication with every apartment in the building. The system was installed by the Relay Automatic Telephone Company, and the whole of the operations are manipulated by means of a central switchboard to which each instrument is connected by twin wires only.

Mr. Burchill, the managing editor, who presided over a gathering of the representatives of municipal, commercial and newspaper interests and of the chief local Post Office Officials, said that if the Post Office was left free to work out its own salvation, and was only subjected to the right degree of wholesome pressure instead of venomous and vindictive criticism, it would by and by, attain the high ideal towards which, as they all knew, Sir William Noble and his colleagues were earnestly striving.

Mr. Burchill paid a whole-hearted tribute to the Liverpool Post Office engineers, who during the installation had been most assiduous and unremitting in their attention, and specially mentioned the invaluable co operation of Mr. Cornfoot, the sectional engineer.

In conclusion, he invited Sir William Noble to accept, as a memento of the occasion, a handsome silver inkstand, the centre of which consists of an automatic dial with which Sir William made the first call on the new system.

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 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 WORLD'S TELEPHONES.

THE statistics which we publish in another column show that there were nearly 21,000,000 telephones in the world at the end of 1920 as against nineteen and a half millions the year before. The figures are, as our contributor explains, of a composite nature, and only those who have attempted the task can appreciate the difficulty of assembling telephone statistics of recent date. Some countries furnish figures up to March, some to June, some to December, and others none at all; in some countries the telephone is in such numerous hands that it is difficult to know how to reach all the companies concerned in its provision. Again, some countries show their development in the form of "lines" and others in the form of "stations" or telephones. All these figures need to be equated as far as possible, and recourse must be had to estimates for an earlier year where recent statistics are not available. It may be asked whether it is worth while to make such calculations and whether it would not be better to wait until absolutely official statistics for every place were obtained, even though they were five or six years old. The answer to that is that telephone statistics are not stable, like those referring to railway development, for instance. The mileage of railways—in Europe at least—shows little change from year to year, but telephone development proceeds at the rate of six per cent. and even higher. Even by now there are probably at least another million telephones in the world than our article records, and information relating to 1917 or 1918 would even if there had been no War, be utterly out of date. It has been possible this year to present a more reliable summary than we have been able to show on any previous occasion. Figures for Mexico, Central and South America—places where the operating companies are numerous—have been obtained by the kindness of Mr. V. M. Berthold of the American Telephone & Telegraph Co., and all the figures of the great telephone-using countries are official, so that only a small margin of conjectural estimate is required to round up the sum total.

The figures present no novel feature. The preponderance of North America in telephonic development is undiminished. In that continent are contained 14,355,000 of the 20,791,000 telephones in the world. The major portion of the balance is in Europe. The difficulty of obtaining information from any of the States formerly comprised in the Russian Empire (with the exception of Poland and Esthonia) makes the total for Europe a matter of conjecture to the extent of some 50,000 stations; 5,235,000 is a conservative figure, and we should not be surprised if there were 5,300,000 to 5,400,000 telephones in Europe at the end of 1920. There should of course be at least twice as many, even allowing for the fact that the non-industrial countries are never likely to possess a high telephone development. It is useless to expect any signs of overtaking America in the present year, nor do we think that (whatever rates may prevail in the future) the telephone will ever be considered such an urgent necessity by dwellers of all degrees in the ancient civilisations of Western and Central Europe as it has become to the Western World; but the telephone field in Europe is full of possibilities, and telephone men can only hope that when trade improves and questions of exchange are settled, a great forward movement in telephone expansion will begin.

HIC ET UBIQUE.

MR. ELLIS BARKER'S statistics and strictures, which we dealt with fully in our December issue, have overflowed from the *Quarterly* into sundry evening papers where, truth to tell, such "tendencious" stuff (to use Mr. Emil Davies' expression) is much more at home. One would gather from this article that if you want to get a five-dollar call free of charge in America, all you have to do is to ask for the husband if you want the wife (or *vice versa*). Then, (so Mr. Barker informs us), since "no charge is made if one can only speak to the wife" (and that could easily be arranged), you can enjoy "free speech" in the most literal sense.

AN official return gives the following statistics for Poland:—

Administrative District.	No. of Telephones
Bydgoszcz (part of Posen province) ...	8,357
Gdansk (formerly West Prussia) ...	5,383
Grodno	—
Krakow (Cracow)	8,093
Lublin	1,356
Lwow (Lemberg)	3,510
Poznan (Posen)	16,936
Warszawa (Warsaw)	3,815
	47,450

The figure of 3,815 for the Warsaw administrative district does not include the telephones (some 23,000) in the City of Warsaw which are worked by a Swedish Company.

A CORRESPONDENT has sent us a translation of an open letter to the *British Esperantist* from M. Modenov, Central League Committee, Cudovsky, 6, Moscow, to the effect that the Postal Telegraph, Telephone and Wireless Telegraph officials in a combination of separate societies, desiring to start reciprocal communication with all colleagues in like services throughout the world, decided at their all-Russian Congress to study the Esperanto language for the purpose of interchanging by its help, our thoughts.

"The time is soon coming when Russian officers of the League will be able to initiate and carry on friendly correspondence with you, and by this means we might progress on a mutual base—a common interest. But in order that we may effect this, friends, you must help us—you must inform us to what grade you belong in the "Esperanto" movement of your land—how your professional leagues are arranged, and particularly you must let us have addresses of all Esperantists of the league which will be printed in our journal. We desire to have your journals and gazettes of your societies and Esperantist gazettes, and also we would like photos of your groups in exchange for ours."

The societies in Russia number 185,000 members. They desire similar information from England.

THE *Manchester Guardian*, commenting on Dr. Fleming's recent lecture, says: "The telephone is not and never was an ideal creature. It has its shibboleths like the Ephraimites at the fords of the Jordan; it cannot pronounce 's' properly, and tends to make 'f' sound like 'n' . . . and in addition it has some special trump cards of malevolence that it rarely gets the chance to play. The waves passing over a long-distance wire get tired of their job, which is perhaps not surprising. Unfortunately in this long-distance work they do not get all tired at the same rate: some stay the course better than others. It is therefore possible for the faster waves to overtake the slower, 'so that the notes of a tune like "God Save the King" might possibly arrive at the other end of a long wire in the wrong order.' This is a terrible warning against misguided vocalism down a long-distance telephone. What is too silly to be said may be sung—but not through an instrument of this sort."

As we read these instructive lines there recurred to us the memory of some of those facile jokes about the telephone and the telephone service which flow in a never ending stream through our comic dailies and weeklies. If they could be sung into a telephone over a wire of interminable length, perhaps they might edify and amuse the stranger at the distant end—but only if they reached him in sufficiently inverted order.

A WRITER in the *Irish Independent* seasons some excellent "advice to the novice" with considerable wit.

Most people, he says, approach a 'phone for the first time convinced that there is a catch somewhere. A blurred memory of an electric shocking coil in early youth and a fear that when they put in "the other penny" there will be no chocolate left, and the station-master won't have a key, unnerves them from the start.

The first thing to remember is that Bell or Edison (according to taste and nationality) invented the 'phone—Sandow had absolutely nothing to do with it. The little handle at the side is intended to attract the operator, not distract her, and certainly not for developing the muscles. Again, the idea that yelling down the receiver gets any farther than all round the office and next door is erroneous. The voice travels better when the speaker speaks quietly.

When the operator puts you through, don't jangle the bracket and curse or give an impersonation of a watchdog on a short chain. You are now at the mercy of your fellow-subscriber. If you ring again, the exchange girl, being a lady and not inquisitive (she doesn't know you, anyhow, and has 49 other plugs to mind) will take it that you are ringing off. Then you are where you started, minus tuppence and temper. You ring again and get the exchange, and so on.

* * * *

Have a heart for the girl who sows plugs all day and reaps harsh words. The only variety she ever gets is when she alters her voice and manner and pretends she is the supervisor. She is a telephonist, not a telepathist. If you don't give the correct number she can't read your mind: or know you are trying to get on when you ring off. If she were a thought-reader she'd be on the halls. If she told you her mind she'd be fired.

The Post Office is a British Government department, and, therefore, responsible to nobody, but it is polite. It says, "You may telephone from here." It might say, "Why should you telephone from here?" or "How dare you telephone from here?" or just "Certainly not," but it says you may, and you may; perhaps, people have—think of Bruce and the Spider. Anyhow, be polite to the Exchange girl. When you are rude you hurt her to the quick. Oh, yes, indeed, she has—you are thinking of Post Office telegraphs.

We feel sure our humorous critic would agree that the moving apologue of Bruce and the Spider would apply even more suitably to the telephone joke-repeater than to the telephone caller. He does try!

THE NIGHT TELEPHONE SERVICE AND SOME OF ITS PROBLEMS.*

BY E. J. LANSBURY (LONDON TELEPHONE SERVICE).

IT may appear from a cursory reflection on the title of "The Night Telephone Service and some of its problems," a little difficult to establish the case that problems do exist apart from the service as a whole; but yet, a closer examination will reveal certain features that are conditioned by and peculiar to a night service. As one views the telephone system it has a twofold function; firstly to cater for what may be termed the purely utilitarian needs; secondly, to render service in the purely social sense. This might sound paradoxical because both features are utilitarian, but one is desirous of drawing a distinction between traffic arising from ordinary commerce and traffic which is solely of social use, or service apart altogether from a commercial value.

Critics of the telephone system take little or no account of the latter feature. Seldom has the service been credited with its full usefulness; mainly its standard of value is regarded solely from its return of money profit, and whilst some regard for this aspect is needful, yet it is not all important. In theory and practice the purely service aspect is accepted by critics. It could not be otherwise. It is only disregarded because it is convenient to do so and the principle never in jeopardy, and if such a retrogression were possible as the closing-down of the night service, the line of defence for its retention would be its social usefulness, and doubtless the loudest critics of to-day would assist most assiduously in the campaign.

The night service more than the day emphasises the purely service aspect of the institution of telephony. As the night wears on, it becomes clearly defined, and, according to the purpose which prompts its use, the telephone, becomes invaluable in terms of money's worth. It may be for fire, police, or doctor, and upon these demands during the stillness of the night, when the normal means of daily contact are suspended or limited in scope, the telephone is rendered incomparable with the usually accepted standard of value. When meeting such needs as these, the night telephonist loses his individuality as a mere telephonist. In the wider sphere of rendering a social service, he finds himself functioning in the highest degree of citizenship.

It appears most likely that the service aspect of the night system will remain. It may vary in degree, but all the portents point to the limitation of night industry as far as is possible. Bearing this in mind, it is apparent the problems to be met are of a different nature from those arising from the day organisation.

The first problem that comes to mind, and perhaps the most important because others are subsidiary, is the acceptance as a principle that night telephony is mainly a social service, and because of this its return of revenue must be subservient to its social value. This principle once accepted should determine many of the night staff problems. It would at least determine the fundamental issue upon which conditions and remuneration are based.

Perhaps at this moment it would be well to examine in detail the peculiar circumstances of the night traffic. Firstly, the mode of procedure in operating night traffic has not been dictated, but rather it has developed. It has, of course, its connexion with the system found most suitable for dealing with day traffic, but its rigid application is not possible or desirable, and in the circumstances there is a variation in practice. On receiving calls, for example, the day practice is to deal with each one at a time, and give careful supervision to them, but it has proved convenient and efficient at night to deal with two or more simultaneously, and even then for the operator to leave the position for another one, and repeat the same operation.

In such circumstances it must be obvious that the minute and careful supervision of calls is not possible, and yet it is correct to say that in the main efficiency does not suffer because the telephonist becomes adapted to the condition and knows what is required of him. Again, the system in operation at exchanges with subscribers' multiples is for a scout to watch the whole switchboard for calling signals, and then to call the number for any telephonist who may to pick up the call and see it through. The only

* A paper read before the Telephone and Telegraph Society of London, on Dec. 19.

way to apply the standard procedure would be to employ a much greater force than at present to cover the switchboard. Experience has shown such a course is not warranted, but the variation in practice suitably meets the condition. Perhaps the outstanding feature of the night service is the adaptability of the night telephonist. To give of his best he requires initiative and alertness, and these he acquires by experience. Now there are times when the night telephonist has to determine which of two or more calling subscribers shall receive first attention, and, because of his knowledge of the traffic, his decision is usually accurate. A night telephonist knows his callers, and it is precisely the regular callers, calling at regular periods that ensure prompt attention for the unusual caller, and therefore delay on urgent calls does not arise. The unusual calls in the late night or early morning are invariably due to emergencies.

In nearly all exchanges there are certain regular calls at regular periods, the most common examples are, L.G.O. Company branch garages calling up headquarters to give statistics and records, night guards such as at banks ringing round a circuit to ensure all is well at various branches, police stations also ringing round a circuit to give various instructions, &c. Whilst on this latter point we might here note a very convenient and efficient variation in practice. When it is desired to pass an important and urgent message, say to a dozen areas, usually the caller will say his call is important, and ask to be connected simultaneously. Then the communications are established on one position, the keys thrown over, and all areas can be spoken with as desired. Such procedure is not possible during the day, unless, of course, special provision is made. Further, the procedure is not provided for in standard rules, but it is indeed useful and efficient in practice.

To summarise, the main features of the night service are regularity of traffic at regular periods. By instinct these calls are known, hence when unfamiliar calls are made (and mainly these would be due to emergencies), the question of delay does not arise. The adaptability of the night telephonist to exchange conditions consequently assures prompt and efficient service. There is one other important point which can only be fully appreciated by actual experience, and it is the sympathetic understanding of the calling at night tending towards a tolerance which makes for smooth working. So far we have dealt with the special traffic conditions, and the consequent arrangements to meet them. The relation of the night telephonist to the service as a whole, and his contribution to a general efficiency of the service has now to be spoken of. At night the whole of the exchange equipment and apparatus is tested, and from the point of view of general efficiency such a test is invaluable. The conditions obtaining at night, namely, a big decrease in the volume of traffic renders a complete test comparatively easy, but yet on a thorough overhauling depend most of the factors that make for a good service. Inefficiency due to mechanical faults is lessened, faulty cords, no glows, and faulty ringings are detected, and in most instances all can be adjusted before the high-pressure peaks again come around. It is quite common to pass to the engineers a veritable crop of exchange faults.

The testing of register keys is regarded as most important. The percentage of over—and undercharges, must be a matter of serious concern, and complete accuracy at least in this connexion is a matter of vital importance. This system of exchange testing is known as routine testing. The name is probably best suited in all the circumstances, but it does not convey its very great importance. The measure of its value may be difficult to express, but without doubt this contribution by the night telephonist to the sum total of exchange working and efficiency will always remain vital, but yet obscure.

At this point a glance at the night telephonist from the personal or human point of view might be useful. We find him a person mainly in obscurity rendering service, and aiding in the maintenance of a vital organisation. By the nature of his work he is cut off from the normal mode of life known to others functioning within the organisation; of necessity he accepts all the disadvantages which inevitably follow. At the moment the basis of his contribution to the organisation is not clearly defined; his rendering of social service is not accepted as such, nor is his contribution in other aspects fully valued. He acutely feels his disadvantages and has shown in spite of his difficulties he can prove himself capable and fitted when opportunity presents itself, and he is always glad to be relieved from the incidence of an irksome calling. Occasionally he comes into his own, and ultimately his status is assured. The one outstanding feature of the night telephonist is his isolation. The result is loss of personal touch between him and those who should have a personal knowledge of him. The disadvantage may be a loss to the individual and the service. The difficulties of administration are doubtless appreciated by all concerned. They may by variation or organisation and administration at least be toned down, but the purely human element is not so much a question of organisation as it is the acceptance of certain principles and the consequent implications.

Organisation.—One is not assured that the present method of organisation is most suitably adapted to meet the circumstances of the night service, and whilst the merits and demerits of centralisation and decentralisation could be argued for many hours, the fundamental fact which should determine the principle or expediency in this instance is the peculiar circumstances attaching to the night service.

The one needful effort necessary for the night service administration is a comprehensive system that will abolish its present irksome isolation and give it life and scope, and give opportunity for full expression of individuality, and so make the individual feel, that after all he is really more than an adaptable part of the mechanism. It will further ease the difficulties that must of necessity be many, consequent upon a day staff organising arrangements for a night service.

The present system might usefully be amended, because it is awkward and tends toward duplication. The justification for variation in procedure is produced by the variation of all essential factors in the telephone system. Actually there is no line of demarcation between the day and night administration, so far as it is concerned. The responsibility is centred in the chief of each district area, and the same machinery is intended for both day and night services.

Apparently it is recognised that the system leaves something to be desired. An effort has been made to meet it, for side by side with the traffic district control there exists the night Superintendent's office. Yet neither meets the essential need. Virtual district control is not possible under the system, and a system whereby many people have control from a night Superintendent's office for periods of short duration likewise leaves much to be desired. From the point of view of economy, efficiency and regard for the staff, the centralised system of control with a permanent night personnel can best be adapted to the night-service. It would ensure the specialisation which the special circumstances need. There might also be added to the night organisation the training of the night staff; at the moment it is trained apart from the normal environment. The night telephonist receiving instruction from the day schools becomes acquainted with the apparatus and telephone nomenclature, but that is all. He receives his training at the exchange switchboard, where he learns the reality and becomes adapted.

It will not be doubted that the real secret of efficiency lies in solving the human problem. Therefore, the aim should be to encourage the fullest measure of co-operation, but real co-operation implies a widening of the Whitley constitution, so that staff representatives can function more usefully than in an advisory capacity. An extension of Whitleyism in this direction would be but a recognition of the new outlook on the State and social service that has developed, and is in the process of shaping itself into concrete form. Meanwhile, the basic principle of the institution of night telephony needs to be defined. Shall we accept its function to be rendering of social service and accept the consequent implications? If so, the problem of administration from the consumer's point of view and likewise those engaged in its maintenance will be easy of handling. Then what are considered problems to-day will pass; they may be remembered historically, and that is all.

REVIEWS.

"*Directive Wireless Telegraphy. Direction and Position Finding, &c. By L. H. Walter, M.A., A.M.I.E.E. Published by Sir Isaac Pitman & Sons, Ltd.* xii + 124 *pages. Price* 2*s.* 6*d. net.*

During recent years various methods have been devised for directing the waves used in wireless telegraphy along a definite line, and, at a receiving station for detecting the direction whence the waves are received. The methods used at a receiving station to detect the position of a transmitting station are of particular importance. Not only do these methods enable navigators to find their way in foggy weather, by taking the bearings of known wireless stations in the same manner that the bearing of a lighthouse is taken by optical means, but they also enable the signals from a nearby transmitting station to be cut out at a receiving station, and thus enable duplex working to be carried out.

The ordinary text books on wireless telegraphy do not deal very fully with the subject of directional working, and in view of the importance of the subject the appearance of a book dealing solely with this question will be welcomed. The first chapter deals with the general problem of directional wireless telegraphy. The various methods used, both for directional transmission and reception, are described in the second chapter, together with a summary of the formulæ bearing on transmission and reception with loop aerials, and hints on the design of these aerials. The application of directional working to practical navigation is dealt with in the next chapter, and the fourth is devoted to a description of the various types of direction finding apparatus in use at present. The final chapters give a short account of the wireless stations fitted with directional apparatus which are now in operation, and of various other applications of directional working, including those which aim at the prevention of interference by atmospherics.

The book is well got up, and the illustrations are excellent. It will certainly be found of great assistance to anyone who is in any way brought into touch with wireless matters.

"Rays of Positive Electricity and their Application to Chemical Analyses." By Sir J. J. Thomson, O.M., F.R.S. Published by Longmans, Green & Co., 39, Paternoster Row, London. Second Edition. 237 pages. Price 16s. net.

Everyone who is connected with present day telegraphy or telephony is more or less familiar with electrons and their properties, as exemplified by the thermionic valves used as generators and detectors of electro-magnetic waves, and as relays on cable circuits and on long-distance telephone lines. These electrons are negatively charged. Experiments with vacuum tubes have, however, also revealed the existence of positively charged particles, consisting of atoms from which one or more electrons have been removed, and it is streams of these positive ions, as they are called, which constitute the positive rays, or "canal rays," so called from the fact that they were originally detected streaming backwards through a hole or "canal" made in the cathode of a vacuum tube.

A large amount of research work has been carried out on these rays. Although the results obtained so far do not bear very directly on telegraph engineering matters, they have received very important applications in the determination of the chemical constitution of bodies and of the structure of atoms and molecules, and at least a superficial acquaintance with these results should be possessed by anyone who wishes to keep up-to-date with scientific developments. It should also be borne in mind that phenomena which, when discovered, appeared to be solely of academic interest, have over and over again received very important practical applications, so that it is advisable that no advance in pure science should be neglected by the practical man. The case of the cathode rays, discovered by Crookes, and their application in thermo-electric valves, is, of course, an outstanding example.

The book under review is one which should be read by anyone wishing to keep abreast of modern progress in these matters. Sir J. J. Thomson is well known as the leading authority on these matters, and there is no need to analyse the book in detail. The subject matter has been brought up-to-date, and no great amount of previous mathematical and physical knowledge is required by the reader in order to follow its presentation. Of course, it is not an elementary book, but anyone with the fundamental knowledge required to deal with telegraph and telephone engineering problems should have no difficulty in reading it.

The book is well printed, the diagrams are good, and the plates showing the photographic results of various experiments are very clear.

"The Practical Electricians' Pocket-Book and Diary, 1922." S. Rentell & Co., Ltd. 3s. net.

This, the 24th issue of this well known and useful little work has been thoroughly revised and brought up-to-date—in fact, several sections have been entirely re-written. New chapters have been added on the motor converter, railway signalling, electricity in motor vehicles, &c. The 560 pages are packed with information of utility to electrical engineers of all kinds.

"Sindri." Reykjatik. Nos. III and IV.

We have before referred to this periodical, which is published quarterly by an Icelandic society. No. IV gives particulars of 15 years' growth of the Icelandic telegraph and telephone system, which has increased from 616 km. to 2,420 km. (pole route) and from 1,241 km. to over 7,000 km. (length of wire) in that period.

THE BAUDOT.—XXIX.

By J. J. T.

THE care of the receiver will now receive our attention. Each armature E (Fig. LXXVII) should move freely on its hinge at H and the brass antagonistic split flat spring M should be given sufficient tension to throw its armature sharply upwards to its limiting stop B. In quadruple single plate and sextuples of any type this tension may need to be increased for obvious reasons. All armatures should normally be the same distance from their respective coils, *i.e.*, should be in the same horizontal plane. The play of each armature is adjusted by the notched screw J. The

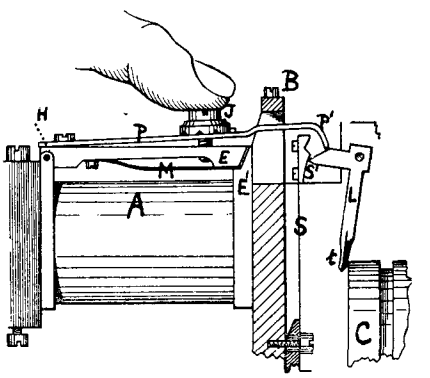


FIG. LXXVI.

lip of each appendix is adjusted before the receiver leaves the factory or workshop at a distance of about 2 millimetres from its corresponding lever L. Should it be necessary, however, it *may* be gently bent either nearer to or farther from the horizontal portion of the same. This necessity should be rare. When the appendix lip P^1 is depressed by the action of the armature E the former should follow L downwards in its course but not with sufficient force to press the lower portion *t* unduly against the edge of the combiner wheel C. To adjust this, stop the receiver at the point where the shuttle cam has just completed the replacement of the appendix levers; then with the finger (Fig. LXXVI) press J firmly

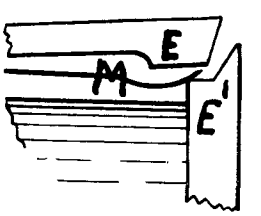


FIG. LXXVII.

so that L rests against the edge of C. In that position there should be (1) no play between the lip P^1 and the horizontal portion of L, and (2) no feeling of flexibility whatever pressure may be exerted upon J. To obtain this necessary condition, the screw J should be adjusted. If, however, as will sometimes happen, there is no possibility of obtaining both conditions, it is better to have a little play between L and the appendix lip P^1 than to have any flexion of the appendix itself.

The antagonistic brass spring is as is already known split into two forks. One only is actually needed as a spring, the other serves to prevent the effects of retentivity in the extended pole-

piece E^1 unduly acting upon the armature E. The correct adjustment is, therefore, that one of the forks of the spring M should be bent slightly lower than the other. The free ends of M should extend right up to the end of the undercut portion of E^1 and on no account should they be bent as shown in Fig. LXXVII.

(To be continued.)

CORRESPONDENCE.

SOME MORE NOTES ON SYNCHRONISM.

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

Sir,—In your December issue you published an article by Mr. J. W. Teare, which by implication gives the credit for the invention of synchronism generated from the message signals to the designers of the Western Electric multiplex. To anyone not acquainted with the facts, Mr. Teare's article would give the impression that this method of correction is a special and exclusive feature of the Western Electric. Such an impression would not only be erroneous but also unjust to other inventors and systems. I must, therefore, ask you to allow me to present your readers with some additional facts which will synchronise Mr. Teare's article with the true position.

Probably the first printing telegraph to correct from the message signals in the modern sense was the Hughes. Of the modern high-capacity systems the Murray automatic printing telegraph was, to the best of my knowledge, the first to use this plan. It was followed by the Creed automatic reperforator, in which this method of correction also appears.

In 1903 when I began to realise the advantages to be gained by a combination of the Murray automatic and the Baudot multiplex, I prepared a paper with illustrations and diagrams describing such a combined system, which embodied all the essential features of the present Murray multiplex. It was a multiplex with perforated tape transmission and automatic transmitters for each channel, and it was provided with the automatic start and stop for the transmitters, invisible correction of errors and other devices employed in the Murray multiplex and since copied by other multiplex systems. It also provided for correction from the message signals. I sent copies of that paper in confidence to the British, French and several other telegraph administrations in 1903. Several years afterwards, the French telegraph engineer Pierre Picard applied this idea of correction from the message signals to the Baudot multiplex in a different way from the plan I had proposed. The Picard plan has been in successful use for many years across the Mediterranean between Marseilles and Algiers, and it is fully described in the French textbooks on the Baudot. It is the Picard arrangement that has been adopted without acknowledgment in the Western Electric multiplex, and I am glad to take this opportunity of expressing my opinion that it is very unfair not to give Pierre Picard credit for his most ingenious application to the multiplex of the principle of correction from the message signals.

The Picard arrangement can be applied to any multiplex system, and it is in no sense a speciality of the Western Electric. In the Murray automatic system correction from the message signals was carried out in a simple way without any extra apparatus. The same remarks applies to the Creed automatic; but in the case of the multiplex such simplicity is not possible, and both in the arrangement I proposed in 1903, and in the Picard plan as used by the French Administration and by the Western Union and Western Electric multiplex, a good deal of extra apparatus is required. This extra apparatus is certainly not worth while in the case of the large number of circuits where the line speed is above the traffic requirements. In the case of underground cables where there is pressure of traffic up to the limit of carrying capacity, and where what we might call the law of diminishing returns begins to operate, then of course the Picard scheme for more intensive cultivation of the telegraph crop can be applied with advantage on any multiplex system, and I have no doubt that the British Post Office Engineering Department will apply the Picard arrangement on some of the British inland Baudot circuits when the need arises. Certainly on the Murray multiplex I advise the use of the Picard arrangement whenever it can be profitably employed, but not otherwise. The French Administration evidently works on the same plan, in most cases preferring the simpler and automatic Baudot method.

I must also dispute Mr. Teare's contention that the Western Electric synchronism is superior to that of the Baudot. Such a claim will certainly make the French Baudot experts smile. Here again I may point out that the Western Electric has no monopoly in fine synchronism, because the synchronism of any multiplex system can be refined to any desired degree, certainly beyond any ordinary requirements. I happen to know that some experiments are being conducted (not by me) in which refinements of synchronism much superior to anything hitherto attempted are being used. In this case special requirements render such refinement desirable, but for all ordinary work synchronism equal to that privided by the Baudot multiplex is amply good enough. The addition of the phonic motor drive to the Baudot method of correction is valuable not for the finer synchronism that is possible with such an arrangement, but because of its greater simplicity, much reduced maintenance cost, and easy change of speed within a range from 20 to 70 words a minute per channel. I know by experience that, with the phonic motor drive and the Baudot method of correction, synchronism ceases to be a multiplex trouble, and it is being widely adopted by the Telegraph Administrations because it gives multiplex without tears.

Dec. 19, 1921. DONALD MURRAY.

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

DEAR SIR,—As criticism of the standard expression: "They will probably call you again, will you please replace your receiver" is suggested under the London Telephone Service Notes in the January issue of the T. & T. JOURNAL, I should like to give the views of myself and the other telephonists in this exchange.

1. The expression is certainly explicit from our point of view, but from our experience it is never grasped at once by a subscriber, and finally, after repeating several times without effect, the telephonist, in desperation, uses her own words such as: "They'll ring you again if they want you: put your receiver back please." The subscriber then, as a general rule, gives a grunt of comprehension and does as he is asked.

2. The P's. L's. and S's. are inclined to trip the telephonist up and the word replace develops into replaish which somewhat suggests the "morning after the night before."

Standard expressions are essential, but they should be made up of short, every-day words that can be grasped at once by any subscriber or caller whether conversant with the use of the telephone or not.

For instance, the expression "Have they answered?" sounds much better than "Have you got them?" but the usual reply to the former is "No! I'm waiting, don't take me off," while the latter is understood at once.

Z. F. RICH,
Supervising Telephonist.

P.O. Telephones, Llandudno.

WIRELESS EXHIBITION AT EDINBURGH.

AN interesting and rather unique exhibition of telegraph and telephone apparatus as applied to radio activity was held in Edinburgh on Dec. 17, under the auspices of the local Radio Society, which is affiliated to the Wireless Society of London.

The object of the demonstration was to bring under the notice of the public the practical research work carried on by the Society, and to give those interested in wireless transmission of intelligence an opportunity of seeing specimen receiving and transmitting sets in actual use. The Society is composed of a number of enthusiasts in the science of "wireless" who reside in the district, and who meet together at weekly gatherings, at which they have a series of lectures and demonstrations. The local president of the Society explained at the outset that the apparatus on view was of the most simple kind, as the members did not wish it to be thought that it was essential to employ complicated instruments for the class of work to which they were devoted. The membership consisted of those who had had experience and those who had not, and the knowledge of the experienced was at the disposal of the inexperienced.

Nine-tenths of the material of the exhibition was entirely home-made, and the fact that they were able to make so great a use of it showed how efficient was the work of the Society. One receiving set had been made at a cost of 17*s.* 6*d.*, and it could receive messages extending over a distance of 1,500 miles. The hobby, therefore, was not a costly one, and it gave astonishing results for very little labour. In the afternoons they got the latest news from the Eiffel Tower, while in the mornings they got Berlin, and on Sundays they got a concert at The Hague which could be distinctly heard in Edinburgh.

The exhibition was opened by Sir J. Alfred Ewing. F.R.S., the Principal of Edinburgh University, formerly and successively Professor of Engineering at Tokio, Dundee, and Cambridge, and author of of many publications of world-wide reputation including the standard work on Magnetic Induction in Iron and other metals.

During the War it was Dr. Ewing's privilege to be the "official eavesdropper" and he had organised the office in which continuous reception was maintained, night and day, of all wireless signals it was useful to overhear. There were many secrets in the archives of the office—secrets which would not be revealed in the lifetime of anyone who took part in the War. He did not give away any of those secrets, but he would say that wireless was an enormous advantage to this country for the purpose of defence, apart from its other use as a means of giving orders to the ships. With the vast improvement upon the early receiving apparatus, in which crystals were used where they now had valves, it became possible to hear almost every whisper that was occurring in the North Sea and they developed an exceeding efficient system of directional wireless. If a Zeppelin crossing the North Sea made a wireless signal, before many minutes had elapsed, the position of the airship was plotted on a chart and we knew exactly where that ship was. We got our directional system perfected before the Germans, and when a Zeppelin would signal asking her own side to tell her where she was we would hear it, although we knew the locality already. The staff became so expert that they could recognise the very "accent" of a sender. It was part of the game of

war to change the call signals of ships from time to time, and it was very important for them to know when the Germans changed theirs, and to locate which ship a particular signal belonged.

The opening ceremony was attended by a very large number of the public who were afterwards given demonstrations in telephony and telepraphy by the various exhibitors. Among others visiting the show were Mr. Taylor, Superintending Engineer, and several of his assistants, Major Jayne, Controller of Telegraphs, Dr. Douglas, Medical Officer, and several members of the Secretarial and Accountants Departments.

The writer of these notes was particularly interested in the function, as he was probably the first to write a popular article on wireless telegraphy for that same somewhat elusive individual commonly known as "the man in the street." At that time treatises on radio telegraphy were confined to the scientific or technical press, excepting when some astounding paragraph appeared in the evening or Sunday papers telling of some marvellous achievement that had either taken place or that was about to be realised.

Preece created some interest in the subject by his experiments across stretches of water, but his system was merely a development of that originally demonstrated by Rowland Lindsay of Dundee. It may not be known to many readers that the old Electric Telegraph Coy. actually tried a wireless system devised by one Howarth, but they evidently had not harboured "great expectations" from it, as in their appeal against the compulsory purchase of the telegraphs by the State they apologetically referred to this incident as being due to an excess of that zealous and progressive spirit which they claimed to have animated them in all their transactions.

The first really practical step from Maxwell's mathematical deductions was made by Hertz when he caught the wave in the form of a spark at an air gap in a metallic hoop. This clearly demonstrated the accuracy of Maxwell's theory, but it was a long way removed from accomplishing a wireless telegraph system. By the introduction of the coherer of Branley, Lodge and others, the next move was made towards successful telegraphy, and all subsequent development has been in the direction of securing greater sensitiveness in that part of the installation which was represented by the original coherer of Branly and in providing means for transmitting waves to a greater distance. The remarkable progress made may be realised when it is remembered that in 1896 the greatest distance over which signals could be transmitted was under two miles. In the year following this distance had been increased to 18 miles, and to 85 miles within a couple more years, while in 1901 it reached 1,800 miles when Marconi achieved the feat of transmitting messages across the Atlantic. The year 1910 saw from 4,000 to nearly 7,000 miles covered, and towards the end of last year communication was wirelessly established with New Zealand, or half way round the Globe.

The comparatively recent development of wireless by the Marconi Company, whereby telephonic communication was carried on by cable to Southwold, thence by wireless to Landvoort, and then by wire to Amsterdam, is only slightly less marvellous than the recorded instance of a man in Kansas, equipped with an amateur's outfit, sending out by wireless a gramophone record of "Humoreske," which was transmitted 1,500 miles to the coast and thence across the Atlantic to Scotland where it was distinctly heard. It may be truly said that few romances can boast of more fascinating pages than the history of wireless telegraphy.

PRESENTATION TO MR. W. J. PARSONS.

LLANDUDNO.

Mr. W. J. Parsons of the P.O. Engineering Dept., retired on Dec. 31, 1921, after 30 years' service with the N.T.C. and P.O.E.D.

The second annual social evening of the Llandudno and district telephone staff was held on Jan. 2 at Paynes' Cafe, and during the evening, Mr. J. Dickson, Sectional Engineer, presented Mr. Parsons with a gold watch, suitably inscribed from his colleagues past and present, and Mrs. Parsons with a pair of silver vases.

Members of the Traffic, Engineering and Operating staffs were present from Chester, Colwyn, Bay, Conway Bangor, Denbigh, Deganny, Llanrust, Llanfairfechan, Penmaenmaur, Partmadoc and Rhyl, and several testified as to the esteem in which Mr. Parsons had always been held. Letters were received from numerous friends, who were unable to be present, including Mr. J. G. Ferguson, Traffic Superintendent, Sheffield, and Miss Parry, Supervisor, Chester. The Postmaster, Mr. W. W. Young, his wife, and several members of the P.O. staff were present.

Musical items were given by Miss Hilda Parsons, Messrs. J. A. Robinson, R. G. Chambers and Clem. Brown, the accompanists being Misses Parson and Thomas and Mr. E. E. Hughes.

Prize winners in the competition games were as follows: -

Progressive Games: Mrs. J. Dickson and Mr. J. Parsons. *Blindfold Donkey Drawing*: Miss G. Thomas. *Hat Trimming*: Messrs. J. Parsons and Wilson. *Jumbles*: Miss Parton. *Stump Speech*: "Paint and Powder," Miss D. Doré; "Should Women Smoke," Mr. A. Bellis.

The arrangements were in the hands of Misses Kennerley, Jones and Rich, and Messrs. Willet, Owen and Williams.

LONDON ENGINEERING DISTRICT NOTES.

Telegraph Mechanical Aids.

THE use of mechanical aids in telegraph working viewed from the standpoint of a traffic officer, was the subject of a paper read by Mr. J. Stuart Jones before the London Centre of the Institution of Post Office Electrical Engineers on Dec. 14. The author described some of the features of mechanical aids at present employed and indicated some of the advantages and disadvantages.

The subject was divided broadly into three parts:—

(1) The reception of a telegraph message over the counter and its carriage to the instrument table.

(2) Alternative means of transmitting a telegram.

(3) The method of delivery.

As was to be expected a paper of this character read by such a well-known traffic officer before an audience composed almost entirely of engineers, provoked a keen discussion. Mr. Lack contended that a statement of the author to the effect that "there had been no notable change in the machinery of the service since the Telegraph Transfer of 1870," did not correctly represent the facts. He stated that while it may have been perfectly true that the administration had not used mechanical aids to the extent that it might have done, it was not because full details of possible and practical application of machine methods had not been supplied by the Post Office Engineering Department. He claimed that no inventor had ever brought a new invention to the notice of the Engineering Department without receiving sympathetic consideration, and, if there was any real promise in the apparatus, the advantage of a practical trial. Details of the results were furnished to the administration. A long list of actual cases was given to substantiate this claim. Moreover, it was stated that in practically every case the inventors' original idea had been improved and developed by Post Office Engineers, and the inventors themselves were the first to acknowledge this. Although the inland telegraph authorities were slow to take advantage of these investigations and recommendations, the foreign countries with whom Great Britain was connected telegraphically were fortunately ready to co-operate, with the result that British Engineers were able to instal, watch and improve various types of machine telegraphs. When, therefore, the attitude of the British authorities changed, and apparatus of similar type was required for inland working, the spade work had been done and no delay was incurred in the Engineering Department.

Mr. Lack also stated that the premier position attained by Great Britain in the investigation of machine telegraph working prior to the War was admitted by other countries and when America awoke to the fact that there was a great future for machine methods, it was to the Post Office Engineering department that she turned in order to get an expert. As competitive companies exist in America, while in England a monopoly prevails, this fact disproved the statement of Mr. Stuart Jones that a monopoly necessarily tended to stifle progress.

Another speaker drew attention to the large number of inventions introduced by Post Office Engineers, and humorously remarked that the difference consisted in the fact that the commercial inventor had his name tacked on to the invention and received the reward of his labour.

One speaker, well-known to telegraph officers, was understood to say that his qualification for being in the Engineering department was that as a telegraphist he had developed telegraphists' cramp and was about to be put on the scrap heap when, fortunately, a transfer was managed. For the benefit of those telegraphists who since the meeting have developed a pain in the thumb it may be as well to say that there are other necessary qualifications. Altogether the meeting was stimulating and helpful, and although the audience was smaller than usual, there is no doubt that everyone present echoed Mr. Weaver's well chosen words of thanks to Mr. Stuart Jones.

Unit Costs.—In all well organised undertakings some system of costing is in use. Naturally the nature of the business determines the simplicity or complexity of the system. The ultimate object is, of course, to enable the managerial staff to control expenditure and regulate the prices of the commodities dealt with.

In some businesses the requirements are met in a simple manner by equating large blocks of expenditure to some units applicable to the particular cases. Examples of this, in the case of the telephone business, are found in such statistics as figures of operating costs per originating call, and the total cost of maintenance per station. In the case of a manufactured article involving a series of operations, it is frequently considered advisable to obtain information regarding the cost of each operation. The supply of telephone plant lends itself to analysis on these lines.

The work involved in the provision of the external plant, the exchange equipment and the subscribers' apparatus, covers a multitude of separate

operations, each of which is repeated over and over again. It is clearly advantageous to know how long each individual operation takes. Such information can be used for estimating purposes and for comparative purposes with the object of setting up healthy rivalry between sections. It is obviously necessary for comparison purposes to eliminate from the returns factors beyond the control of those engaged in the operations—travelling time, for instance.

The Engineering department of the Post Office has a system in operation known as the Unit Construction Cost System from which it is hoped in the course of time to obtain some very valuable information.

The various items of work are scheduled, a number being given to each. Progress reports are prepared daily by the men, or in certain cases by the foremen, each item of work being debited with the time spent thereon. The reports are summarised in the Superintending Engineer's Office by the same staff that prepares the pay-sheets. The value of the statistics obtained is, of course, dependent on the care taken in drawing up the daily reports. Special steps are taken to see that all concerned fully understand the objects of the system, and that the information submitted is reliable.

Pneumatic Tubes.—Captain J. Coxon in a lecture given on Jan. 11 to the Institution of Post Office Electrical Engineers, dealt with a phase of the Engineering department's work that is not such a prominent feature as many others dealt with in addresses to this Institution.

The pneumatic service covering the transmission of messages in bulk between one office and another and distribution within buildings, however, is an important feature of the telegraph system both in London and the Provinces, and Captain Coxon's very lucid description was much appreciated by his audience.

He dealt with various aspects of the subject covering design, construction and traffic, but from limitations of time was not able to explore the whole field. So far as London is concerned, tubes at present radiate principally from the Central Telegraph Office to the more important Post Offices, Government Offices, &c., within a radius of two or three miles of G.P.O. West, but owing to the steady growth in the number, proposals are under consideration to make some of the different offices into switching centres. In fact the development is following on lines familiar in the evolution of the telephone service.

Captain Coxon expressed the view that a cheaper form of tube than the present one, which is of lead inside an iron pipe, is necessary. Iron piping is serving the purpose in France and was used in this country at one time. The cost of laying pneumatic tubes through London streets in naturally great, and any method of reducing the outlay is worthy of consideration. Unfortunately it is generally necessary to open the street for each tube laid, as the methods adopted in telephone practice of putting down plant in advance of the requirements, are not applicable to the same extent with tubes, although advantage is taken of the opening of streets to lay sections of tubes if there is any reasonable prospect of them being required. Most of the adjuncts of the pneumatic system such as traffic regulators, switches, &c., have been designed by Post Office Engineers at Headquarters and in the district.

Mr. Steed in his remarks during the discussion paid tribute to the work of the devoted band of enthusiasts on his staff who have done so much towards making the system a success.

The lecture was illustrated by some very clear slides.

Roman London.—Reference was made in these notes a few months ago to the interesting relics of ancient London which are occasionally brought to light during the excavations for the purpose of laying telephone conduits. In connexion with the provision of plant for the Monument Exchange it has been necessary to open a trench in the centre of Gracechurch Street near Leadenhall Market. At a depth of about 13 feet, an obstruction was met with which on close examination proved to be a portion of a Roman chamber which was once part of a public building or the residence of a Roman citizen of some standing. The walls were 2 feet 9 inches thick and were composed of ragstone and Roman tiles of a bright red colour. A length of about 10 feet of this wall was disclosed, and also part of another wall at right angles, the latter being 4 feet 6 inches in thickness. The walls had a coating of coloured plaster and the floor or pavement was composed of red tesserae embedded in dressed red mortar. When this was removed a layer of loose ragstones was exposed, and below this a bed of earth mixed with mortar.

In the plaster on the walls could be seen the lower part of square panels painted in black outline with a simple design which gave indication that the plaster had been painted to represent marble.

The authorities of the Guildhall Museum have made a careful examination of the remains, and have removed some of the tesserae but unfortunately were not able to remove the plaster in large pieces.

When excavations were being made for the Leadenhall Market extensive remains of an important Roman building were found, and experts considered it very probable that they formed part of the ancient Roman forum. If this theory is correct it is probable that the chamber now exposed formed a part of the same group of buildings.

When the excavators of 2,000 years hence expose the remains of the G.P.O. South and speculate on the uses to which the building was put, it will probably be for the purpose of laying in the trench some apparatus the use of which lis as much beyond our imagination as the telephone was beyond the dreams of the most advanced Roman scientist. *Materiem superabat opus.*

Obituary.—It is deeply regretted that the news has just come to hand of the death of Mr. G. W. Connell which took place on Jan. 10 at his new home at Fowey, Cornwall.

Mr. Connell recently retired and a full account of his services appeared in a previous issue of the JOURNAL.

It is also announced with much regret that Mr. T. H. Ayre of the Superintending Engineer's Office, London District, passed away on Jan. 6, 1922. He came of a Post Office family, his father having been the Postmaster of Canterbury. He entered the Post Office in October, 1885, and most of his service was spent in the Engineering department. He was a gifted organist and musician and was an Associate of the Royal College of Organists.

He bore his age remarkably well and although 62½ years of age, up to a few weeks prior to his retirement on Jan. 1, 1922, he looked to have many years of leisure before him for the pursuit of his musical attainments. The tragedy of his death after such a short illness is deplored by his colleagues and sympathy is extended to his widow and family.

Another tragedy in the London Engineering District has to be reported due to the prevailing epidemic of influenza. Mr. F. Jenkinson who had been in the service of the Engineering department for exactly 21 years, having entered on Jan. 7 1901, passed away on Jan. 7, 1922, aged 58. For many years he had charge of the heating apparatus at the Denman Street headquarters of the London Superintending Engineer. He was a most zealous officer in the pursuit of his duties, and his loss is greatly deplored by the whole staff, and their sincere sympathy is tendered to his widow and family in their distress at his sudden and unexpected decease. He had a vigorous constitution, and was ill for a few days only with influenza, when pneumonia intervened

POST OFFICE STORES DEPARTMENT

TRADE CLASSES—PRIZE DISTRIBUTION AT HOLLOWAY FACTORY.

The Assistant Postmaster-General (The Rt. Hon. H. Pike Pease, M.P.), was the guest of honour at the Annual Distribution of Prizes at Holloway Factory recently to the factory and depot boys engaged in the Post Office stores department. This pleasant little function was preceded by renditions by the Holloway Factory Orchestral Society, under the able leadership of Mr. Aldridge. In addition to Mr. Pike Pease, Mr. W. H. Allen, the Controller, Mr. G. E. Mansbridge, Assistant Controller, and Mr. C. E. Fenton, we noticed on the platform Mr. C. C. Sanderson, Controller, L.P.S., Mr. A. L. De Lattre, Assistant Engineer-in-Chief, Mr. C. Smith, General Secretary of the Post Office Engineering Union, Mr. Ingram of the L.C.C. Education Department and Mr. Thomas, Responsible Master of Shelbourne Road Technical Institute.

Mr. W. H. Allen, the Controller, presided and briefly reviewed the work of these vocational classes, referring with pleasure to the appreciation which the lads show by their diligence and progress, and to the devotion of the tutors to their work. During the 1920-21 session, seven lads obtained County Council Exhibitions, tenable for three years at the evening classes at Northampton Polytechnic.

Mr. Pike Pease, after distributing the prizes, congratulated the lads on their successes and on the fine specimens of their work exhibited on benches in the room. He commended them for their wisdom in seeking to acquire all the technical knowledge within their range, and reminded them that not the least advantage arising from such knowledge was the moral sense of mastery of their jobs. At such classes they learned the why and wherefore of things, and were freed from the bondage of rule-of-thumb. The Assistant Postmaster-General, who gave two prizes for the best all-round work last year, promised to do likewise in respect of the 1921-22 session. Mr. G. F. Mansbridge thanked the Assistant Postmaster-General for his presence, and for the stimulating advice he had given the boys. He counselled the boys to mark well the emphasis which Mr. Pike Pease placed on the moral value of the training given them. Mr. Beresford Ingram, of the L.C.C. Educational Department, bore testimony to the quality of the training given in the classes and to the high standard of efficiency obtained by the lads. Mr. C. Smith, the General Secretary of the Post Office Engineering Union, congratulated the officers of the department on the work of the classes, and the lads on having shown their appreciation by diligent application.

LONDON TELEPHONE SERVICE NOTES.

Statistics.

ACCORDING to one authority there are three forms of prevarication; lies; d—— lies; and statistics.

However, this may be, the statisticians themselves probably prefer the dictionary definition—a collection of facts tabulated numerically—and will plead, that, having presented the facts, they are not to blame if the figures are employed to deceive.

Statistics are employed mainly in two directions; for study, or for exhibition. When they are employed for the latter purpose there is often the suspicion that something less than the truth is presented, perhaps because the exhibitor has rejected some of the statistical evidence as irrelevant, but sometimes we fear, perhaps not. The statistical enthusiast is frequently to be found in the ranks of the exhibitors, but as a rule we know there is a show on and refuse to let "Mr. Statistics" take possession of our better judgment.

The study of statistics is quite a different matter. Here the student is seeking information and searching for signs and portents; he follows where the facts lead him; he casts none of them aside without examining them with the greatest care and deliberation. He does not mind admitting that although he is forced by the weight of evidence to a certain conclusion, yet some of the facts are hostile witnesses.

Since the successful development of the telephone business depends largely of the accuracy, first, of statistics themselves and secondly on conclusions drawn from them it behoves us to satisfy ourselves that we have reviewed *all* the facts *every* time. Extracted figures are useful in their way, but we should always remember that they are not the whole story; they may be likened to the spires and towers of a town which enable the traveller to recognise the town from a distance but give little indication of the character of the inhabitants.

* * * *

London Telephonists' Society.

The annual dance of the London Telephonists' Society was held at Bishopsgate Institute on New Year's Eve and was once more an unqualified success. The demands for tickets, which had to be limited to 250, far exceeded the supply and practically all were allocated a month before the event. All the principal exchanges were represented in the gay company which assembled.

Mr. Skinner's Orchestra was once more in attendance and in very best form, and the dancers needed no encouragement to respond to his inviting melodies. Attractive as the supper tables looked many of the company were reluctant to tear themselves from the music even for a brief half-hour.

It was a matter of regret to all members of the Society that their President, Mr. M. C. Pink, was unable to be with them owing to recent family bereavements. In his absence Mr. G. Buckeridge was indefatigable in performing the duties of both M.C.s. The members who so thoroughly enjoyed the evening can look forward to a repetition of the event next season as the hall has been booked for Dec. 30.

* * * *

The next meeting of the Society will be held at the usual place of assembly on Wednesday, Feb. 8, when the successful competitors in the annual competition will read their papers.

* * * *

Standard Expressions.

Appropos last month's notes on standard expression, the following is an example of the awful consequences of falling from grace to the extent of saying "Line engaged" instead of "number engaged."

Small child:—"Mother; why do they keep lions at the Telephone Exchange?"

Mother:—"They don't dear, what makes you ask?"

Small child:—"Because when I rang up Daddy, they told me the lion was engaged."

(*Windsor Magazine.*)

* * * *

Culled from the Exchange.

Victoria Exchange.—On Saturday, Jan. 7, the Engineering and Traffic staffs combined in entertaining 420 poor children connected with the Wesleyan mission, Lambeth, to a Christmas Tea.

This was followed by an entertainment which consisted of dances, songs, and a performance by the Victoria Engineering Staff's Minstrel Troupe.

The children were delighted with the performance and manifested their pleasure by the hearty and fervent singing of the choruses. Towards the close of the festivities, Father Christmas and a Christmas Tree appeared on the stage and each girl was given a doll which had been daintily dressed by members of the staff. The boys each received a penknife or a mouth-organ and another toy. On leaving each child took away a bag of fruit and sweets and a new penny. The happy smiling faces of the kiddies as they toddled out were proof of the success of the entertainment and amply rewarded those who contributed to the treat.

* * * *

By means of weekly subscriptions the Victoria staff accumulated a fund amounting to £70 which has been divided between the Westminster, St. George's and St. Bartholomew's Hospitals.

* * * *

Regent Exchange.—Regent Exchange staff had a most enjoyable evening on the occasion of the dance they gave at the Shaftesbury Hotel on Dec. 14. Although on a much smaller scale than their usual functions, it lost none of the spontaneous gaiety which always prevails at Regent festivities. The small cosy hall had the effect of making it seem a happy family party.

* * * *

On Dec. 22, the Gerrard and Regent Catering Committee entertained all the members of their club to a Chirstmas Dinner. The menu contained all that is associated with yuletide feasting—Turkey, Christmas Pudding, Fruit, and Crackers. The guests found the most piquant moment of the occasion when they did *not* have to ask for bills and wait at the cash desk.

* * * *

"If."

(Certainly not by Rudyard Kipling.)

If subs. were only tractable,
And Radials* were not;
O! then would we telephonists
Enjoy a happy lot.

If lunch time was an hour,
And tea-time nearly half;
We'd greet our labours joyfully—
Upon our lips a laugh.

If we could have a telephone
For just "Two pennies please!"
Fixed up within our rest room,
To 'phone our "boys" with ease!

If someone would but banish
Those Saturdays we hate,
Which come so very frequently
And are known as "long and late."

If a scheme of ventilation
In Exchanges would prevail,
Whereby we'd neither roast alive,
Nor perish in a gale;

Man wants but little here below,
And women even less;
Will someone grant our wants and earn
Our lifelong thankfulness?

For then in gratitude we'd count
The blessings we have got,
But most especially I think,
If Radials were not!

(DOROTHY TURNER.)

* It should be explained that by "Radials" is meant the time-recording machines in which telephonists record their arrivals and departures.—(ED., T.& T.J.)

OVERHEARD.

Stores Clerk (on telephone):—

"Stores speaking . . . What's that? . . . Punch, oh yes, Sir. . . . fine paper . . . yes, indeed . . . but beyond the range of a Civil Servant's salary . . . Eh? . . . some mistake . . . I'm not contradicting you, Sir, but really . . . conviviality . . . I quite agree . . . punch-bowl! ! ! . . . what the dickens! . . . Yes! . . . certainly he mentioned it . . . Pickwick and others' enjoyment . . Oh! Dickens, . . . Ah; now I get you. . . . May I remind you this is the Stores Department speaking . . . What . . . you know it is, do you . . . well . . . not a periodical you're speaking about. . . . Ah! now I hear you better . . . requisition relative to paper-punch. . . . Sorry, old man, how funny . . . I'll look it up and urge it for you . . . good-bye-ee!"

H. M.

OBITUARY.

REGINALD MYLES HOOK.

ON New Year's Eve there passed away from this life a notable member of the Engineering staff of the British Telegraphs in the person of Executive Engineer Reginald Myles Hook, M.B.E., A.M.I.E.E.

He was the son of the Rev. F. P. Hook, at present curate of St. Faith's, Stepney, who was himself in the Civil Service before taking Holy Orders. Myles was appointed S.C. & T. in Limerick, the city of his birth, in 1894. He was passionately fond of music and has been organist at several churches, and at one time held the post of assistant organist of York Minster. Latterly he had taken up orchestral work and was conductor of the Southend Symphony Orchestral Society. In this connexion it is not surprising to learn that he was perhaps one of the greatest authorities on Time, and was awarded the silver medal of the I.P.O.E.E. on "Correct Time" in 1912. It was Myles Hook who developed the present system of G.M.T. distribution by the introduction of sub-chronophers at Provincial centres. This was only one of the features of his engineering knowledge as will be recognised when it is cited that he contributed articles in Kempe's Engineers' Year Book on the Slide Rule, Pneumatic Transmission, Steam Engine Indicators, Light, Gas Testing, Clocks, &c. There is little doubt but that his strenuous life as captain of H.M.T.S. *Madis* and the hardships which the duties of this tiny submarine cable laying vessel entailed during the war had undermined his strength, and sapped even at his marvellous energy so that a chill brought on an attack of pneumonia all too quickly in its train.

He was a keen amateur yachtsman and a member of the Committee of the Essex Yacht Club. With his delight in engineering he could not resist a certain preference for his own motor-boat, while the claims of his model of a home workshop also held a warm corner in his affections.

Bluff and hearty, he had the tenderness of a woman towards the weak, and a practical sympathy for the man who was down which would brook no mention of thanks or gratitude. His ruggedness of speech was a mere mask to the finer qualities of one who amongst men had the undeniable right to be called a man. It was no mere formal crowd of sight-seeing mourners that stood round the grave in Leigh Cemetery, but rather representative friends from every phase of those activities which had crowded a life pulsating with action, a gathering of men and women who will feel the gap his death has left for many a day to come.

J. J. T.

W. J. RIGG, OF LIVERPOOL.

We have to announce, with sincere regret, the death of Mr. W. Rigg, Assistant Superintendent of the Telegraph Branch, Liverpool Head Post Office. Mr. Rigg was one of the oldest agents of this JOURNAL. Himself a keen enthusiast for technical matters, he spared no opportunity of encouraging others, and was always ready to spend himself both in the application of his knowledge to the actual needs of the Service and in distributing his knowledge to others. He was more than a technical enthusiast, however. He had many interests in other things outside the office, and he was well known to take a particular delight in running a little telegraph system of his own at church bazaars and the like, charging what used to be, before the war, a penny for his little telegrams. He was a great-hearted and a buoyant character. In days gone by he devoted himself to the study of the technical details of telephony with a zest which led him into strange adventures, and it is said that on one occasion, finding that a fault on a wire many miles from Liverpool had not been removed as quickly as he had hoped, he went out on his own bicycle and mended the fault. His technical knowledge was not merely the knowledge of books: he was one of the happy men who could make things with his hands, and he left behind him tangible evidences of his skill and ingenuity which many of us might well envy. He was loved and lovable; he was sincere, earnest, and ready to sacrifice himself for the good of anyone whom he might help. We offer to his widow and his friends our sincerest condolences and we bid them remember that in William Rigg they have lost one who left the most precious of marks on the Telegraph Service.

J. L.

PERSONALIA.

LONDON TRAFFIC STAFF.

Resignations on account of marriage.

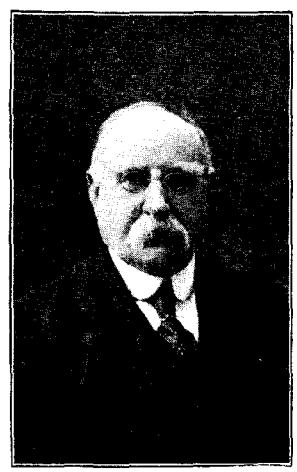
Miss K. M. BLACKMORE, Assistant Supervisor, Class II, Trunk Exchange.
Miss W. CHANTER, Assistant Supervisor, Class II, City Exchange
Miss R. D. PIZZEY, Telephonist, Trunk Exchange.
Miss N. M. TRETHEWEY, Telephonist, Trunk Exchange.
Miss G. E. MANSELL, Telephonist, Trunk Exchange.
Miss R. C. READ, Telephonist, City Exchange.
Miss G. F. GRIFFITHS, Telephonist, Hornsey Exchange.
Miss J. GORDON, Telephonist, New Cross Exchange.
Miss T. F. MALYON, Telephonist, New Cross Exchange.
Miss D. M. R. HINES, Telephonist, Regent Exchange.
Miss O. R. WHITE, Telephonist, Regent Exchange.
Miss H. W. E. PAXTON, Telephonist, Toll Exchange.
Miss M. L. BIRCH, Telephonist, Museum Exchange.
Miss D. J. HOWARD, Telephonist, Holborn Exchange.
Miss H. A. PURDIE, Telephonist, Holborn Exchange.
Miss N. L. BRAY, Telephonist, Holborn Exchange.
Miss E. H. JONES, Telephonist, Central Exchange.
Miss K. GLEN, Telephonist, Central Exchange.
Miss V. M. IRWIN, Telephonist, Supt's. Office, F.E.S.
Miss E. J. HOLLEYMAN, Telephonist, Victoria Exchange.
Miss A. M. MILLER, Telephonist, East Ham Exchange.
Miss E. F. RYTON-BENSON, Telephonist, East Ham Exchange.

EASTBOURNE.

A very pleasing and interesting ceremony took place on Friday, Jan. 6, at the Town Hall, when the Mayoress (Mrs. J. Duke), presented Mr. Arthur Miles (Skilled Workman, Class II) with the silver medal (first class), and £2 10*s.* given by the City and Guilds of London Institute for the final examination in Telegraphy (Full Technological). Several members of the telephone staff attended. The congratulations and good wishes of the local staff go to Mr. Miles.

RETIREMENT OF MR. F. A. CARMICHAEL.

Mr. F. A. Carmichael, Chief Superintendent, Telegraphs, Manchester, who retired, under the age limit, on Dec. 23, entered the Service as a learner in January, 1876, and 11 years laters was promoted to the grade of First Class Telegraphist. During his career as a Telegraphist he was employed for some years at the Manchester Stock Exchange B.O., and for about three years held the appointment of Inspecting Telegraphist in the Manchester District. Promoted to the class of Clerks (now the Overseer class) in 1897, he acted for some time as Clerical Assistant to the Instrument Room Superintendents. Further promotion to the class of Assistant Superintendent, Class II, quickly followed (December 1900) and subsequent advancements were: Assistant Superintendent, Class I, July 15, 1907; Superintendent, July 1, 1913; Chief Superintendent, Oct. 30, 1916.



Mr. Carmichael was well known outside Manchester, having taken charge at various special events. He also came into association with supervising officers elsewhere on many occasions, notably in connexion with Telegraph Conferences at Headquarters, whilst he was a member of the Committee which recommended the abolition of office copies of received telegrams. For his services on this Committee he received the thanks of the Postmaster-General.

Mr. Carmichael was always anxious that the reputation of MR. should be maintained, and ever appreciative of good service. He was of genial disposition, invariably considerate for others, and was held in high esteem, particularly by those whose intimate acquaintance enabled them to form a reliable opinion of his good qualities. By his retirement, after practically 46 years' service, the Department loses a painstaking, conscientious officer, and the Manchester staff a considerate Chief and friend.

THE

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RAMSEY VILLAGE AUTOMATIC EXCHANGE.

BY L. B. LUGET, HEADQUARTERS TRAFFIC SECTION.

THE transfer of the Ramsey (Hunts) Exchange from Central Battery Signalling to Automatic working was effected satisfactorily at 1 p.m. on Monday Oct. 24, 1921. As this is the first exchange to be provided with Village Automatic equipment, it is thought that a description of the system and of the facilities which are available will be of interest.

The question of installing equipment of this type at a number of small exchanges for experimental purposes has been under consideration for several years. Progress in this direction was, however, suspended until after the War. It was then decided to instal this equipment at two exchanges only, viz., Ramsey and Hurley. The latter exchange was brought into use on Dec. 20 last.

The equipment has been specially designed to serve rural areas, as its name implies, in order to reduce the cost of providing for night and Sunday service. It will, normally, be unattended, and for this reason it has been made as simple as possible in order to reduce the amount of attention required and to keep the cost low.

The system is somewhat limited, due to the desirability of keeping it as simple as possible, and it does not provide for certain facilities which are normally available under the manual and larger automatic systems. It is also restricted, in its present form, to exchanges having an ultimate development of 100 subscribers' lines and junctions. No provision is at present made for party-lines, coin-box lines, PBX and auxiliary lines, or for the interruption of local calls in favour of long-distance trunk calls. As none of the special classes of service mentioned above were required at Ramsey and Hurley, it was decided to instal automatic equipment of this type at these exchanges. If, however, any of these facilities are required at a later date, special arrangements will have to be made. For example, if a subscriber requires two or more lines it will be necessary to show two numbers in the directory. These would have to be dialled as separate numbers and it would be necessary for the telephonists at exchanges having dialling-in facilities to remember that they were alternative numbers.

Ramsey exchange is situated about 13 miles from Peterborough. It has two outlets, one to Peterborough, which is regarded as the controlling manual exchange, and the other to Warboys Exchange, which is situated within the Ramsey Exchange local fee area. The new equipment, which has been installed by Messrs. Siemens Brothers and Company, Limited, is accommodated on the first floor of the Post Office. The system is a 40-volt one, and two batteries of secondary calls are provided. Consequently, a fairly large amount of accommodation is required for an exchange of this type.

The system is of the two figure type, and Ramsey subscribers desiring connexion with a Warboy subscriber dial 00. Enquiries, complaints, and all other trunk and junction calls, circulate *via* Peterborough, for which 01 is dialled. Similarly the Peterborough telephonist gains the attention of the Warboys attendant by dialling 00 and Warboys gains the attention of Peterborough by dialling 01. Warboys Exchange has only one outlet and all trunk calls have to be obtained through Peterborough *via* Ramsey.

The initial equipment provides for 8 simultaneous connexions and is designed to accommodate 40 subscribers' lines (Nos. 20 to 59), 8 trunks too Peterborough and 1 junction to Warboys. It is not anticipated, however, that more than 5 trunks to Peterborough will be required during the initial period. Each subscriber's line and each trunk and junction circuit is a associated with a pre-selector, 50 pre-selectors and 8 final selectors being provided. There are 32 subscribers' lines, 4 bothway trunks to Peterborough, and 1 bothway junction to Warboys at present working.

The ultimate capacity of the equipment is for 80 subscribers' lines (Nos. 20 to 99), 10 trunks and junctions, and provides for 12 simultaneous connexions Where, however, more than one group of junctions is required, as in the case of Ramsey, the junction capacity is less than 10 owing to the appropriation of a terminal in each group for the engaged signal, as explained later. The junction and trunk circuits are allotted numbers 01 to 00. It will be seen

that it is not proposed to use level 1 (Nos. 10 to 19). This level on first selectors is generally not used on account of the liability of accidental connexions due to faults or to a careless manipulation of the switchbook by calling subscribers. If, however, level 1 were used it would be possible to accommodate 90 subscribers lines.

Each subscriber's line is associated with a pre-selector for originating calls and is multipled on the banks of the final selectors for incoming calls. The selectors are of the vertical and rotary step by step type and respond to the impulses from the dial.

When a subscriber removes his receiver, it causes the pre-selector to hunt for an idle final selector. As soon as connexion has been made with an idle final selector, a "Dialling tone" is transmitted to the subscriber. This is a continuous clicking sound and indicates to the subscriber that he may commence dialling. This tone operates until the first digit has been dialled.

As soon as the required number has been dialled, the subscriber receives the "audible ringing signal," in the case of local calls, if the called subscriber is disengaged. This is an intermittent clicking sound and indicates that the required number is being rung. Subscribers do not at present receive this tone in the case of originating junction and trunk calls, but the question of providing the tone in such cases is being considered.

If the called subscriber is engaged, the selector switch moves to an eleventh contact, which is fitted on each multiple bank, thereby transmitting an intermittent buzzing sound to the calling subscriber. When more than one group of trunks or junctions is necessary, as in the case of Ramsey, a terminal at the end of each group is appropriated for supplying the engaged, signal. This is not, however, necessary in the case of the last group as the eleventh contact is then used.

Should a subscriber receive a continuous buzzing sound, after the number has been dialled, it indicates that the number is unobtainable for some reason other than "number engaged" or "no reply" This tone which is known as the "number unobtainable tone" operates in the case of subscribers dialling dead levels, spare, ceased, or changed numbers, or lines temporarily out of service. The tone is not usually used in connexion with changed numbers, but it is necessary to do so in this case as no interception circuits are provided. It is not anticipated, however, that there will be any frequent changes of numbers in an area such as Ramsey.

It is interesting to note that Ramsey Exchange is the first exchange to be equipped with the four tones already described. These tones are now regarded as standard and are being introduced at existing automatic exchanges and will be provided at all new automatic exchanges. The Ramsey subscribers have been visited and it is satisfactory to know that they understand the meaning of the various tones and that they are not experiencing difficulty in distinguishing between them.

In the case of local calls automatic registration takes place when the called subscriber answers. Originating trunk and junction calls are not, however, registered automatically, and consequently these calls have to be ticketted at Peterborough and Warboys, the number of the calling subscriber being ascertained.

"Back release" conditions apply in all cases, *i.e.*, the connexion is released when either subscriber replaces his receiver. The subscriber is not held by the telephonist in the case of originating or incoming junction calls as at the larger automatic exchanges.

Separate trunk and local exchanges at present exist at Peterborough. As most of the trunk calls originated by the Ramsey subscribers are for exchanges beyond Peterborough, and cannot be completed on demand, it was arranged to terminate the Ramsey-Peterborough trunks in the Peterborough trunk exchange. These lines, which are 13 miles long, terminate on one position. A dial and four dialling keys, one in association with each trunk, are fitted on this position.

The trunk exchange is closed at 7 p.m. when all lines are switched over to the local exchange where a dial and dialling keys are fitted on one position. Dialling facilities have also been provided at Warboys Exchange.

The method of operating calls at the trunk exchange is as follows: To call a Ramsey subscriber the telephonist inserts a calling plug into a disengaged outgoing jack, and listens. When the "dialling tone" is heard, the dialling key, associated with the trunk circuit in use, is moved into the dialling position. The number of the required subscriber is then dialled and the dialling key restored. If the subscriber is disengaged, the "audible ringing signal" is heard until the subscriber answers. If the "number unobtainable tone" is heard, the number is verified and if found to be a working number is redialled. If the tone is then received the line is probably faulty and is reported in the usual way. When conversation is finished a clearing signal is given in the usual manner. As the subscriber's numbers commence at 20 under the new system, certain numbers have had to be changed. It has been arranged, therefore, for all inward calls to Ramsey subscribers to be intercepted for a time in order to ensure the connexion of the correct subscriber. Trunk calls originated by Ramsey subscribers are received at Peterborough on jack-ended equipment, and the insertion of an answering plug into an incoming jack connects the telephonist direct with a Ramsey subscriber or the Warboys attendant as the case may be.

In order to relieve the Sub-Postmaster, in this and similar cases, from the necessity of giving attention to alarm signals, a system has been devised whereby the existence in certain faults is notified automatically to the controlling manual exchange. The presence of any urgent fault which would interfere with the working of the exchange is notified to the Peterborough Trunk Exchange telephonist by an intermittent actuation of the calling indicator on Ramsey No. 4 trunk. The arrangements are such that the fault signal is not operated if the trunk is otherwise engaged, also the fault signal is being given the trunk tests engaged. Immediately any signals are received the Engineering staff are notified.

As an additional safeguard it has been arranged that the Peterborough telephonist by dialling 19 on any of the first three Ramsey trunks will receive the "number unobtainable tone" if the equipment is free from urgent faults. The presence of a fault will be indicated by the receipt of the engaged signal. This test is carried out three times daily and is, of course, additional to the routine test on each trunk which is carried out at 8 a.m. The routine test on the Ramsey circuits is effected by dialling on one trunk the number of another trunk. For example, if 02 is dialled on No. 1 trunk a calling signal should be received on No. 2 trunk. Similarly when 01 is dialled on No. 2 trunk a calling signal should be received on No. 1 trunk.

If a subscriber leaves his receiver off the switchhook, or a fault develops on a subscriber's line circuit, the switching equipment is automatically released after a certain interval. The presence of such faults is also notified to the Peterborough telephonist, and subscribers are requested to report them by the best means available.

The generator for charging the batteries is driven by a petrol engine. There are two batteries of secondary cells. The present arrangements are such that the first battery supplies the whole of the power for working the exchange for 48 hours. At the end of that period the second battery replaces the first one and supplies the power for working the exchange for a similar period. When the first battery is cut out, the generator is automatically brought into use and charges the cells until they reach a specified voltage. The charging then ceases and the petrol engine stops. The charging of the batteries is controlled by a clock mechanism, the above cycle being repeated every 48 hours.

The Ramsey subscribers have been visited by a number of the district Traffic staff, and all expressed themselves as very pleased with the new system, which they consider is a great improvement on the manual system.

THE TELEPHONE DEVELOPMENT OF THE WORLD AT DECEMBER 31, 1920.

By W. H. Gunston.

(*Continued from page* 67.)

ASIA.

	No. of Telephones.
Japan (305,275)**	est. 320,000
Chosen (12,372)	13,000
Manchuria (7,848)	9,000
Sakhalin (1,248)	1,500
Formosa (7,892)	9,000
China	35,910
Ceylon (3,334)	est. 3,500
Dutch Indies (33,080)	est. 37,000
Hong Kong and Kowloon	6,112
India (30,002)	est. 34,000
Straits Settlements	2,438
Singapore	3,345
Siberia, Russian Turkestan, etc. (1915) ...	18,600
Philippines (say)	8,000
Iraq, Palestine, and Syria (say)	2,000
French Indo-China (1,610)	est. 2,000
	507,000

** Figures in brackets refer to 1919.

Population 910 millions or 1,794 inhabitants per telephone.

Official figures have been received from the Chinese Administration and from the Oriental Telephone Company. The statistics for most of the other States are based on official figures for 1919. Pekin has 9,227 stations. Tientsin 5,060, Hankow 3,241, and Hong Kong 6,112. In India there are 6,838 stations in Calcutta, and 9,709 in Bombay, Karachi and Ahmedabad. The figures for Siberia are pre-war. The telephone is at last making its appearance in Western Asia and systems are working in Iraq, Palestine and Syria. Persia is believed to have inaugurated an exchange.

AFRICA.

Algeria	14,363
Egypt (20,827)**	22,595
Tunis (3,959)	4,200
Belgian Congo	180
French Congo, Senegal, Dahomey and other French Colonies, about	800
Madagascar (558)	600
Mauritius	948
Southern Rhodesia	1,181
South Africa, Union of (42,419)	49,634*
	95,000

Population 180 millions, or 1,900 inhabitants per telephone.

* June 30, 1921.

** The figures in brackets refer to 1919.

The only systems of importance are those in Egypt, Algiers, Tunis and South Africa. The latter is by far the largest (49,634 stations). Johannesburg has 13,558 telephones, and Cape Town 6,880.

NORTH AMERICA.

	No. of Telephones.	Population (thousands).	Population per telephone.
Canada (778,578)**	856,266	8,593	10
U.S.A. (12,688,700)	13,411,379	105,710	8
Mexico*	41,684	16,000	384
Cuba*	30,654	2,889	97
Dominican Republic* and Haiti	1,569	3,400	—
Central America*	13,852	6,092	—
	14,355,404	142,700	9.9

*Jan. 1, 1920.

** Figures in brackets refer to 1919.

Canada had 856,266 telephones in 1920, an increase of 77,508 over the previous year. They are distributed in the principal States as follows:

Quebec	135,530
Ontario	364,798
Manitoba	69,902
Saskatchewan	90,596
Alberta	54,482
British Columbia	75,422

Ten Canadian cities possessed upwards of 10,000 telephones., viz.:—Montreal, Toronto, Ottawa, Hamilton, Quebec, Vancouver, Victoria, Winnipeg, Edmonton, and Halifax, N.S.

The United States.—The number of telephones increased from 12,668,747 to 13,411,379 made up as follows:

Owned by Bell Companies...	8,333,979
Connected with Bell Companies' system ...	4,267,956
Totally independent systems	809,444
	13,411,379

About 100 cities in the United States possess upwards of 10,000 telephones.

Mexico, Central America and West Indies.—The figures given refer to 1919 and are furnished by Mr. V. M. Berthold.

SOUTH AMERICA.

(JAN. 1, 1920).

	No. of Telephones.	Population (thousands).	Population per telephone.
Argentina	111,122	10,000	90
Bolivia	2,517	—	—
Brazil	76,837	29,000	377
Chile	25,871	5,850	225
Colombia	5,935	—	—
Ecuador	3,176	—	—
Guiana	1,898	—	—
Paraguay	428	—	—
Peru	7,850	—	—
Venezuela	8,119	—	—
Uruguay	20,984	1,463	70
	264,737	67,203	243

Say 277,000 telephones at end of 1920.

These figures are from the same source as the foregoing and also refer to 1919. The total is 264,737 and an estimate of 277,000 for 1920 would be quite justified in view of the steady telephonic progress of South America,

AUSTRALASIA.

	No. of Telephones.	Population (thousands).	Population per Telephone.
Australia (215,930)* ...	233,406	5,030.5	21
New Zealand (80,798)* ...	88,541	1,196.5	13.5
	321,947		

* Figures in brackets refer to 1919.

Australia.—Telephones in Australia increased from 215,930 in 1919 to 233,406 in 1920. New South Wales had 94,355, Victoria 69,118, Queensland 29,168, South Australia 20,464, Western Australia 13,281 and Tasmania 7,020.

There were 57,958 telephones in Sydney, 48,034 in Melbourne, 12,519 in Brisbane, and 15,798 in Adelaide.

New Zealand had 88,541 stations in March 1921, as against 80,798 in March, 1920. Auckland had 7,497, Wellington 7,685 and Christchurch 6,087.

TABLE B.

CITIES WITH UPWARDS OF 20,000 TELEPHONES.

New York	892,198	Dallas (Tex.)	38,663
Chicago	575,840	*Budapest*...	37,579
London	311,350	Vancouver	36,498
Boston, Mass.	294,678	*Frankfurt (Main)* ...	35,576
Berlin (including Wilmersdorf)	233,133	*Cologne*	35,514
Philadelphia*	214,092	Columbus*	34,865
Paris	159,692	New Orleans	34,576
San Francisco	153,477	Winnipeg	33,682
Detroit	148,547	Atlanta	33,700
Los Angeles	145,002	Des Moines	33,391
Cleveland*	121,175	*Dresden*	33,150
Pittsburg*	119,245	Osaka (1919)	33,002
Stockholm...	118,180	*Amsterdam*	31,214
St. Louis*	102,368	Houston, Tex. ...	29,816
Cincinnati	96,837	*Christiania*	29,754
Minneapolis	96,674	New Haven, Conn. ...	29,375
Copenhagen (and suburbs)	96,018	Spokane	29,062
Toronto	95,686	Worcester, Mass. ...	28,330
Washington	88,810	Syracuse, N.Y.	27,947
Baltimore	86,902	Rio de Janeiro	27,487
Hamburg	85,748	Richmond, Virginia ...	27,368
Milwaukee	80,513	Hartford, Conn.* ...	27,845
Vienna (1919)	79,858	Springfield, Mass. ...	27,404
Montreal	77,247	*Breslau*	26,198
Indianapolis	76,721	*Birmingham*	26,188
Seattle	74,879	Salt Lake City	26,846
Buffalo	69,414	Albany, N.Y.	25,314
Portland (Oregon) ...	67,614	*Dusseldorf*	25,194
Tokio (1919)	64,250	*Stuttgart* (1919)	24,315
Buenos Aires	63,011	Memphis, Tenn. ...	24,209
Petrograd (62,939 in 1916)	?	*Rotterdam* (1919) ...	23,073
Oakland (Cal.)	61,993	Rochester, N.Y.* ...	23,940
Sydney	57,958	Toledo, Ohio*	23,852
Moscow (57,538 in 1916)	?	Ottawa	23,806
Kansas City (est.) ...	55,000	*Gothenburg*	23,778
Omaha	54,746	Norfolk, Virginia ...	22,784
Denver	54,432	*Warsaw* (1919)	22,400
Newark N.J.	48,406	San Antonio, Texas. ...	22,274
Melbourne	48,034	Oklahoma City	21,550
Providence	47,562	Duluth	21,754
Glasgow	43,212	Habana, Cuba	21,795
Munich	42,174	*Hannover*	20,928
Manchester	41,746	Mexico City	20,964
Charlottenburg	40,978	*Zurich*	20,023
Liverpool	40,796	Dayton*	19,930
Jersey City	39,069	*The Hague* (1919) ...	19,831
Leipzig	38,830	Louisville, Kentucky* ...	18,025

*These figures refer to the Bell Co.'s stations only. At least 10 per cent. should be added for independent stations.

The Report of the Wireless Telegraphy Commission dated Dec. 5, 1921, has been issued as a Command Paper No. 1752 of 1922 (price 1*s.*). Its recommendations may be briefly summarised as follows:—

Thermionic valve stations should be erected in England, Canada, Australia, South African, India and Egypt, and arc stations in East Africa, Singapore and Hong Kong. Each transmitting station should be allotted two wave-lengths and, except in Canada, a central receiving station should be equipped for simultaneous reception from the other stations.

The cost, excluding the stations in Canada, Australia, South Africa and India for which the Dominion Governments would be responsible, is estimated at £853,000.

THE BAUDOT—XXX.

BY J. J. T.

(*Continued from page* 76.)

THE spring S (Figs. LXXVI, LXXVIII. See also Fig. XL. Vol. VII, No. 69) of each appendix lever L should be adjusted so as to retain the levers when at rest with a clearance of about $\frac{1}{32}$ in. in regard to the shuttle cam (Figs. XL-XLII, Vol. VII, No. 68) and to determine the play of these levers so that when in the rest position the horizontal portion of L shall remain well engaged in the retaining slot of S^1 (Fig. LXXVIII), but with the minimum of pressure. To obtain the first adjustment the height of S is adjustable by means of the block and the two screws at S^2. To obtain the required tension of S these two screws should be very delicately screwed tighter or looser respectively to give more or less tension. To determine whether the adjustment is correct, press the horizontal portion of L downwards on to the lowest slope of the slot S^1, then with equal deftness permit L to rise. In so doing it should engage right into the slot so that if now forward pressure is brought to bear on the back of S^1 no noticeable movement of the engaged lever will be felt.

For the workshop only, according to British practice, the following method may also be followed :—Remove the bridge-piece above the appendixes so that the latter may be thrown back on their hinges. This will permit the levers L being placed in the position as shown (Fig. LXXVIII). The extremities of each should then cover half the width of the block S^1 and its screws as shown by the dotted line.

The screws on the block S^2 are capable of adjustment without dismantling the apparatus if a special screw-driver be employed,

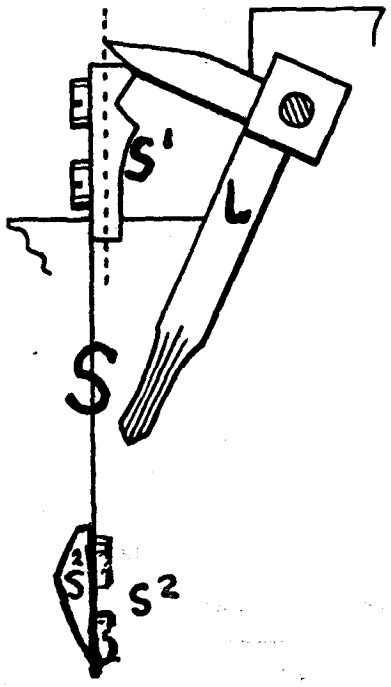

FIG. LXXVIII.

but such adjustments in practice are very rarely needed except in workshop overhaul where dismantling is done as a matter of course. Naturally the adjustments by means of S^2 are of a very fine nature.

The levers themselves should be perfectly free on their spindle and should be absolutely free and independent in action of one another upon it. Lubrication should receive due attention, but a tiny drop of oil between each lever and the washers is all that is necessary. The spindle itself should be rigid and straight. See that the end screws are properly tightened. Failure of this precaution may lead to breakage.

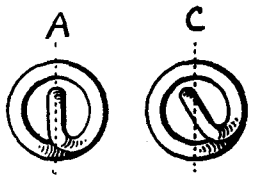

FIG. LXXVA.

The Shuttle Cam.—This should be carefully lubricated also as there is considerable friction in the selecting channels of the cam.

The two following items together with their appropriate diagrams should have followed Article XXVIII. The illustrations will therefore take the numbers of Figs. LXXVA and LXXVB.

The Baudot governor springs in general use are designed to run at 1,800 r.p.m. with a good margin fast or slow of that figure. Small differences in speed may be made by adding to or removing from the octagonal governor weight M (Fig. LXXIV) very small

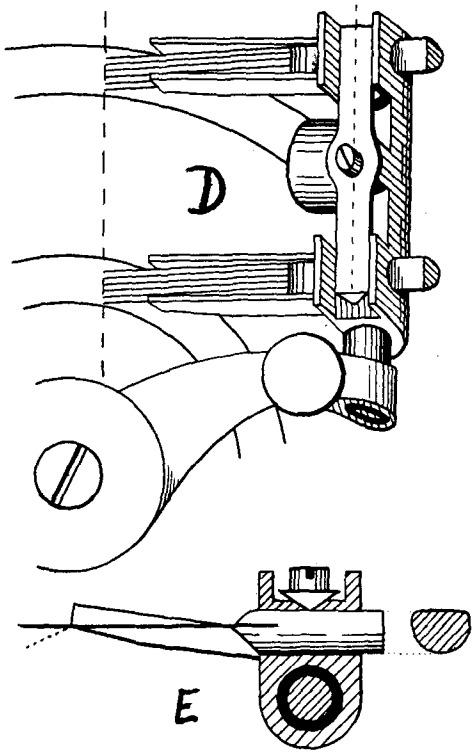

FIG. LXXVB.

masses or weights, respectively to slow down or to increase the speed. Larger differences are obtained by screwing the governor springs farther into or out of the weight M. By doing the first we bring a *lesser* number of spring spirals into play, thus *decreasing* the effective number of turns of the springs, and consequently *increasing* the speed. By taking the second course the effective number is *increased,* thus *decreasing* the speed. When making either of these adjustments care should be taken that each spring be screwed in or out, as the case may be, an equal number of turns to its fellow. Each spring should only be turned one-half turn at a time. The eyelet of the free end of the spring should always be placed in relationship to the adjusting bar as at A (Fig. LXXVA) and not as at C.

Brushes.—In adjusting brushes the ends should not extend more than $\frac{3}{16}$ in. beyond the troughing of the brush carriers, and the ends of any pair of brushes should fall into alignment along the same radius (Fig. LXXVB). To exceed the prescribed length beyond the carriers leads to many faults, for example, "spreading" of the brush ends and thus liability to short circuiting with a neighbouring ring. If the recognised length be not exceeded the relationship between the various pairs of brushes is more easily maintained; thus standardised, when any one brush needs changing, it can be more rapidly and more accurately replaced. Each brush at the point where it leaves the troughing should be so fixed that only a gentle pressure is given at the edge where the brush leaves the troughing, see E (Fig. LXXVB). The dotted line shows in exaggerated form an incorrect manner of fitting a brush. All brushes should be neatly trimmed. All short hairs should be cut away. They are a source of short circuits, false letters, and on Ring-I false correcting currents. Do not use brushes which are too short. They tend to give heavy pressure and to wear the plates. The slope of each trough should not be too acute nor the pressure of the brushes heavy.

(*To be continued.*)

THE EDINBURGH TELEGRAPH AND TELEPHONE SOCIETY.

THE Edinburgh Telegraph Department has recently started the above-named Society with Brigadier-General Price, C.B., C.M.G., &c., as President, and Major A. A. Jayne, D.S.O., &c., Controller of Telegraphs, and Mr. Macfee, Telephone Superintendent for Scotland, as Vice-Presidents. The inaugural meeting was held on Jan. 31, with Brigadier-General Price in the chair. A paper, of which a copy is reproduced below, was read by Major Jayne on Vocational Training. There was a large attendance of telegraph and telephone personnel, and a most helpful and interesting discussion took place. The Telegraph Sub-Committee of the Society is composed of Mr. E. H. Fisher, Superintendent Telegraphs, Chairman; Miss Douglas, Mr. Weir and Mr. Ingram, with Mr. Lamb as Secretary.

VOCATIONAL TRAINING.

BY MAJOR JAYNE, D.S.O., &c.

The report of the Whitley Sub-Committee on the question of training after recruitment to the Post Office Service is a timely contribution to this important subject, especially just now when there appears to be an awakening of interest in the subject of finding suitable men and women for specific vocations rather than the old system of endeavouring to find what kind of work was best suited to men and women already in vocations.

Seeing that it has already been recognised by the Department that it is desirable to train young telegraphists at properly equipped training centres, the next step is to place the training at those centres on a scientific basis, mainly in the direction of studying internals or the subjective mind rather than purely externals. The Whitley Sub-Committee have indeed suggested something in the direction of scientific analytical study of telegraph learners—that is, they recommend a careful record to be kept at each training centre of the progress of each pupil, and that for a period of two years from the date of the application of their report it should be supplemented by records of the subsequent career of the young telegraphist after he has been passed as qualified.

The Edinburgh Telegraph Branch has recently been going rather farther in these directions than is suggested by the Whitley report. First of all, considerable attention is being given to recruiting the right kind of young person for girl probationers and boy messengers. Having regard to the fact that the Post Office Service is largely recruited from these primary grades, it is obviously of vital importance that they should produce the right sort of employee for the careers in the Post Office that are open to them. The initial difficulty in selecting for those primary grades is that it is not known what positions in the Service the young people will subsequently occupy; they may be telegraphists, sorters, telephonists, postmen, &c. It appears, therefore, that the only general line to adopt at this stage is to find some common factor which will govern the entry of a young person into the Service. General intelligence is a safe one and the opinion of the officers employed on the recruiting duty supplemented by simple tests will probably be as valuable as certificates of scholastic ability obtained from the schools; but both should be taken into account. This common factor must not, however, be confused with suitability for any specific vocation in the Post Office.

In addition, the candidates for employment should come up to the Departmental standards or show a practical certainty of coming up to those standards in due course—that is to say, in height, general appearance, absence of any physical disability, &c. If possible a record of a boy or a girl's moral, intellectual and physical characteristics should be obtained from the school-masters. All this information should be recorded on a history card relating to the new entrants, and it should follow them throughout their career as boy messengers or girl probationers until the time when they are to be trained for higher positions.

The particulars as regards training, which I will deal with more fully later, should also be recorded, and then onwards to the time suggested by the Whitley Sub-Committee.

At the present time a certain number of boy messengers and girl probationers are given opportunities of becoming telegraphists provided they possess certain educational qualifications. Here we see the factor of scholastic ability or general intelligence determining whether or not a boy or a girl should become a telegraph learner. I am hoping in the future that the records I have described will play an important part in determining the future positions of boys and girls in addition to scholastic ability, but before we can arrive at that stage it is necessary to make very careful analytical studies based upon detailed records, and this of course involves a year or two's study before anything can be decided.

Upon arriving at the stage where we wish to select personnel for Telegraphists, we have first of all to determine two vital questions:—(1) What are the requirements of the telegraphist's occupation; (2) what sort of person is the best for that occupation.

My own view is that this person should be one who has a well-developed sub-conscious mind. If this is the case our analytical study should probably be as follows:—

(1) Can he do two things at once—that is to say, ask him to write down from memory something he knows by heart such as a selection from Shakespeare or Burns. In the middle of writing it down, is he capable of making an intelligent reply to a question on another subject entirely?

(2) He should then be seated at an ordinary telegraph key and asked to take hold of the key as if he were about to operate it. The instinctive manner in which he grasps the key should be noted.

(3) What kind of wrist has he and how does he naturally place his arms?

(4) By *sound* he should be taught the difference between a dot and a dash, and then immediately asked to distinguish by *sound* the difference. The action of the mind to sounds will thus be disclosed.

(5) Telegraphist's work is no longer confined to sending and reading by Morse key and Sounder. Keyboard working occupies a prominent part in his occupation, and this includes Baudot operating and the working of keyboard perforators and typewriters. In this connexion, therefore, it is necessary to have some idea of the candidate's memory span, sustained attention, the sense and strength of touch, and the quality of strength in the two hands.

In carrying out these studies the procedure of the tests and the results must be standardised. The test which candidates undergo must always be the same and the instructions given to them identical.

By such a process as that indicated in the foregoing, it may be possible to determine the right sort of person for the occupation of telegraphist.

After training has commenced there must be trustworthy standards of results at different periods classified for example as "Good," "Fair," and "Inferior." There must also be the same instructor who has been selected with great care, and refined methods of observing and examining the pupils. The conclusions made at the end of the training will not depend so much upon the results achieved as upon the relative extent of the progress made with a *standard* amount of progress.

With analysis on the foregoing lines it is fairly certain that time and money will not be wasted upon candidates likely to develop disabilities such as telegraphist's cramp.

I will not deal with other vocations in the Post Office except just to touch upon telephone operating. Many people are mentally and physically incapable of dealing quickly with telephone calls without undue effort, and therefore excessive fatigue. By analytical study it should be possible to exclude such candidates from training, as they would be vocationally unfit. The analysis might, and does to a great extent now in the British Service, determine acuteness of hearing and vision, distinctness of pronunciation, degree of attention, memory for figures, exact visional space perception,

restrained nerves, rapidity of hand movement and perhaps, to sum up, well-developed sub-conscious mind.

So far as the Telegraph Department in Edinburgh is concerned, we have a small Committee studying and dealing with the question of Vocational Training, and shortly it is hoped to produce for approval a history card on the lines suggested in the foregoing and a revised syllabus of training in telegraphy.

The time and study to be devoted to this subject will, I am sure, be extremely valuable, and apart from the advantages accruing to the Post Office, there will probably be the discovery of congenial work for the candidate himself. There will be less waste of human material and more economic efficiency.

TELEGRAPHIC MEMORABILIA.

NOVEMBER last saw the opening of the Trans-Continental commercial lines, now in full operation, and owned entirely by the Canadian Government. The manager of the Great North-Western Telegraph Co. (the latter also a Government line) in connexion with this inauguration, recently said :—

"Two commercial wires to Eastern Canada are thus open, but it is only one step towards unification of all State-owned Canadian telegraph services. Prior to the completion of the lines just put into regular service there were no Government-owned commercial telegraph lines connecting British Columbia with Eastern Canada. Neither was there a direct connexion with the system in South-Eastern B. C. nor the Yukon telegraphs, both of which have been Government-owned and operated services for many years. At the time the Canadian Northern Railway was purchased by the Dominion Government, the controlling interest in the Great North-western Telegraph Co. was also acquired, as it was owned by the Mackenzie and Mann interests. Only railway telegraph lines had been constructed by the Canadian Northern across Canada, and now the Government has completed the lines which have been opened.

"Both in Eastern and in Western Canada the Government owns a number of telegraph lines covering more or less extensive areas. The addition of the G.N.W. system considerably increased the Government holdings in Eastern Canada, and assisted to co-ordinate them to some extent. In British Columbia the G.N.W. lines did not reach many points, the chief being Victoria, Vancouver, and New Westminster. In South-Eastern B. C., however, more than 200 points are served by the Government commercial telegraph lines which were controlled and superintended from Kamloops. The Yukon Telegraphs, which reach across the Caribou and Northern B. C. to the Yukon, ended at Ashcroft. In addition to those two systems, the Government, on acquiring the Grand Trunk Pacific, took over that company's commercial telegraph lines extending eastward from Prince Rupert.

"As the main line of the Canadian National Railway into Vancouver touches both Ashcroft and Kamloops, near Jasper Park, the new commercial lines now in commission along the Canadian National link up all the Government telegraphs in British Columbia, and also connect them direct with Eastern Canada."

On Jan. 21 it was announced that the Japanese had taken the important step towards placing the peace of the Eastern world on a firmer basis by renouncing Japan's rights over the pre-war German cables in the Kiaochau leasehold. As is well-known in telegraphic circles these cables are the Chefoo-Tsingtao and the Tsingtao-Shanghai lines laid by Germany and the Tsingtao-Sasebo cable laid by Japan. The latter will be operated by a joint Chino-Japanese Commission. The Japanese have also agreed to hand over to Chinese control, subject to fair compensation, the two wireless stations in the Kiaochau leasehold of Tsinan-fu and Tsingtao, coincidently with the withdrawal of the Japanese troops. One cannot disconnect these arrangements from the decision by Great Britain to return to China the air-base and naval port of Wei-hai-wei.

Readers of these columns will not have been surprised to read the announcement in the daily press of the contract between the German Atlantic Co. and the Commercial Cable Co. by which two new submarine cables will be laid and put into operation between New York and Emden (Germany). The cables will pass *via* the Azores, and the estimated cost is £2,500,000.

The Times states that an overhead telegraph service has been established between Mombasa and Cape Town *via* Tanganyika Territory, Nyassaland and Rhodesia. The rates are said to be cheaper than those of the submarine cables.

The President of Brazil has issued the necessary formalities sanctioning the law which authorises the joining up of railway and telegraph communications between Brazil, Paraguay, and Bolivia.

The announcement that the Postmaster-General of the United States, Mr. Hays, had resigned his appointment in order to accept that of a director in one of the huge Cinema combines at a salary of £35,000 per annum—more than ten times that which he had received as a State official—may possibly lead critics of State services to pause awhile before talking too glibly of the "enormous" salaries of Government officials.

A correspondent writing to the London *Times* recently suggested that with a view to "economy," it is presumed, "all the older postal telegraph and telephone officials should be placed on half-pay at 50 instead of 60," *i.e.*, should be pensioned ten years before the normal period. The scheme has been examined by one or two not unwilling *eligibles* who, while willing to assist in any reasonable scheme of national economy have not yet been able to see how it would prove of financial assistance to the Exchequer to pay a body of experienced officials even half salaries during one-quarter of their recognised official life to do nothing. The writer of the letter pleads on behalf of business men for whom he thinks there would thus be "some chance of getting cheaper postage telegrams and telephones!"

The latest Board of Trade returns show that the Electrical Exports from this country for 1920 and 1921 are respectively £14,272,479 and £17,809,468, or an increase for 1921 of over £3,500,000. Of the items which go to make up this increase, no less a sum than £1,784,057 is credited to the export of Telegraph and Telephone material and apparatus.

The Minister for the Dutch Colonies stated in the First Chamber of the States-General in connexion with telegraphic communication with Surinam, Dutch Guiana, that the Governor of Surinam granted a concession to the Compagnie Francaise des Cables Télégraphiques on Sept. 18, 1889, for 60 years, for the establishment of a connexion between Surinam and the world's cable network by means of one or more cables. Among other matters the concession stipulates that during its duration the holder shall enjoy the preference in all cable connexions associated with the colony of Surinam, and that therefore no facilities can be granted to another cable company without such facilities being first offered to the French company and being refused by the latter.

With regard to wireless telegraphy, the negotiations for the establishment of a wireless station for the needs of Surinam were interrupted through the war, but were resumed at the beginning of 1921, and have now been so far advanced that a solution may be expected in the near future. The Surinam Bauxite Co. has established small wireless stations at Paramaribo and at Moengo, and the Liberty Development Co. one at Albina for its own use and for Government messages, which stations can be taken over by the Government at any time. The stations at Paramaribo and Albina are also open for communication with ships at sea, but not with other fixed stations; and the former is also arranged for communications with French Guiana in the event of cable interruptions.

The German authorities have recently established direct telegraphic communication between Berlin and Riga by means of the Hughes apparatus. It is understood that the line will be served in the very near future by Siemens High-Speed Telegraph System.

The continued unsatisfactory telegraphic communication between the United Kingdom and Italy *via* France has been considerably ameliorated by the diversion of a large portion of the Anglo-Italian traffic *via* Germany, by the medium of the Siemens apparatus. This assistance has been much appreciated by the London office.

Amongst the proposals of the German Government for balancing its Budget an official Note states that telegraph charges have been raised to a figure which apparently works out at about ten marks per word.

Two interesting items came to us from Melbourne last month. The first was the statement by witness before the Federal Parliamentary Committee on the wireless communications to the effect that the adoption of the proposed wireless agreement would practically give the Amalgamated Wireless Co. a monopoly of the wireless service of Australia.

The second was the announcement that the Melbourne-Sydney new Trunk line is operating most satisfactorily as a "composite telephone and duplex telegraph circuit."

We are all children in respect to the extent of our knowledge of the phenomena which surround us, and need feel no shame in admitting our ignorance. In this we may take our places with due humility by the side of Newton. Thus, one might well have wished to have been present at the Christmas lectures by Prof. J. A. Fleming, given before an audience largely composed of young folks at the Royal Institution. Especially interesting to our readers was the fourth lecture on "Electric Waves." Space must, therefore, be spared for the following condensed excerpt from the lecturer's explanation of electrons :—"An electric current reduced to first principles is a drift of the movement of electrons. Electrons are of two kinds, positive and negative. Imagine first the smallest piece of gold that could possibly be seen under a good microscope. That piece of gold would be about the 100,000th part of an inch. If it could be divided up still further into about 2,000 pieces, these would be atoms. An atom, in fact, was hardly discernible in a good microscope.

"Electrons were still further lost in the depths of invisibility. They were each about the 100,000th part of an atom. They are as much smaller

than an atom as a particle of dust just seen under a good microscope is smaller than a golf ball. It is now generally considered that a chemical atom is in structure something like a solar system. In the centre is a nucleus built up of positive electricity or electrons, and round it circulate, in rings, a number of negative electrons like planets. These electrons moved about in a piece of copper wire, for instance, at the rate of 60 miles a second, and an electric current consisted of electrons moving, not to and fro, as was their nature, but in the same direction."

Are not we, poor men in the street, under a considerable obligation to those, such as the lecturer, who are prepared to come down to the level of children of a larger growth, and in terms shorn of all abstruse technicalities, without ostentation or fuss, are willing to declare the mysteries of science in the simplest of words ?

Parliamentary sanction is to be sought, probably during the new session by the Postmaster-General, for the acquisition of the underground works of the Pneumatic Despatch Co., Ltd., and maintenance, reconstruction, and use thereof for Post Office purposes.

The C.T.O. staff and supervision are organising a Grand Bazaar in order to endow another bed (this time in a women's ward) in St. Bartholomew's Hospital. Miss Russell, the Chief Supervisor, is already surrounded by an enthusiastic band of workers, and hopes are high for a successful issue of this praiseworthy effort. The Controller, though a mere man, has not, it is understood, been altogether barred from co-operating and thus, the door for the sterner sex, once having been placed ajar, it seems highly probable that male assistance will not be wanting as soon as opportunity offers.

Confirmation of this willingness comes to hand as the proofs of this column come to hand, for a Football Match has been arranged between TS and TSF on Mar. 7 at Ealing. The whole of the proceeds are to be handed over to the Bazaar Funds.

In an interesting report by their special correspondent, the *Electrical Review* summarises some of the telegraph developments due to Latin-American Engineering in 1921. In a much condensed form they may be displayed as follows:—

By a French company the installation of a high-power wireless station was commenced in order to establish communication between Argentina and France.

Work was commenced upon high-power stations at Rio de Janeiro and Belem, State of Para, by the Radiograph Co., of Brazil.

A wireless telegraph service was established between Santiago and Valparaiso in April in view of the interruptions of the telegraph lines during the winter months.

A radio station was completed by British engineers at Puerto Colombia (Republic of Colombia).

A commercial wireless service was established between the Canal Zone, Panama, Colombia, Venezuela and Ecuador. The charge per word from Balboa to Cartagena is 22 cents (gold) if transmitted in Spanish, or 24 cents (gold) if in English or code !

A wireless service was also established between the City of San Salvador (Republic of El Salvador) and the W/T office of the Republic of Guatemala.

A cable was laid across the Alto Paraná, Paraguay, from the vicinity of Encarnacion to an Argentine town near Posadas, thus establishing telegraphic communication for the first time between Paraguay and Argentina.

A wireless station was also set up and is now in operation at Ilo, the southernmost part of the Peruvian South Coast.

The Venezuelan Government arranged for the installation of 22 wireless stations. That at Maracay was completed in December, it is believed, while contracts were concluded for wireless towers at San Cristobal, Maracaibo, Puerto Caballo, Coro, La Guaira and Ciudad Bolivar. A wireless school was founded in the capital of Caracas.

In Uruguay the meteorological institute commenced preparations for installing apparatus for transmitting time signals by wireless—the first of its kind in South America—using the system employed during the war with excellent results, the contact passing directly from the pendulum to the antenna. Preliminary trials proved a range of 9,800 kilometres, but at any time signals from the institute may be received at 3,400 kilometres.

A triennial prize, to be known as the "Fondation George Montefiore," is offered by the Association des Ingenieurs Electriques, 31, Rue Saint Gilles, Liege, and will be awarded in 1923. The value of the prize is 21,000f. (about £400), and it is open to electrical engineers of all countries, for the best work done in the three years preceding April 30, 1923. Particulars may be obtained from the secretary.

L'Electricien announces that the Swedish Government is about to construct an extensive network of underground cables between Stockholm and Gothenburg. The length of the line will be over 500 km. It will be the longest line of its kind in Europe, and only exceeded anywhere by that between Boston and Washington, in the United States. To carry out this huge scheme 140 million metres of wire will be needed, 25,000 loading coils, 8 repeating stations, and 300 repeaters. The scheme will require a year and a half to complete.

The *Board of Trade Journal* furnishes some particulars regarding the further enterprise of the Swedish Government in that it has recently approved proposals made in connexion with the use of wireless telegraphy by the Swedish Pilotage Board for co-operation between countries on the North Sea and the Baltic with regard to ice signalling by wireless. The proposals comprise the issue of reports covering the entire Swedish coast from Haparanda to the Norwegian frontier regarding the condition of the ice, to be issued daily in cipher, the key to which is being published in the Swedish "Notices to Mariners." The messages are also to include information regarding wrecks, the withdrawal of lightships, and obstacles to navigation.

The annex to the agreement which was signed on Dec. 6 by representatives of the British Government and by representatives of Dail Eireann on behalf of the Irish Free State, states in part, that (2) a convention shall be made between the British Government and the Government of the Irish Free State to give effect to the following conditions: (*a*) That submarine cables shall not be landed or wireless stations for communication with places outside Ireland be established except by agreement with the British Government; that the existing cable landing rights and wireless concessions shall not be withdrawn except by agreement with the British Government; and that the British Government shall be entitled to land additional submarine cables or establish additional wireless stations for communication with places outside Ireland.

(*c*) That war signal stations shall be closed down and left in charge of care and maintenance parties, the Government of the Irish Free State being offered the option of taking them over and working them for commercial purposes subject to Admiralty inspection and guaranteeing the upkeep of existing telegraphic communication therewith.

Another worthy and well-known figure left the C.T.O. on the last day of January in the person of Mr. F. Skinner, upon reaching the age-limit. A member of the Engineering staff, like his old and respected colleague, the late George Connell, he had been associated with the Central Office practically throughout his career, and leaves behind him many good friends on the commercial staff, who will always remember his willing assistance and ready co-operation. Never man, on his 60th birthday, stepped more blithely and briskly over the door-step of G.P.O. West than did Fred. Skinner. Our best wishes go with you !

Hearty congratulations to Mr. R. E. V. May on his promotion to the class of Assistant Superintendents. Mr. May has always been in the forefront of C.T.O. activities, and it is hoped that his interest in the Sanatorium movement will receive no check with his new responsibilities.

Commiserations with the Western Telegraph Company on the loss of their cable ship *Cormorant* off the coast of South America. This comes at a particularly difficult period in submarine cable history. The deterioration of the war period is far from being overtaken, and at the present moment there is a long list of interrupted or partially interrupted cables between the British Isles and the Continent, all of which are more or less urgent cases. Some of these are Government-owned, and others are the property of private companies.

The cable steamer *Faraday* too, built in 1874 for her owners Messrs. Siemens Bros., has performed her last service for telegraphy after many a stormy and useful journey all over the world. She is to be broken up.

According to information received from Reval the Petrograd - Pekin line of the Great Northern Telegraph Company has been restored as far as Irkutsk.

The following small contracts are open at Adelaide and Brisbane until April 5, says the *Electrical Review*. Twelve adjustable condensers for use on telegraph duplex circuits and Testing and Telegraph instruments. Apply P.M.G.'s Department.

Time—That great mystery of Time ! The illimitable, silent, never-resting thing called Time—rolling, rushing on, swift, silent, like an all-embracing ocean-tide.—CARLYLE.

The Human Mind.—The mind is able to look forward from the solemn ticking of the household clock and can rise to the solemn periods of rolling epochs or ages. It can step into the antediluvian years, or even to the vast mensurations of astronomic cycles and epicycles, the pendulous beat and throb of palpitating planets in their orbits, or the mighty adjustments of of the celestial mechanism, and it is still *in* Time.—PAXTON HOOD.

J. J. T.

Frame's Travel Office announce some very reasonable inclusive trips to the Isle of Wight, commencing at Easter. It will be seen that £5 5*s*. 0*d*. covers railway fares and a week's hotel accommodation and motor excusions.

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 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 DIRECTORIES.

ONE result of the introduction of a new tariff involving the calculation of trunk charges strictly on the basis of Distance is the abolition of the old trunk exchange area, now become a term without meaning. It follows that there remains little justification for grouping subscribers in the telephone directories within quasi-geographical boundaries which no longer exist.

The Post Office has under consideration the re-arrangement of the grouping in the provincial directories on broad and comprehensive lines. The telephone district in the majority of cases must remain the unit for each sectional directory, and the collection of subscribers into one alphabetical group for each district presents itself as an attractive end to be achieved. This standard is not likely to be uniformly realised, and in some cases local conditions will probably lead to the retention of more than one grouping. Local opinion will be consulted, and the friendly aid of the Telephone Advisory Committees in provincial towns will be enlisted to ensure a satisfactory arrangement.

There are always those who object on principle to all change, but those who cling to the retention of the present system will, we think, find some difficulty in defending it. The trunk areas have no definite geographical basis. They were originally created, as most of our readers know, to delimit the activities of the late National Telephone Company, and it was found expedient to employ them as the standard unit for grouping subscribers in the directories. But they have many drawbacks. Two or more boroughs are often included in one area, and difficulties of nomenclature at once arise. Probably a Newark subscriber does not see why his area should be called the Grantham area, a Runcorn subscriber complains that his name has to be sought in the Widnes area, and so on. Such objections should largely vanish with the broader grouping.

Where a large city (such as Liverpool, Manchester, Glasgow or Birmingham) is the preponderating constituent of a district, there should be little opposition to the arrangement of all the subscribers in that district in one alphabetical group. Where a district stretches over several counties some ingenuity may be requisite to find suitable and acceptable titles for the groups, but we imagine that to group, for example, such places as Grantham, Boston, Spalding, Skegness, &c., under a generic title such as South Lincolnshire would do violence to no local susceptibilities. It may be of interest to observe that Sweden, which is often held up to us as a shining example, arranges her telephone subscribers in six volumes, roughly, according to provinces, each volume containing one alphabetical group. It would, however, be impossible to adopt any strictly geographical grouping, such as by counties, in this country. To separate Manchester from Stockport, Liverpool from Birkenhead, and Birmingham from its Worcester and Staffordshire subscribers—to name no other cases—is not to be thought of.

One objection to the proposals we hear of is that they will necessitate wading through an inordinate number of "Smiths." It may be observed that no provincial directory in any way approaches the size of the London book, where the Smith problem has not heretofore been urgent. On the other hand, it is surely easier, if, for instance, you want to ring-up a Smith in some small town in the West Riding, to run through a column or two of Smiths in a West Yorkshire directory and be sure of finding him there, than to search either in an index or else through a Huddersfield, Halifax and Bradford string of Smiths before finding the one you desire.

HIC ET UBIQUE.

THE establishment of an Institute of Public Administration is an historic event in the history of the Civil Service. The objects of the Institute are to provide in every way for the maintenance and furtherance of the high ideals of the Civil Service and of public services generally, to develop the professional worth and standing of public servants and provide a means whereby education and training of Civil Servants may be furthered. The Institute will consist of Fellows, Members and Associates. All members of the public services are available for election as Associates. The annual subscription will be 10*s.* 6*d.* Members need to have certain qualifications in the nature of having performed executive or administrative work for three years, but Associates are eligible to election as members by passing an appropriate examination. The Fellows will be a very carefully selected body of members who have given distinctive service in the administration of important branches of the public service or who have made a notable contribution to the furtherance of the professional interests of Civil, Municipal and other public servants. A quarterly journal will be published and will be sent to all Fellows, Members and Associates. It is a venture which is of the utmost importance to all members of the Telegraph and Telephone Establishments.

MR. JAMES SMYTH (President of the Dublin Wireless Club and G.P.O. official) gave a lecture on "The Wonders of Wireless" on Jan. 20 at the College of Science.

According to FREEMAN'S JOURNAL "he described the improvements which followed (the invention of wireless), comparing what is known as the tuned *ariel* (*sic*) with the plain A system. He spoke also of the various improvements in the reception, starting with the *co-hearer* (*sic*) and going on with the crystal, and coming to the latest improvements which had revolutionised wireless with the "valve."

Apparently the revolution led to the death of the co-hearer, presumably from valvular disease of the heart. American readers may pray for a similar fate for his trans-Atlantic kinsman, the "rubberneck."

WE learn that the Manchester telephone district has reached a total of 50,000 stations, being the first provincial district to do so. Liverpool and Glasgow, in the order named, are following hard on the heels of Manchester.

OF course, this achievement pales beside that of Toronto which has reached the 100,000 standard, with mayoral luncheons and other suitable celebrations. Toronto claims to be the best developed city in Canada with 1 telephone for every 5 inhabitants.

SOME unknown genius in the Postmaster-General's department, says the *Daily Express*, must have spent a holiday on Olympus. The name for the new Stratford E. telephone exchange is to be "Maryland." This is inspiration.

Whisper it softly—"Maryland"! You can almost smell the new-mown hay; you can see the dear old farm standing back among the elm trees, cows returning in single file to the sheds across the meadow, and Mary, her sleeves rolled up, standing on tip-toe to reach a rambler rose from the trellised bower beside the door. . . .

"Number engaged!" What matter? Who would disturb the peace of "Maryland"?

Our own associations with Maryland are somewhat different. So far from recalling the smell of new-mown hay, it brings back memories of holidays in France and the odour of a native tobacco of astounding properties.

RESTITUTION of social rights, says a writer in *Truth*, might prove a case well established against the telephone, because it as often avoids as confirms its responsibilities.

What lies the instrument transmits, what shufflings, and there could be well filled a list for service marked "Also rangs" to indicate messages from the undesirable who have—Providence be praised—caught you napping and "not to be disturbed."

We think the writer means that the subscriber and not the telephone avoids its responsibilities. But how much easier to say "I was unable to get you on the telephone" than to confess that one purposely omitted to ring up!

A WRITER in the *London Mail* says:—

I think it is about time somebody protested against the charges made for the use of the telephone in restaurants where the price of food is, to put it mildly, on the stiff side. Not long ago I was charged over £2 for a very modest lunch for two at the Ritz Grill-room (no meat, wine, liqueurs, cigars or costly delicacy), and immediately after lunch had to pay 4*d*. for the use of the 'phone. It wasn't the trifling sum that annoyed me, but the thought that after a considerable profit had been made out of me over the food, an additional few pence were raked in over something that in most Continental and American hotels is free.

We express no opinion on the ethics or the wisdom of the hotel people's policy. What strikes us chiefly is the indignation with which the diner is filled at being charged 4*d*. for a 3*d*. call and the equanimity with which he pays £2 for (if his memory is accurate) what he seems to suggest was a few shillings-worth of food. But this is characteristic of the attitude of the public to telephone charges generally.

OUR casual peregrinator seems to have met with similar cases for he sends us

THE BALLAD OF THE DISGUSTED DINER.

I met with a wight whom I assumed
To be one of your men-about-town,
(Such as lady-novelists term "well-groomed,")
And his well-groomed brow wore a frown.

"Now out upon it and fie for shame
That I should be rooked, pardie,
In London Town!" and in words of flame
He unbosomed himself to me.

He unbosomed himself in chosen words,
And his choice was wide and free!
Of his flowing discourse a goodly two-thirds
Was unfitted for poesie!

"I entered a lordly resort whereat
Great dukes and fair dancers dine,
And where aristocrat and theatrocrat,
To shed distinction combine.

And lightly, lightly did I eat,
And lightlier did I drink,—
No generous wine or *chartreuse* fine,
Ever crossed my goblet's brink.

Not on ortolan or on marzipan,
Or plovers' eggs did I feast;
No maraschino enlivened my beano—
But I heeded this not in the least.

For all around sat damsels well-gowned,
Priceless and peerless and "smart";
And scions of peers mixed with profiteers
In a way that gladdened my heart.

My soul to the stars soared above cigars;
I waved *Coronas* away,
And, contented in mind, my head I inclined:
"Ho, varlet, the bill, I say!"

With shirt-front clean and majestic mien,
There came—do I speak of Waiters?
Nay, one of the line of the Byzantine
Panhypersebastocrators.

He brought my bill and was'nt unwilling,
Its incidence to expound;
"No meat, twelve-and-six; no vine, thirty shilling,
No cigare—that vill be two pound."

I came to earth; but my money's worth
I had had in reflected glory,
Then I asked for the loan of their telephone,
But that is a shameful story.

What think you, what think you the brigands charged?
What think you they charged to me
For a threepenny call from a cabinet small?
Even four pence instead of three!

I ask not wine, I ask not meat,
I ask not dainties dear:
For the two pounds or three which they charge to me,
But, good lack! when they profiteer

When they profiteer by a penny clear,
For the use of a telephone booth,
Then Faith seems dead and Hope is fled,
And vain are Love and Truth."

W. H. G.

OBITUARY.

WE regret to record the death of Mrs. Moorhouse, the wife of the District Manager of Telephone, Reading, which took place very suddenly from hemorrhage following a seizure. Much sympathy is felt for Mr. C. F. Moorhouse and his daughter and sons in their great bereavement. Evidence of the respect in which the deceased was held was forthcoming, when the funeral took place at Caversham. A large number of people were present, including representatives from the various departments of the P.O. telephones.

MR. H. J. E. BOOTH.

WE regret to record the death of Mr. H. J. E. Booth, Managing Director of the Electrophone Company. Mr. Booth had been the leading spirit of the electrophone system from its inception, and its present development is due chiefly to his efforts. The Post Office was represented at his funeral by Mr. G. F. Greenham, Assistant Superintending Engineer.

TELEGRAPH MECHANICAL AIDS FROM A TRAFFIC POINT OF VIEW.*

THE subject of my paper to-night "Telegraph Mechanical Aids from a Traffic point of view," is a wide one, and I can hope to deal in the time available with only a few of the directions in which progress has been made with the use of machines to replace or economise human labour and also with a few where such progress is desirable.

At first sight one would think that the telegraph service offers very great possibilities for the introduction of labour-saving machinery and that the great advance in the employment of machinery by industry generally during the last three or four decades would be reflected in a corresponding evolution of telegraph apparatus. The transmission of telegrams from one town to another, especially by such a medium as electricity, seems to be a business particularly suited for machine appliances, and even the internal transfer of forms from point to point in an instrument room seems to lend itself to mechanical transfer instead of conveyance by hand. Yet the disappointing truth is that, until the shortage of skilled Morse operators during the War gave an impetus—which fortunately is persisting and indeed gathering momentum—to the introduction of labour-saving machines such as the Baudot and the Western Electric, the Inland Telegraph Service of this country was in the main conducted by hand at hand speed and there had been no notable change in the machinery of the service since the Telegraph Transfer of 1870. There was, of course, a high-speed machine in existence, the Wheatstone, but it was used for stand-by purposes only. There have been changes of a minor character in types of instruments. Single needles and double-plate sounders have given way to the Morse sounder, but the significant fact is that these changes were merely from one type of hand-operated instrument to another.

Let me hasten to add, especially as I am in the presence of Post Office engineers, that this fact reflects in no way on the Post Office engineering establishment. To its credit be it said that on many occasions it introduced experimentally labour-saving appliances, such as various forms of multiplex machines, but they did not survive, sometimes no doubt because of mechanical defects or other engineering objection but often, I think, because of other reasons.

The fact that telegraph practice stood still for so many years in the matter of new types of machinery is capable of explanation in several ways.

Probably the telegraph service has suffered from being a monopolistic industry. Where a monopoly is concerned, whether it is a public or a private monopoly, there is not the incentive to keep in front of competitors which exists when there are different independent and competing undertakings within the limits of the same industry; nor is there the same scope or the same possibility of the acceptance of new ideas and new methods. The telegraph service indeed cannot hope to attract to its problems the attention of men of inventive genius to the same degree as a commercial industry does.

Again, the Post Office system of finance and the conditions of employment hardly conduce to the rapid introduction of new machines. The amount of money and the number of staff available for engineering and traffic research have always been very meagre, and our arrangements in this respect contrast very unfavourably with the research work of the telegraph and telephone corporations in the United States. The system by which the money required for Government services is provided through Annual Votes of the House of Commons, is perhaps inevitable under the British Constitution, but its application to an industry like the telegraph service has many disadvantages, and not the least is that, if adequate provision for research were made in the estimates, it would surely attract uninstructed hostile criticism in the House of Commons. Research is always difficult to justify in terms of money, for its fruits are seldom immediate. It is indeed amazing that the Post Office engineers have been able, during the past few years, to do as much as they have done in the development of machine telegraphy, although it is far from being what it might have been with more means at their disposal.

The amount of money available each year for the purchase of new machines is at present very limited. In a private industry, staff displaced by machines have to seek other employment, but in the telegraph service the introduction of labour-saving machinery must keep some sort of relationship to the normal rate of wastage of staff. More money for this purpose would, however, probably have been available, despite the general financial stringency, if it had not been for the unsatisfactory financial position of the telegraph service. The loss on the telegraph service as shown in the Post Office estimates year by year, has had a most discouraging effect on its development. One may entertain doubts whether the loss is really so great as the Post Office system of accounting shows it to be, but, be that as it may, it is not too much to say that the service will never progress satisfactorily until the deficit is wiped out.

But one of the most important of the contributory factors has been the essential conservatism of the telegraph staff. The telegraph service is traditionally a hand-operated service, and the telegraphist is proud of his craft. The service of this country, we all think, is the best in the world, but there is unquestionably within its ranks a bulk of opinion which is not favourably disposed towards departures from the traditional methods of working. I ought perhaps to say that this attitude is not attributable wholly to mere antipathy to change. The more complicated the machinery, the more liability there is to error, and to interruptions. These troubles have so serious an effect on the service that it is not surprising that the old simple machinery is preferred by many. This attitude of mind has never prevented trials of new apparatus from being made—indeed the catholicity of such trials has been remarkable—but in all probability it has affected the judgment of these trials. As an instance of the effect of this attitude, let us take the case of the use of typewriters.

Of all the machines which can have any possible value as aids and adjuncts in a telegraph office, it is probable that the typewriter at once appeals to the mind as the most promising. The process of signalling can be accomplished by the operation of typewriter keyboards and, obviously enough, no machine would seem to be more suitable at the stage of reception. For years past telegraph economists have held out the great advantages to be secured by a more and more extensive employment of the typewriter. The prospects have been alluring but the progress in this country has been very disappointing. In America and in most of the British colonies, the typewriter is a highly important organ of the telegraph service. The telegraphists use it with the ease and naturalness with which the British operator uses his pencil, but in British offices the typewriter is relatively something of a side line and a side issue and is relegated to a side table. Its use is confined to the transcription of Press messages received by Wheatstone over news circuits. A fair amount of such typing was done at one time, but the introduction of Creed apparatus has reduced it almost to a negligible quantity. This difference is thoroughly characteristic, and typical and proceeds from a different natural outlook and a different national atmosphere. The Americans have built up a great name as inventors and makers of machines, machines of all descriptions for all kinds of repetitive work, and the British have a long-established and not less honourable name for the individualistic work of the hand. In America invention has invaded the workshop, the office and the home, and the typewriter is an essential part of the equipment of business and often of the domestic circle. In this country on the other hand many business houses have not even yet invested in a typewriter, and a typewriter is rarely seen in the home My point is that we have not in this country and particularly in our telegraph offices, the social driving-force impelling us to concentrate upon the scientific development of the use of the typewriter. Some half-hearted attempts have been made in the past to introduce the typewriter in this country for the reception of telegrams, the messages, as received on the sounder being typed instead of being written, but for various reasons these attempts met with no success. It is too late now to revive the question of using typewriters for the reception of telegrams by Morse. The trend of development is towards the introduction of printing telegraphs, and typewriters are to that extent obsolescent for telegraph purposes; but one may regret their rejection in the past because, if typewriters had been in general use now, certain problems concerned with keyboard transmitters would have been easier of solution.

The national tendency of the Americans to employ machines wherever possible is shown also by the almost universal use of the Vibroplex Key on circuits which are not sufficiently busy to warrant the employment of multiplex machines. The operation of the Vibroplex Key consists merely of two lateral movements, one signalling dashes and the other automatically signalling dots, the operator having to estimate the time taken by the key to signal any required number of dots. The machine thus relieves the operator of the need to signal each dot separately and is capable of being worked at a considerably higher level of speed than the Morse Key in use in this country. It is less tiring and can be used by telegraphists unable to use the Morse Key owing to cramp or other disability. It has been tried in this country on two occasions, the first occasion, when it was tried without typewriter reception, being some 10 years ago, and the second occasion within the past 2 years when typewriters were used in conjunction with it. Competent telegraphists were borrowed from the American Army to teach the staff, but, although good results were obtained during the early stages of this second trial before the novelty of the key had worn off, the staff did not take kindly to it and ultimately the experiment was abandoned.

Gell and Kleinschmidt machines which have typewriter keyboards and which punch slip for Wheatstone working are provided at several offices, but, although fairly good use is made of them, it cannot be said that on the whole they are popular. It is amazing and perplexing how the attitude towards these typewriter-perforators varies at different offices, but it may be said that, generally speaking, the staff prefer the old hand stick-perforators.

These are instances of the effect of the traditions in favour of hand operation which stil dominate the service. But we are discerning a change in the drift of opinion. It is veering round steadily, thanks to the enthusiastic efforts of various officers throughout the country, and there is reason to hope that in course of time the British telegraph service will hold as high a position in the application of machines to its needs as it has held in the past in hand operation.

Let us examine now the details of the methods of handling telegrams.

The process of accepting telegrams from the public at telegraph counters does not readily lend itself to mechanical aids and it is not surprising that the system of bringing charges to account by means of affixing postage stamps to the forms and of date-stamping and completing the forms for transmission is one of long standing. Recently, however, attention has been directed to the use of a type of Cash Register for such work in some of the British Colonies, and it has been possible to arrange for a trial of a similar machine at the telegraph counter of a busy city Post Office. A telegram which is tendered by a member of the public is now not handed back with stamps to affix, but

* A paper read before the Institution of Post Office Electrical Engineers London Centre) On Dec. 14, 1921, by Mr. J. Stuart Jones, Inspector of Telegraph and Telephone Traffic.

is placed on a printing platform of the register, and the amount of the charge, the consecutive number in the series, the date and the name of the office of origin are simultaneously printed on it together with the identification letter of the accepting counter officer. At the same time the amount of the charge is exhibited to the sender and a record of certain particulars for accounting purposes is printed on a continuous band. Each counter clerk using the machine is allotted an identification letter which is locked during absence. This letter is used before every transaction and has the effect of adding together the amount of cash received by each counter clerk in separate totals. The machine, therefore, provides for (*a*) the printing of the charge and other particulars on the telegram form, (*b*) a continuous printed record of every transaction on a paper band (*c*), the display of the charge to the public, (*d*) individual records of cash received in respect of each counter clerk using the register, and (*e*) total amount of cash received.

The results obtained in the initial stages of the trial are promising, but it is yet too early to say definitely and under what circumstance such machines are economical. From tests which were taken at a busy telegraph counter it was found that 45 per cent. of the total time occupied in accepting a telegram is taken up in tendering the appropriate stamps to the sender and having them affixed. This margin to some extent is reduced by overlapping operations, but even considering this, there appears to be sufficient margin left to make the use of cash registers desirable at busy offices.

We come now to the conveyance of the form from the counter to the instrument room. Prior to the War, about 400 of the tubes used for this purpose and also for the purpose of conveying telegrams from the instrument room to the delivery room were equipped with hand pumps. This pattern of tube is noisy in operation, sometimes requires much energy to operate, and is unsightly behind a Post Office counter. It is to be hoped that it will before long be possible to replace these hand-operated tubes by a more modern system.

I may perhaps say that the latest system of house tubes installed at a number of offices during the last few years is excellent from a traffic point of view. The number of operations in connexion with the despatch and receipt of the carrier is reduced from 8 to 3 as compared with the older system which it replaced, while the table space required for the terminal apparatus is much less than formerly.

When the instrument room is directly above the counter or delivery room, various devices have been adopted for the transit of telegram forms, namely, lifts, cages, or holders mechanically propelled, while in some cases gravity chutes are used. Generally these devices are simple, effective and inexpensive.

As regards the transfer of message forms from point to point in instrument rooms, a few of the larger instrument rooms have had for years one or more cord carriers for the conveyance of telegrams between the main circulation table and subsidiary circulation points. This cord carrier on the whole works fairly well, but its speed is slow and, judging from instrument room experience, its maintenance is expensive.

The ideal mechanical system for the internal circulation of message forms is one which would be so complete as entirely to eliminate the need for hand conveyance, but so far the only installation, the Lamson Carrier installation at Birmingham, which achieved or nearly achieved this ideal brought such serious practical disadvantages in its train that it has had to be greatly modified.

This Lamson system provided for forms to be dropped and collected at every operating position with a few exceptions in the Birmingham instrument room. Its superstructure, however, was so cumbrous as to interfere not only with such amenities as the room had, but also seriously with supervision. It was very noisy. Forms were frequently mutilated. Even during the busy hours a very large number of the travelling carriers performed the round journey or half their journey without conveying any telegrams, the traffic even at the busiest time of the day not being sufficient to provide a reasonable load for the apparatus, and the wastage of power and the wear and tear of apparatus under these conditions was considerable. On the other hand, fewer carriers would have meant undue delay to the telegrams. The plant took up a considerable amount of the available floor-space. It was necessary to depart from the standard layout of instrument room tables, many tables being placed back to back and the gangway space being restricted. The system could not be installed at Baudot and other positions with machine telegraphs because the carrier tracks made it difficult to make adjustments at the back of the apparatus.

Ultimately, it was decided to modify the equipment to the extent that each arm radiating from the centre should serve two groups of tables with human collection and distribution of forms for these groups of tables.

This arrangement has been adopted as a standard one, and in course of time, if no improved system comes along, Lamsons will gradually be substituted for the existing cord carriers and new installations will be put in the larger instrument rooms where they are found to be desirable. A particular advantage of the Lamson carrier is that the conveyance of message forms is not confined to two points, as is the case with the cord carrier, there being facilities for interchange of forms between any two of three or more points on the system.

At some of the larger telegraph offices in the United States belts are utilised for the conveyance of message forms from the circuit position to the circulation table, belts running along each table and discharging on to transverse belts. There may be something in this system for us and the matter is being studied, but it is perhaps worthy of mention that a belt system on the American plan, which has been introduced at Amsterdam, is not favourably reported upon by the authorities there.

The experience with the full Lamson equipment at Birmingham was unfortunate, and it may be that practical difficulties willl always make the ideal system of circulation, which wouldentirely eliminate hand conveyance, impossible of achievement, but it is to be hoped that efforts will continue to be made to solve this problem, which is an important one from both an economical and an efficiency standpoint.

I now come to the actual despatch of the telegram. The introduction, on routes with too light a traffic load to justify multiplex machines, of a simple and inexpensive form of printing machine working at a higher speed than is possible with Morse signalling by hand is very desirable from a traffic point of view. Recently the appearance of the Teletype instrument produced by the Morkum Telegraph Company of America has attracted attention. The system of transmission is an adaptation of the Hughes and Baudot. A five-unit alphabet is employed with additional signals for starting and stopping the movement of the sending and receiving mechanism. A typewriter keyboard of a universal pattern is employed for transmitting. The depression of a key sets the letter combination to be signalled and operates the rotary transmitter. At the receiving station the received signals operate a single magnet which controls the setting of selectors and the letter is printed by the impress of the tape on the printing wheel on the Baudot principle. This machine promises to give a normal working rate of 40 words a minute as compared with the normal rate of 20 to 24 words per minute on the Morse, and if the engineers find the instrument to be sound in contruction and the maintenance cost proves to be low, there should be a very wide field for its use. The maintenance question is, of course, particularly important. An instrument that will not stand up to hard usage without frequent adjustment and repair is not likely to be successful even if its speed is high. At present the Teletype is arranged for simplex working only, but it is believed that duplex working can be arranged for without difficulty.

An interesting instrument called the Teleprinter produced by the Telewriter Company of London has come under notice. It consists primarily of two typewriters, one at each end of a loop circuit upon which an additional channel is superposed. The operation of these machines is obtained by the setting of relays operated by reversing and incrementing currents, the combinations being signalled by the depression of the keys on the typewriter. The type-bars on the receiving instrument are actuated by compressed air. As there are only 24 possible combinations and as one of these must be employed as a space signal, only 23 characters are available on the primary and 23 characters on the shift. Three letters, "Q," "J," and "Z" are therefore worked on the shift positions. The speed of operation is fast, a demonstration at 60 and 70 words a minute having been witnessed. There is, therefore, no limit in practice to the operating rate imposed by the action of the machine. The system, however, suffers from several obvious objections. A loop circuit is essential, and the need for compressed air involves the use of compressing machinery. It is proposed to try this apparatus between the Central Telegraph Office and the Victoria Street branch office.

The "start stop" instrument of the Western Electric Company is another machine of this order, but its cost at present is very high.

As regard multiplex and automatic high-speed telegraphs, which are suitable for use on busy routes, while we may deplore the slow rate of progress with the introduction of such apparatus in the years before the War, there is some reason to congratulate ourselves on the progress which has been made since then and it is a matter for satisfaction that in certain respects the British telegraph service stands in the forefront of multiplex development.

It is easy to demonstrate the economic superiority of the Baudot, the Western Electric, the Murrey, the Siemens and the Creed over the old system of hand operation, but it is not so easy and is indeed extremely difficult to determine the precise comparative values of these different systems and even of different forms of the same system. There are so many complicating factors which give fine scope for academic discussion, but these weighty matters are decided not so much on theoretical grounds, not so much even in the Engineers' Laboratory, as in the telegraph rooms under ordinary working conditions. This is the hard and solid fact of the situation, and we have to visualise vividly and sympathetically all the factors and ascertain impartially their multiplying or dividing values. We do not yet, for example, see clear daylight on the question, whether the typewriter-keyboard plus transmitter system is appreciably more economical than the Baudot system of direct signalling to line. With this very object in view it was arranged some time ago for a prolonged trial of two duplex quadruple multiplexes fitted with typewriter keyboards and automatic transmitters as against two duplex quadruple Baudots operated by hand. The installations were worked respectively with two of the largest provincial centres where the traffic conditions and the average length of the telegrams were approximately equal. The staff employed was the ordinary rota of operators working under every-day conditions. It should be explained that with automatic transmission the rate of working was 40 words per minute, and with manual transmission it was 30 words per minute.

Arrangements were made to keep special records of—

(*a*) the number of telegrams transmitted per channel hour by hour;
(*b*) the number of operator hours;
(*c*) the number of channel hours;
(*d*) the number of ineffective channel hours due to faults of apparatus or line;

(*e*) the amount of unoccupied time due to absence of traffic ;
(*f*) the number of RQs, that is to say the number of irregularities due to incorrect number of words, faulty manipulation, etc., detected by the receiving telegraphist and requiring correction by the sending office ;
(*g*) the time taken to correct defective messages ; and,
(*h*) the amount of stationery and the number of coils of slip and printing rolls used.

These various values were brought as accurately as circumstances would allow into a sharp focus for each system by ascertaining the cost of dealing with a telegram-unit.

It will perhaps be interesting to run rapidly over the ground of the enquiry and note the salient features so far as the working of the machines is concerned. In the four weeks the typewriter keyboard circuits to station A. disposed of 110,000 telegrams with a total of 6,150 operator-hours, whereas 95,700 telegrams were transmitted directly by hand to station B. with a total of 6,720 operator-hours. That is to say, machine manipulation had a superiority of 14.9 per cent. in output with 8.5 per cent. less staff, or alternatively with equal staff the type-keyboards gave an increased yield of 25 per cent.

The records of unoccupied time due to absence of traffic were admittedly the least trustworthy of the trials. They are correct as far as they go, but periods of two minutes or less went largely by default, and there is no doubt whatever that it is the large accumulation of the small and unrecorded intervals that provide the wide margin of elasticity for busy periods—when thy come. The amount, however, actually recorded during the month was 529 channel-hours on the circuits operated by machine and 383 on those worked direct by hand.

Let us now glance at the RQs—they are the snags and bugbears of telegraphy. I should first point out that with the typewriter keyboard circuits a perforated slip is employed, and the operator goes ahead with his work and gets in advance of the automatic signalling apparatus, so that there may be several messages awaiting transmission on the slack slip hanging from his keyboard. It is therefore obvious that when he desires to put a question to the distant office his enquiry in ordinary course has to wait its turn on the slip. Similarly at the other end of the line, when the reply is perforated, the machine has first to run off the slack. In this manner precious minutes go by, and the telegrams affected have to wait. In the case of the Baudot circuits, the question put is instantaneously received at the distant office. During the month covered by the returns, 8,952 RQs. (9 or one in 12.3 messages) were recorded at the machine keyboards and 7,130 (or one in 13.4 messages at the Baudots, an advantage of about 9 per cent. in favour of the latter. The average time taken to correct defective messages was 8.7 minutes at the first-mentioned circuits, and 5.1. minutes at the second.

I have dealt with only a few of the headings which I gave above, and have endeavoured to throw into relief strong features of type keyboard operating, but I may say that the trial, favourable as it was in many respects to keyboard-operating, was not wholly conclusive that that system was the more economical. All theoretical traffic considerations are in favour of the type-keyboard system, as compared with hand-signalling, despite the heavier cost of the keyboards and transmitters. The freedom of typing, one would think, should result in greater output than is possible when operating is restricted by the Baudot cadence, but nevertheless the disappointing truth is that the periodical returns of output do not yet indicate a marked superiority on the part of the type-keyboard system. Endeavours are being made to determine the factors which prevent the theoretical advantages of the keyboard from being realised, but until these causes are located and removed where possible it would be premature to undertake much development of keyboard working, though some development is necessary for purposes of experience.

The Post Office, by adopting the recommendations of Captain Norton's High-Speed Committee some years ago, definitely decided upon the multiplex system, as against the automatic high-speed system, for its main telegraph routes, and experience since then has not shown its decision to be wrong ; but there is no finality in such matters and it behoves us to keep an open mind on any new or improved system, whether multiplex or automatic, which may appear in the future. We must not overlook, for example, the Siemens-Halske apparatus, which is developing considerably on the Continent, or the new Creed apparatus which possibly may affect our views as to the superiority of multiplex.

The evolution of the multiplex should clearly be in the direction of page or form printing. The pasting of Baudot tape on a form is a rather messy operation, and the result is not a pretty form of telegram. The continuous roll of paper used on the Western Electric provides a message form which is hardly in keeping with the dignity of the British Post Office. There are no doubt at present difficulties in the way of providing a satisfactory and economical method of form feeding, but it is to be hoped that these difficulties will be overcome in time.

The Wheatstone system, supplemented by Creed reperforators and printers, holds at present pride of place as the standard system for the transmission of Press messages from one town to several other towns simultaneously over news wires. The perforated tape received at any one of the towns of reception can be put through a printer, if the message is for local delivery, or it can be run through a Wheatstone transmitter if the message is intended for a town not connected with the main circuit. As the Creed printer normally prints on one tape only and, as the retention of top or office copies has been abolished, it is obvious that gumming a printed Creed slip on a suitable form and delivering it to the addressee, provides a rapid method of dealing with received Press traffic. When multiple Press messages do not exceed three, three printed slips are obtained by using triplicate tapes, but where several copies are required, as they are at Manchester, a "Victoria" or "Roneo" Copier can be employed. The Creed system is thus very expeditious and very labour-saving.

The possibility of providing similar facilities for Press traffic by means of multiplex instruments, which would necessarily have to be of the typewriter and transmitter type, has, it is understood, received some attention from the engineering department, but the position as regards the supply of apparatus is hardly sufficiently advanced to make progress possible. It is a subject, however, which calls for serious study.

Since the War steps have been taken to replace by a lamp signalling pattern the old type of telegraph concentrator which had many objections from a traffic point of view. The improvements which have been effected with the new pattern are as follows :—

(1) Greater reliability of calling signals ;
(2) Easier operating ;
(3) The clearing signal from the working set operates at two points (*a*) at the switchboard ; (*b*) at the working set ;
(4) A reduction in instrument room noise, the sets being so wired that, when telegraphists send, marks are not received on the home sounder ;
(5) Sets may be worked over Morse double current or the condenser impulse system ;
(6) Day and night concentration may be provided for on one switchboard except at a few large offices ;
(7) Less table space required.

It is hoped that out of about 70 concentrators throughout the country about half will have been replaced by the new pattern switchboard by the end of next year. It is clear, however, that in the past concentrator switch working was overdone and it is certain that many of the concentrators will be abolished, as the advantages of concentration in these cases are outweighed by the cost of switchboard operating, capital cost and maintenance charges of the concentrator. Even the lamp-signalling concentrators, similar as they are to telephone switchboards, seem very suitable for replacement by automatic switching apparatus so as to avoid the cost of manual operating. An automatic concentrator which appears to meet traffic conditions admirably has been designed by the Engineer-in-Chief, and an installation is being provided experimentally at Leicester.

Next there is the addressing stage of telegrams to be considered.

The initial operations in dealing with telegrams for delivery when they reach the addressing stage are to date-stamp and number the forms. Hitherto the general practice has been to perform both operations separately with different instruments, and at the larger offices it is necessary to staff both the date-stamping position and the numbering position. Trials have been proceeding with a view to combining both operations and it is found that, with the addition of a simple die-plate fixed to the frame work of the ordinary pull-over numbering machine above the serial number printing position, it will give a simultaneous impression of the name of the office and the date as well as print the serial number. No alteration is made to the numbering mechanism and, apart from the provision of fitting the die-plate and the increased size of the pad which takes the blow, little expense is involved in obtaining this comparatively small but effective and economical improvement.

Finally I come to the stage of conveyance of telegrams from the office to the address. The system of delivering telegrams by telephone is gradually developing, and, with the increase of the use of the telephone by the public, we may expect that the proportion of telegrams delivered by telephone will increase considerably. But there will always be a large proportion which will require to be delivered by hand and the question of mechanical aids to increase speed of delivery and to economise staff costs is as worthy of attention as other parts of the telegraph service. The obvious method is a larger use of bicycles, but, so far, the use of bicycles has been restricted and, generally speaking, the number of bicycles in use is not nearly so large as it might be if speed of delivery and economy of messenger force were alone considered. The recent introduction of the system of delivering telegrams in pre-arranged walks has led to the question of the use of bicycles being looked into more fully than has hitherto been the case, and as a result the number of bicycles is being increased.

In conclusion, I may perhaps say that I have tried in this paper to indicate in a broad way how the improvement of the telegraph service by means of machinery appears from a traffic point of view. There are many fields of telegraph traffic service and economics which are far from being fully explored or have not been explored at all, for the telegraph service is behind the telephone service in traffic study, but I hope that I have said sufficient to show that traffic officers are alive to the position and that they are making progress as quickly as circumstances will permit.

HOLIDAYS.

THE annual party, which has hitherto visited the Bernese Oberland under the guidance of the late Canon Horsley, will be conducted in future by Mr. Fewtrell, of the Post Office Engineering Department. Anyone desirous of joining this year's party, leaving London on Whit-Monday, June 5, at 2 p.m., should communicate with Mr. J. W. Fewtrell, Engineer-in-Chief's Office, G.P.O. West, E.C. The cost, including railway fare, hotel accommodation and gratuities, is about £16 10*s*. for 15 days and about £21 5*s*. 0*d*. for 22 days.

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(*Continued from page* 69.)

Continuous Waves.

In the various transmitting systems described above the signals are produced by setting up a succession of groups of oscillations in the aerial, the amplitude of the oscillations in any particular group, and therefore, of course, the amplitude of the waves in each of the resulting wave-trains, gradually dying away. A long or short series of such groups of oscillations produces a dash or a dot respectively. During recent years several systems have been developed in which, instead of these detached groups of oscillations, a continuous oscillation of constant amplitude is produced in the aerial during the whole duration of a signal. These systems are known as "continuous wave," (C.W), systems. They have considerable advantages over the earlier systems in which detached trains of waves were used, and all these latter systems are now practically obsolescent, at least as far as large stations are concerned.

There are four methods by which continuous waves can be generated. Alternators have been built by which the necessary high-frequencies can be directly produced. Although such alternators have to be of very special design to meet the peculiar conditions of the service for which they are intended, the principles of their action are the same as those involved in the action of the low-frequency alternators used in ordinary electrical practice. One terminal of the alternator is connected to the aerial, and the other terminal to earth. When the signalling key is depressed the alternator is excited, and causes a steady high-frequency current to flow up and down the aerial, with the consequent radiation of waves of constant amplitude.

In other C.W. systems alternators are employed, but the high-frequency current is not produced directly by the machine. The alternator generates a current at a frequency considerably lower than that required, and by suitable devices, the action of which is too complicated for description in articles intended for the general reader, the frequency of this current is multiplied till the desired high-frequency is reached.

The remaining two systems are those in which the high-frequency currents are produced by the use of an arc (Poulsen system), or by a valve.

Poulsen System.

The Poulsen system is based on a discovery of Duddell that if a condenser C (Fig. 27) and an inductance L of suitable magnitude be connected in series as a shunt across an arc, the direct current supply to which is taken through inductance coils L_1, L_1, a steady alternating current will be set up in the shunt path, the frequency of which is determined by the value of the inductance and capacity in that path.

The production of this alternating current depends on the peculiar manner in which the voltage across the arc changes when the current through the arc is altered. The relationship between these two quantities can be shown by a curve—the characteristic curve of the arc. Such a curve is shown in Fig. 28, from which it can be seen that the voltage across the arc increases as the arc current falls, and becomes less as the arc current rises. Suppose the arc to be burning, and then the condenser-inductance shunt joined across it. The condenser will at once begin to be charged by the potential difference which exists across the arc, but the inductance coils in the leads to the arc prevent any sudden alteration in the current taken from the source of supply. (The reader will recollect that inductance in electrical matters corresponds to mass or inertia in mechanics. In just the same way that the speed of a moving train, or of a spinning fly wheel, cannot be suddenly changed, so the value of the current flowing in a circuit of high inductance cannot be suddenly altered.)

Consequently, as current flows into the condenser to charge it, the current through the arc will fall by an equal amount, the total current from the supply remaining the same. Directly the current through the arc falls, the voltage across the arc will rise, as is shown by the characteristic curve.

Consequently, the current being driven into the condenser will increase. This will cause a further fall in the current through arc, resulting in a further increase in the potential across its terminals. These actions will continue till the arc current falls to zero. At

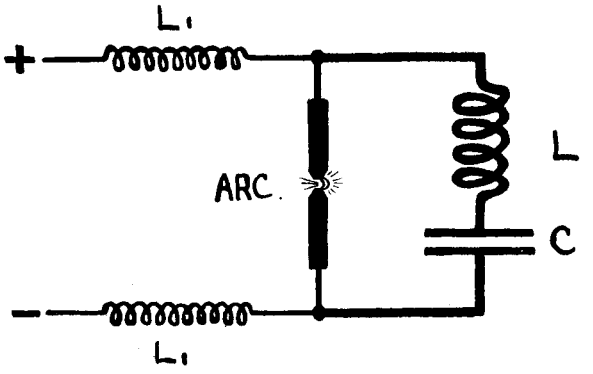

FIG. 27.

this instant the condenser will be charged to the voltage of the supply itself. The current into the condenser will not, however, immediately stop, as the inductance L joined in series with it across the arc will cause the current to continue flowing for a short time. The action is similar to that already explained in the case of the oscillatory discharge of a condenser.

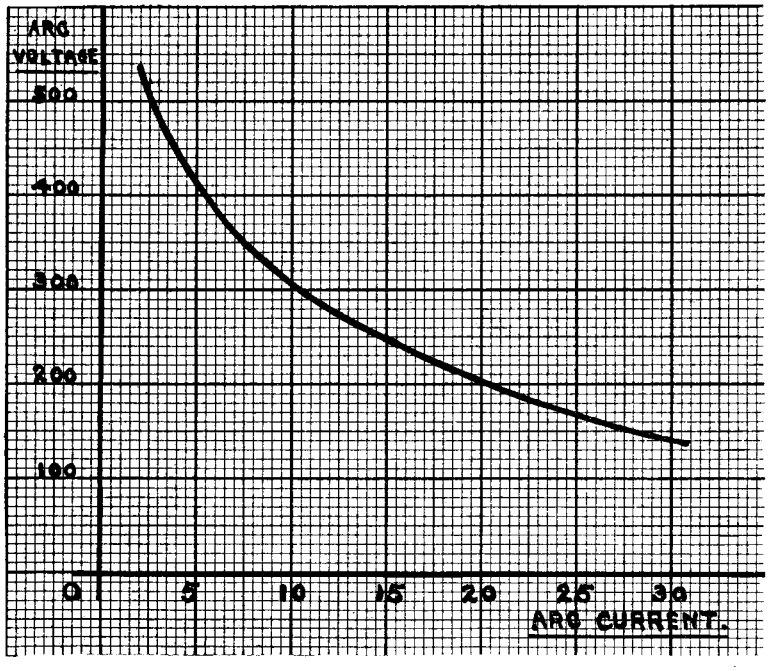

FIG. 28.

When the current into the condenser finally stops the condenser is charged to a voltage somewhat higher than that of the supply to the arc. The arc now re-ignites, and the condenser begins to discharge across it. Directly this happens, since the discharge current from the condenser is now added to the current which flows through the arc from the supply, the total arc current is increased and therefore the voltage across the arc will fall, as shown by the characteristic curve. The arc voltage opposes the discharge of the condenser, and so, when this opposing voltage is reduced, the discharge of the condenser takes place more readily.

Every addition to the total arc current by current from the condenser causes a corresponding further drop in the arc voltage and therefore allows the condenser to discharge more easily. This will continue till the condenser is completely discharged. The inductance L in series with the condenser will then again exert its effect and cause the current to continue flowing, with the result that the condenser is now charged in the reverse direction. The condenser then discharges and is re-charged in the same direction as at first, and these actions continue indefinitely. Thus, as long as the supply of current is kept up to the arc, an alternating current will flow in the shunt path LC.

(To be continued).

LONDON ENGINEERING DISTRICT NOTES.

Retirement of Mr. A. E. Cooke.

THE London Engineering District lost one of its noteworthy veterans on Feb. 27, in the person of its principal Clerk, who retired from active service after 45 years' service in the Post Office. Mr. A. E. Cooke came to London from Birmingham in the autumn of 1901 to take charge of the clerical force in the newly-formed Metropolitan Central District. These were the opening days of the Post Office telephone enterprise when London was divided into three engineering districts. Progressive development reduced these to two, and eventually to the one London engineering district, and on every stage of its growth the distinctive personality of Mr. Cooke was impressed as a prominent feature. His many friends wish him happiness and good health for many years to come.

Development.

The gradual lengthening of the days as the year progresses turns the thoughts of many to the cultivation of the soil and the rearing of plants. The quiescent period when nature is relied upon to improve the soil conditions with the aid of rain, frost and wind, is nearly over, and the time for man to take direction is rapidly approaching. In full time the rich harvest will be reaped. There is one type of plant cultivation that does not permit of rest during the sunless winter period. It involves the frequent turning over of the soil and the more frequently this operation is performed the more rapid is the spread of the roots and branches. In favourable trade winds the fruit forms freely, and if cultural instructions are followed carefully, is evenly distributed. The astute readers of this JOURNAL will have already guessed that it is the telephone plant that is referred to, and, therefore, at this stage metaphor will be dropped.

Good progress is being made in the provision of plant to meet the future requirements of the vast population in the London engineering district. Very few areas exist now in which serious difficulty is experienced in giving service on demand or within a short period thereof, and the day is fast approaching when it will be possible to accept orders in any part with knowledge that they will be completed in a few weeks at most. The most serious difficulty to be overcome is the provision of exchange plant in certain congested areas. Delay in the completion of exchanges reacts very unfavourably on the progress of the external work and makes the outdoor operations more complicated and expensive. The difficulties attendant on a settlement of the problems arising out of the advent of the automatic system are very real, and a false step might have disastrous results, but it is hoped that a way through the difficulties will soon be discovered, and certain much-needed exchanges will materialise rapidly.

It is doubtful whether any organisation or firm has such difficult problems to solve as are met with in connexion with the telephoning of large cities, and certainly there is no more difficult case to deal with than London.

The selection of sites for new exchanges is not the least of the difficulties. It is rarely that anything suitable can be found at the ideal centre, and if it can be the cost may be so high as to make it necessary to seek something further afield in the hope that the additional-line costs consequent on a site being out of centre may be more than balanced by the lower purchase price. One of the most important considerations that has to be investigated is the means of access for the line plant. In the heart of London a good site from other points of view may be found and yet be useless because the many ducts and cables that have to be led to it cannot be accommodated in the congested and narrow surrounding streets.

A very fine site has now been purchased in Wood Street, Cheapside, for a 30,000-line exchange to relieve the present London Wall area. One has only to look on the road and pavement surfaces around this to see that some careful planning will be necessary, combined probably with some deep tunnelling, to avoid the existing obstructions and lead-in the required 70,000 odd pairs of wires.

In designing a new exchange building, consideration is given to the possibility of accommodating engineering stores and workmen's quarters, if such are necessary—and they invariably are. Space outside P.O. buildings is difficult to obtain, generally expensive, and rarely meets the full requirements.

In the City and Centre sections there are as many as 2,410 workmen and 110 inspectors to be considered. Some of these must in virtue of their duties be housed in the exchange buildings themselves, but, although desirable, it is not absolutely essential that the remainder should be. The nearer the men's headquarters to their work the more effective work can the men perform. It is a nice problem to decide how the workmen shall be grouped so as to obtain the maximum output. Consider, for example, subscribers' apparatus-fitting work. Should all the fitters in a section work from one headquarters or should there be more than one fitting office, and if so how many and where should they be located? Each section must be considered on its merits, and allowances made for the length of journeys and the travelling facilities. It must, of course, be advantageous to have all the office work centralised. Such problems as these keep the minds of the administrative officers from atrophying.

Extension of London Engineering District Boundary.

On Jan. 1 the Ilford and Woodford Exchange areas were added to the London engineering district. The addition of this portion of the old Ilford section did not involve the transfer of the sectional engineer to London. This is unfortunate for London, but fortunate for Exeter, where Mr. Wise is being transferred. Mr. Wise was under the old conditions an agreeable neighbour: the best wishes of his London colleagues go with him in his new field of activities.

Instructional Films.

Most people who claim to possess a fair degree of intelligence are excessively bored at the usual cinema entertainment. Sooner or later those who make a living from moving picture entertainments will find that the public is surfeited with inanities and will give their attention to providing more intellectual fare. The cinema offers a splendid means for educating the masses and at the same time entertaining them.

An example of what can be done was given at the Institution of Electrical Engineers' meeting on Jan. 12, and at the I.P.O.E.E. meeting on Feb. 8. At these meetings the theory of the Audion or thermionic relay was explained by the aid of moving pictures. The behaviour of the electrons and the flow of current in the associated circuits was shown in such a clear manner that those present will probably carry a mental picture of the phenomena about with them for the rest of their lives. The application of the Audion to wireless and cable telephony was demonstrated in a similar manner.

One interesting reel showed the 200 odd parts of a C.B. telephone spread out on a table, and the gradual assembly of the parts apparently without human aid. The films were prepared in the Western Electric Co.'s Research Department, U.S.A., and it was due to the courtesy of this firm that the members of the I.P.O.E.E. were enabled to see them. The films are, of course, prepared by taking innumerable photographs either of drawings or apparatus, each differing very slightly as regards the position of lines or parts from the preceding one.

The same methods could be adopted to show the action of say, automatic telephone exchange plant, and help students over the initial period of their studies of a very difficult subject. Films showing activities of the Post Office should be very instructive to the public and remove from their minds much of the misconception that now exists.

New Exchange at Kilburn.

The building hitherto in use at Kilburn as a Fire Brigade Station has now been purchased by the Department for use as a telephone exchange, and the Office of Works is very busy carrying out the necessary structural alterations which will render the building suitable for this purpose. The exchange will be of the No. 10 type, and will have a capacity of approximately 2,000 lines. The whole installation will be carried out by the Sectional Engineer with his normal construction staff. At a later date a much larger exchange will be installed in a new building to be erected on a piece of land at the rear of the existing building.

The provision of the temporary exchange will afford much-needed relief to the Hampstead Exchange.

Temporary Bishopsgate.

Before this issue appears it is expected that the temporary Bishopsgate Exchange will be opened. The equipment is located in the Clerkenwell Exchange building, and is, in fact, the equipment which was used to give temporary service to Clerkenwell subscribers while the main Clerkenwell Exchange was being installed. The capacity of the equipment is approximately 1,500. A site for a large permanent exchange to accommodate 10,000 lines has been acquired in the Bishopsgate area, and it is hoped that a start will soon be made with the building operations.

Electrophone Service.

Reference has previously been made in these notes to the improvemen in the Electrophone Service occasioned by the introduction of some

experimental amplifying units. The results were so satisfactory that it was decided to extend their use, and recently 10 sets were completed. The amplifiers are inserted at the Electrophone Exchange end of the music lines, and not only does the amplification improve the hearings to individual subscribers, but it enables a far greater number of subscribers to be connected to one line than was possible under the old conditions.

Despite the fact that the exchanges are staffed with members of the gentle sex, and that none are employed in the test-rooms, yet far more jumpers are seen in the latter than in the former.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

THE fifth meeting of the session was held on Wednesday, Feb. 8, when Mr. Pink took the chair. Two of the prize-winning papers submitted in the yearly competition were read. The papers, which were a complete contrast to each other, were much enjoyed. The first one heard, "Toll Exchange *from a Supervisor's point of view*," was by Miss A. E. Knight, Supervisor, Toll Exchange, and it was read by Miss Johnson. It gave most interesting particulars of Toll exchange before, during, and after the opening. Mr. Dive and Capt. Berry took part in an animated discussion. Mr. Pink, in thanking Miss Knight for her paper, referred to the interesting discoveries, reported *in the daily press, which were made when the Toll ducts were laid, the workers*, when burrowing under London, coming across stonework suggesting an old Roman bath, foundations of a building that may have been a temple of Diana, and a portion of the old Lud Gate.

The second paper, by Miss E. J. Turner, Telephonist, Mayfair Exchange, was entitled "A stage in the life of a Private Branch Exchange Telephonist." Miss Turner, in her own inimitable way, told her audience how she kept her subscribers in order, and how, by the force of example, she lured wrong-doers from the paths of slackness, and instilled into them a lively consciousness of how far they fell short in their official lives of the high ideal attained by Private Branch Exchange Telephonists. It was sometimes curiously reminiscent of Ethel Monticue in "The Young Visiters," as, for example, when the mysterious "Mr. Edmund X," on hearing that Miss Turner was leaving his service, gave her —"a kind look!" It was an entertaining paper, and, judging from the laughter which it provoked, was much appreciated by the audience. Miss Turner promised to make some further revelations later, to be entitled, "Miss New-Departure, and how she met her Fairy Godfather!" This will no doubt be looked forward to eagerly by those who were present at her first paper.

At the next meeting, which will be held on Mar. 8, the remaining prize papers, and essays to be judged by the audience will be read, and the prizes distributed.

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The King's Levee.

Among those attending the Levee held by His Majesty the King at St. James' Palace on Feb. 14, was the Controller, Major G. F. Preston, C.B.E.

* * * *

Hospital Saturday Fund.

The annual general meeting in connexion with the Telephone Staff Hospital Collections, for the Hospital Saturday Fund, was held on Monday, *Feb. 6, Mr. Reed, the Secretary of the Hospital Saturday Fund, being present.* Unfortunately Mr. Preston, who was to have taken the chair, was ill; and a message was sent to him from the meeting, expressing regret at his absence. Mr. Valentine substituted at very short notice, and was warmly welcomed. Miss Reekie (Joint Hon. Secretary) read the report for the year, which was *a highly satisfactory one, each department showing an increase on its previous* year's collections. The total amount collected was £1,871 1*s.* 11½*d.*—an increase of £400 over last year's collections. As the Chairman pointed out, this was very creditable, having regard to the many other funds to which the members generously contrbuted, and to the tragically diminishing bonus. It must *not be forgotten, though, that the goal to be aimed at is £2,000*, and a special appeal is made to all concerned to keep this amount in mind and to endeavour to reach it this year.

Miss Cox gave some interesting facts about the eight letters issued for Sanatorium treatment. She was able to report that the majority of the girls who had undergone the treatment had made a complete recovery, and were back at work.

Mr. Valentine, Mr. Stirling, Mr. Reed, and other speakers, in referring to the figures for the year, emphasised the human element underlying this work, and, by the alchemy of sympathy, transmuted dull statistics into living facts.

The office bearers and delegates for the year 1922 were appointed, and Mr. Preston was unanimously re-elected Chairman. The meeting closed on a happy note, when Miss Reekie, on being, with Miss Wormald, re-appointed for another year, exclaimed naively:—"We *should have been so disappointed* if you had not re-elected us"! Such enthusiasm, that "genius of sincereity," for what is undoubtedly a very arduous task, is as refreshing as it is rare, and should be an incentive for the present year's work to all who take part in it.

Langham Choral Society.

The performance of "Elijah" at Queen's Hall on Jan. 24 was an artistic success. The choir sang better than ever, a specially noticeable feature being the excellent balance between the male and female voices. The third and last concert of the season will be a performance of "Hiawatha," on Tuesday, Mar. 28. The three parts of the work will be sung, and those who have not yet attended any of the Society's concerts will be well-advised to make early application for tickets for this occasion. The concert secretary, Mr. W. R. Child, will be pleased to send posters, handbills, and tickets to anyone applying to him at West District Contract Office, 102, Dean Street, W.1.

London Telephone Service Swimming Association.

The annual general meeting of the L.T.S.S.A. was held on Monday, Feb. 6, Mr. E. A. Pounds, presiding. The Association decided to put up for competition a shield to be held for a year by the affiliated club gaining most points in specified events at the annual galas. Owing to the large number of competitors at the last gala, it was decided to hold two during the forthcoming season, one for individual events and the second for team races. The Association is in a very healthy state, having 21 clubs affiliated to it with a total membership of over 1,200. Over 300 girls have learnt to swim since the formation of the Association two years ago. Miss Temme, of the Trunk Exchange, who has acted as Secretary since the Association's birth, was presented with a gold wristlet watch in appreciation of the excellent results achieved, largely by virtue of her enthusiasm and energy.

P.O. Orphan Homes.

A recent collection amongst the L.T.S. staff provided a sum of £53 to be devoted to the Entertainment and Summer Holiday Fund.

* * * *

Culled from the Exchanges.

Clerkenwell Exchange.—A correspondent writes:—The tea given by the staff of the Clerkenwell Exchange to 190 children of the Wenlock Road Schools, City Road, was held at the Leysian Mission on Saturday, Jan. 14. The children were drawn from amongst the poorest in the School, most of them having fathers out of work. It was well for us *that the masters attended, for 190 children even on their best behaviour* want managing; and even the Supervisors, hard and austere as they are, would, I think, have been powerless in the midst of the 190. Every item of catering and entertainment was stage managed by the staff, and really the supply of good things was so plentiful and the tables looked so pretty that *I am sure we have some splendid house-keepers on our staff.*

It was my debut as a pourer of tea and, goodness, I never knew children had such capacity. In alarm I forcibly stopped one little chap from having his sixth. Several jerseys and coats protruded very much when tea was over, but we were assured by the owners that nothing but a cap was concealed therein. The conjurer, who performed most wonderful tricks was a great favourite, and games and choruses by the children completed a thoroughly jolly evening.

Each child on leaving was given a toy and a bag of goodies so that a little of the joy was taken home. This effort was good, but it only served to show what scope there is to give much needed pleasure to some of our neglected child-life.

East Exchange.—On Thursday preceding Christmas, a party of the East Exchange staff visited Shadwell Children's Hospital and conveyed a taxi-load of toys for the little patients. A conversation with one of the Sisters led to the discovery that the Hospital was badly in need of both funds and garments, so schemes have since been brought into action enabling material to be purchased for the making of nightdresses and woollen vests for the little ones.

This Hospital is situated in one of London's poorest quarters, and a number of its little patients are suffering from the ill effects of insufficient nourishment and clothing. In these cases, it is quite impossible for the relatives to supply anything in form of luxuries, and even eggs are beyond their means, while the Hospital itself is much too poor to provide anything beyond the barest necessities. Visits have been made by members of the staff with gifts of sweets and chocolates, and they have great hopes to do much for the relief of this Hospital in the near future.

Regent Exchange.—Regent has always made it a practice to celebrate each New Year by giving a very special tea and concert to their protégées at Gifford House. Jan. 25 was the occasion of their 1922 feast, and it was an unqualified success. A splendidly performed sketch was given in addition to the delightful solos and recitations. The men declared their happiness was complete when it was found that a very useful gift had been provided for each of them.

The efforts of the Regent Social Club were well rewarded by the great success of the dance which was held at the Holborn Hall on Jan. 30. Mr. Buckeridge with his usual interest in all exchange functions, acted as M.C. Fancy dress was optional, and a fair percentage attended in costume. A prize was given for an "Economy" dress.

"CUTTING."

At times when I'm performing with
A knife and bread and butter,
I've cut myself alarmingly,
Yet ne'er a sound did utter.

And once, tho' I am loth to say,
My first love cut me dead;
It irked me not—I got engaged,
To someone else instead.

Full often I've submitted verse
Of beauty, length, and wit,
The Editor—a ruthless man,—
Has cut out all of it!

Most philosophic'ly I've met,
With all life's vexing cuts,
Just thinking 'twas my proper share,
But—direful," worst of "buts."

O wrest it from its tape-bound rut,
And cry it through the town,
Alas, that "February" cut,
That hateful, fateful wages cut,
That misnamed "cost of living" cut,
Is the "cut" that gets me down.

DOROTHY TURNER.

Victoria Exchange.—A most enjoyable evening was spent on the occasion of a social, held in the Dining Room, Victoria Exchange, on Friday, Feb. 3. Its object was the augmentation of the funds of the Willow Swimming Club. The Victoria staff was well represented, and several members of Mayfair, Trunks, Regent and Gerrard Swimming Clubs were present. The programme consisted of songs and dances and a special entertainment was given by the Minstrel Troupe, composed entirely of the Victoria Exchange Engineering Staff. The refreshments were admirably arranged and great credit is due to the members who assisted in the preparation of them. The evening was a very successful one, and thanks are especially due to Miss Hill, whose efforts for the benefit of the Swimming Club are untiring.

Contract Branch Notes.

Newspapers tell us a great deal nowadays about the wasteful methods of Government offices. The Contract Branch comes into contact with the other side of the question and can testify to the "Dilly Dally" methods of the so-called "World of Commerce."

On Aug. 11 last, a number of Revision of Rate Agreements were submitted for signature to a West End firm of world-wide fame and repute. There was no dispute as to the installation or the rentals payable, yet the Agreements were not signed until a personal note was sent to the Managing Director in the early part of February. Letters, personal calls and telephone calls had, in the interval, failed to produce anything but vague promises out of the Company's Secretary.

In another case a local authority has been asked eight times to return the Revision of Rate Agreements for their Fire Alarm System, but not one of these applications has been acknowledged. It has been ascertained by telephone (after many fruitless attempts) that the Agreements have now been passed by the Fire Brigade Committee and will be recommended to the Council for acceptance in due course!!!

ANSWERS TO CORRESPONDENTS.

Enquirer.—We see no reason for the transfer of the English ends of the Anglo-Irish Free State telegraph circuits to the eable room. The same rules and regulations will no doubt govern the working of these lines as hitherto. The Free State will, however, probably claim a representative at the next International Telegraph Conference.

Costing Clerk.—The elimination of *travelling time* from the calculations in costing referred to in the London Engineering District Notes of last month only referred to costing for "comparative purposes" as regards the actual process and not with a view to costing for estimates. The example chosen, *i.e., travelling time*, is, however, unfortunate as an Associate of the C. & W. Institute states that, "the words used are the technical description for time chargeable on outside jobs."

COMING EVENTS.

Mar. 3.—C.T.O. Annual Dinner, Holborn Restaurant.

„ 10.—Society of Civil Servants. Lecture.—"Co-operation's Contributions towards Collective Control of Industry. Mr. A. Baines, (London Co-op. Society.)

„ 20.—T. & T. Society Paper.—"Some aspects of Publicity in relation to Post Office work." Mr. John Lee.

„ 24.—Society of Civil Servants. Lecture.—"Characteristics of a Great Industrial Organisation." Mr. Hugo Hirst (General Electric Co.), Chairman, Sir Evelyn Murray.

CORRESPONDENCE.

SYNCHRONISM.

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

SIR,—In the current edition of your journal, a very controversial criticism of the article by Mr. J. W. Teare is rendered by the very distinguished and respected inventor, Mr. Donald Murray.

The criticism has, I notice, met with approval from those unacquainted with the mysteries of synchronism. On the other hand, some of the *dirigeurs* who have had practical experience with Multiplex telegraphy (with and without tears) think otherwise.

The point at issue is not clearly answered. Firstly, Mr. Murray disputes Mr. Teare's contention, and then goes on to say that the Baudot synchronism is amply *good enough*. A point which inventors should bear in mind is the question of *operator output*. A transmitter that runs less than 40 words per minute will be useless to the average operator of the future.

In America, a patient hearing is given to anyone, be he cleaner, or eminent scientist, before an invention is placed on the market.—Yours truly,

R. G. LEATHERN.

C.T.O., Feb. 9.

NEWCASTLE.

MR. CHAS. ANDERSON, Assistant Traffic Superintendent, Newcastle, was presented by his colleagues with three volumes of Rudyard Kipling's poetry and a fountain pen on the occasion of his promotion as Assistant Inspector of Traffic, Class II, at Headquarters. Mr. Davison, Assistant Traffic Superintendent, made the presentation.

BLACKBURN.

On the occasion of the transfer of Mr. J. F. BROWN, Traffic Superintendent, Post Office Telephone, Blackburn, to a similar position at Nottingham, on Dec. 31, 1921, he was presented with a silver tea service contributed to by the Traffic Staff, Heads of Departments, District Office Staff and the Operating Staffs, at the various exchanges throughout the district.

The presentation was made by the District Manager, Mr. E. E. Stockens, in the presence of various members of the staff, who wished Mr. Brown every success in his new district.

Mr. A. L. May, Traffic Superintendent, from Nottingham, succeeds Mr. Brown. The hearty co-operation of the Traffic Staff is extended to him on his promotion to the Blackburn combined district.

On Jan. 20, Mr. Stockens, the District Manager, very kindly presented to the staff, books on Telephone Engineering, Electricity and Magnetism, Mathematics and Telephone Traffic Studies.

In making the presentation, Mr. Stockens pointed out that it is now necessary to pass an examination to obtain promotion to Assistant Traffic Superintendentships. Apart from this, he emphasised the importance of a thorough knowledge of the theory underlying one's profession, particularly in telephone work, where originality and initiative help to forward the Department's development of the telephone system. The Post Office welcome suggestions for improvements, and he hoped the volumes would be the nucleus of a library for the use of the staff. The books are by standard authors, and Mr. Stockens said that during his career they had been of great benefit to him. He hoped that the staff would study and so be able to improve their positions and put forward suggestions for improvements. Mr. A. L. May, Traffic Superintendent, on behalf of the Traffic staff, said how much the staff appreciated Mr. Stockens' very great kindness and encouragement. It is the intention to add to the volumes and have a system of regular study for those members of the staff who intend in the future to sit for the examinations. Also other officers will study, and the Supervising staff held the students forward, and by conference make clear any points not understood.

THE

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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.

CONTROLLER'S OFFICE PRIVATE BRANCH EXCHANGE.

RULES FOR THE EXTENSION POINTS.

In all telephone communications aim at courtesy, both in word and tone. Remember that unless the person to whom you speak happens to be an acquaintance, all that he can know of your personality will be conveyed by the tone of the spoken word.

(*a*) IN MAKING A CALL.

(1) *Ascertain the number required by reference to the Directory* or official list of extension points, as the case may be.

(2) Pass the call immediately the Switchboard Telephonist has said, "Number Please?"; speaking distinctly, giving the Exchange name first if an Exchange call is wanted, and the number only if the call is to another extension of the Controller's Office. *Always give the required number, even when calling local extensions.* Endeavour to leave the Switchboard Telephonist free to devote as much of her mental effort as possible to outside callers, who are usually unacquainted with the extension numbers and local organisation, and who must, therefore, rely entirely upon the Telephonist's assistance.

(3) Listen to the Switchboard Telephonist's repetition, and *immediately correct any error.*

(4) *Wait with the receiver to your ear* until you get a reply from the distan station, or the Switchboard Telephonist gives you some reason why it cannot be obtained.

(5) If the required number is engaged, *repeat the call yourself* after a few minutes' interval. Do not ask the Switchboard Telephonist to make further attempts on her own initiative unless:—

(*a*) You have more urgent work in hand; and

(*b*) You or some fully instructed representative will be available to deal with the call when the Telephonist rings you.

(6) Before commencing conversation with a member of the public, announce yourself as "London Telephone Service, Controller's Office"; where the call is to another official of the London Telephone Service, the announcement should give particulars of the Section and the name of the Officer speaking—or the latter only where this is sufficient.

(*b*) IN RECEIVING A CALL.

(7) *Answer promptly,* giving your name or the name of your Branch or Section in accordance with the attached schedule. *Do not wait for the caller to announce himself.*

(8) *Take and record the caller's message yourself, even though it may not refer to the work of your Branch; also his Exchange Number and Name.* If the caller's message is one which you cannot answer without reference to someone else, tell the caller that his request shall have attention and that he will be communicated with on the subject as early as possible. *In no circumstances should a member of the public be obliged to give his message twice to the Controller's Office.*

(9) If the message is a complaint, neither admit nor deny the Department's responsibility for any difficulty *mentioned unless you are fully aware of the circumstances of the case.* Take the caller's message sympathetically, express regret that he should have been troubled, promise full enquiry, and tell the caller that the result will be communicated to him.

(1) If a member of the Department's staff requires to speak on any matter outside the province of your Branch, say "Hold the line please, and I will put you through to the.....Branch." Ascertain the extension of the official likely to be required, flash the Switchboard Telephonist into circuit by moving the receiver rest up and down slowly until she answers, and say to her: "Transfer the caller to extension ..... please."

(11) See that arrangements are made for someone to answer calls on your extension during your temporary absence from the telephone (*e.g.,* during the lunch interval). Leave a scribbling pad and pencil available in order that you may have a record of messages taken while you are away.

Every member of the Controller's staff should realise that when answering a telephone call the credit of the Telephone Department in the minds of those outside it, is very largely in his or her hands.

Feb. 17, 1922. G. F. PRESTON (Controller, L.T.S.).

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

By F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(*Continued from page* 94.)

Duddell was unable to obtain an alternating current in the shunt path of sufficiently high frequency to be of use for Wireless Telegraphy, and he was not able to use high powers.

The advance which converted the Duddell arc into a useful means of generating high-frequency currents for wireless purposes was made by Poulsen. He replaced the positive carbon by an electrode of copper, which was cooled by a continuous flow of water through suitable spaces arranged in its mass. He also placed the arc in a closed chamber which was filled with hydrogen or some hydrogen-containing gas, such as coal gas or the vapour of alcohol, and further, he placed the arc in the powerful magnetic field between the poles of a large electro-magnet.

The results of these three modifications of the original arrangement were that alternating currents of frequency high enough for wireless purposes were obtained in the circuit LC and that much greater powers could be dealt with.

In Fig. 27 the capacity in the shunt path has been shown as an actual condenser. There is no reason, however, why this capcity should not consist of an aerial, which, as already explained, can be considered as forming one plate of a condenser, with the surface of the earth as the opposing plate. This arrangement is shown in Fig. 29.

The oscillating shunt across the arc now consists of the inductance L, the aerial, the medium between the aerial and the surface of the earth and the connexion from the earth to the negative electrode of the arc. The condensers C_1, C_1, in the leads from the arc to the aerial and earth respectively, are of large capacity, and are inserted to prevent the supply mains being short circuited if the aerial should accidentally be earthed.

The windings of the electro-magnet which is used to produce the magnetic field in which the arc is burnt are also used as the inductances in the supply leads. They are shown at L_1, L_1, in Fig. 29.

When such an arrangement as that shown in Fig. 29 is in operation the oscillations set up in the shunt circuit round the arc cause a sustained high-frequency alternating current to flow up and down the aerial, with the result that a continuous train of electric waves, of uniform amplitude, is radiated so long as the arc is burning.

Since the frequency of the oscillations in the shunt circuit can be controlled by varying the inductance of the coil L, as explained above, the radiated wave-length which, of course, depends on the frequency of oscillation, can in this way be adjusted.

It is necessary now to provide some method by means of which this steady radiation can be cut up into long and short trains of waves corresponding to the Morse equivalents of the messages to be transmitted.

One method of accomplishing this would evidently be to extinguish the arc at the end of a signal, and re-ignite it at the beginning of the next signal.

Such a method of signalling, however, would be extremely slow. In any practical arrangement the arc must be kept burning steadily all the time signalling is in progress, and some other means must be found for cutting up the radiation into the necessary dots and dashes.

There are two methods by which this is accomplished in practice. The first one, in which the radiation from the aerial is continuous, but in which the "marks" are sent on a wave-length differing slightly from the "spaces," is shown in Fig. 29.

A key K is provided, joined up in such a manner that when it is depressed one or more of the turns of the coil L are short-circuited.

This reduces the inductance of L, which increases the frequency of the oscillations, and so a shorter wave-length is radiated.

The receiving apparatus is tuned to respond to the shorter wave-length sent out when the key is depressed.

Thus, as the key is manipulated the long and short depressions are reproduced as long and short sounds in the receiving telephones, and so the signals can be read.

It is possible to arrange the connexions so that the key short-circuits some of the turns of the inductance L when it is raised, and opens the short-circuit when it is depressed. In this case the marking wave-length is longer than the spacing wave-length and the receiving apparatus is tuned accordingly.

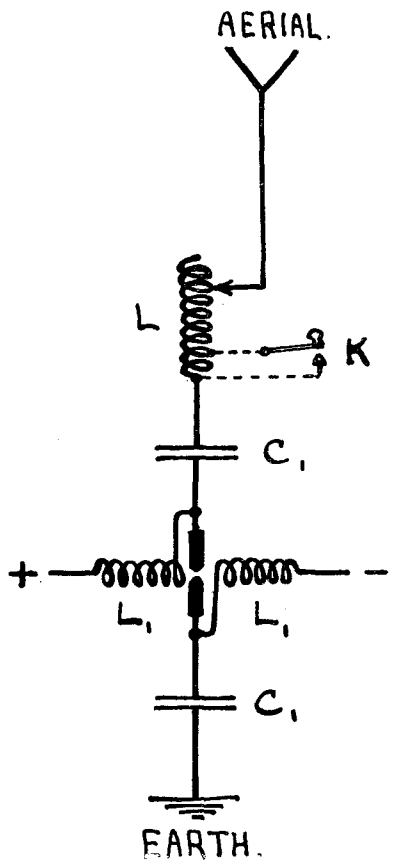


FIG. 29.—CONNEXIONS OF POULSEN TRANSMITTING SET, USING SPACING WAVE.

In the method of signalling just described two different wave-lengths are monopolised by each station. This is a disadvantage. With the continual increase in the number of wireless stations the difficulty of choosing wave-lengths so as to avoid mutual interference between stations becomes greater and greater. If every station takes two wave-lengths for itself this difficulty is, naturally, much increased.

Another method of signalling has therefore been developed in which, although the arc is kept burning continuously, waves are only radiated when the key is depressed. When the key is raised an artificial non-radiative oscillatory circuit, known as the "back shunt," is substituted for the aerial circuit. The arc continues to oscillate on this artificial circuit, but no waves are sent off.

The arrangement is shown in Fig. 30, in which the pieces of apparatus which are common both to the back shunt method and to the spacing wave method, have been lettered similarly to Fig. 29.

The change over from aerial to back-shunt and *vice versa*, is performed by a special key K_1, which is actuated electro-magnetically from the hand key K. The key K_1 consists of a massive

fixed contact C, and two moveable contacts A and B. These moveable contacts are carried on springs which in each case tend to spring inwards, so as to bring the contact block mounted on their ends against the fixed contact C.

A rod R, running at right angles to the contact springs, carries two cross-pieces D_1, D_2, which engage with the upper and lower springs respectively, as shown in the diagram. This rod is normally held up by a spring, but it can be drawn down by the pull exerted by the current in the coil M on an iron armature carried on the end of the rod.

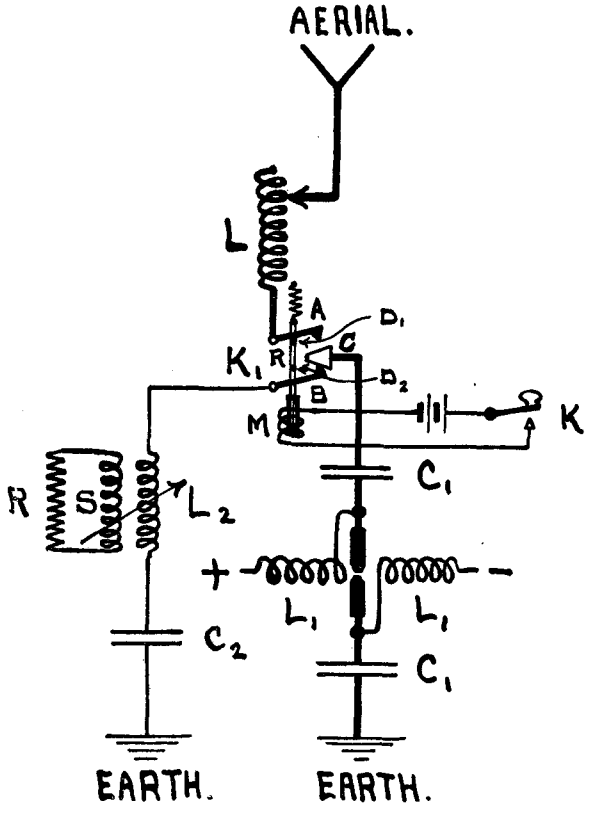


Fig. 30.—Connexions of Poulsen Transmitting Set, using back shunt.

The upper contact spring is joined to the aerial, and the lower spring to the back-shunt circuit L_2 C_2.

When the key K is at rest the rod R is raised by the spring, and the upper cross-piece D_1 lifts the contact spring A away from the contact C. At the same time the lower cross-piece is raised away from the contact spring B, so leaving this spring free to move upwards and to make contact with C. Thus the arc is now joined to the back-shunt circuit.

When the key K is depressed the rod R is drawn down. The upper cross-piece C_1 moves down, allowing the contact spring A to descend and to make contact with the contact C. The lower cross-piece D_2 now engages with the contact spring B and pushes it downwards, so breaking the connexion between B and C. Thus, the aerial is now joined to the arc, while the back-shunt circuit is disconnected. The positions of the cross-pieces on the rod R are so adjusted that contact is made by A before it is broken by B, or *vice versa*. By this means the arc is never disconnected simultaneously from both the aerial and the back-shunt circuit, so that it continues to burn steadily.

In order that the conditions under which the arc burns may be as nearly as possible the same, whether it be joined to the aerial or to the back-shunt circuit, the "damping," or the rate at which energy is dissipated, in the back-shunt circuit is made equal to the damping in the aerial. In the aerial the greater portion of the energy which disappears is radiated in the form of electro-magnetic waves. The back-shunt circuit does not radiate, and therefore some other means of getting rid of the energy must be employed. The method adopted is shown in Fig. 30.

The inductance L_2 in the back-shunt circuit is made the primary coil of a transformer, the secondary coil of which is S. In series with S is the resistance R. The coupling between L_2 and S is variable. The more closely S and L_2 are coupled, the greater is the amount of energy taken from the back-shunt circuit and dissipated in the resistance R. The coupling is adjusted till no change is produced in the oscillatory current whether the oscillations are taking place in the aerial or the back-shunt circuit, that is, whether the key K be raised or depressed.

(To be continued.)

REVIEWS.

"*Real Mathematics: An Aid to the Study and Comprehension of Mathematics.*" *By Ernest G. Beck, Wh. Ex., Assoc.M.Inst.C.E. Published by Henry Frowde and Hodder & Stoughton, 1 & 2, Bedford Street, Strand, W.C.2. pp. × + 306. Price 15s. net.*

This book has been written as an aid to the acquisition of a really serviceable grasp of mathematics by men who have to use this subject in the course of their practical work.

It is not intended as a substitute for the more orthodox text books, but rather as supplementary to them. The special method by which the subject is dealt with gives living reality to what, unfortunately, is so often to the student merely a collection of dead symbols.

The author takes the mathematical operations concerned in ordinary engineering, from addition to integration, and shows how each process can be represented by well understood terms and operations of every-day life. For instance, in dealing with the rule of signs in multiplication, the mathematical symbols are translated into statements of the financial operations concerned in the payment of bills, and by this means this somewhat difficult point for a beginner is made transparently clear.

Every operation is treated on similar lines, abstract argument being in each case replaced by the visualisation of the actual reality. There is no doubt that such a method of dealing with the subject will be found of great use to all students of mathematics. The author concludes the preface by saying that "the scope of the present volume has been confined to such branches of the work as are most useful to the ordinary engineer and student. Much more is available if required." We hope that the author will shortly bring out the second volume at which he hints. It should meet with a reception as warm as that which we feel sure will be accorded to the present book.

Questions and Solutions in Magnetism and Electricity. By Mr. William J. White, A.M.I.E.E. Messrs. S. Rentell & Co., Ltd., 36-39, Maiden Lane, W.C.2. Price 2s. 6d. nett.—Any student desirous of obtaining the certificate awarded by the City and Guilds of London Institute in Magnetism and Electricity, will find this collection of questions and answers extremely useful not only as a guide to the kind of questions which are likely to be asked, but also as a guide to the most satisfactory way in which they may be answered.

Common Battery Telephony Simplified. By M. Walter Atkins, A.M.I.E.E. Benn Bros. Ltd., 8, Bouverie Street, E.C.4. Price 8s. 6d.—This, the fourth edition of a book which is familiar to many telephone men, has been completely revised, obsolete matter having been deleted, and new diagrams added. The subject matter is clearly and succinctly dealt with and the combination of a list of diagrams and a good index should make ready reference easy.

"Continuous Wave Wireless Telegraphy." By B. E. G. Mittell. Published by Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C.2. pp. vii × 133. Price 2s. 6d. net.

During the last few years the spark system of generating the high-frequency oscillations, used to produce the electro-magnetic waves employed in wireless telegraphy, has been entirely superseded, as far as long-distance wireless stations are concerned, by the continuous wave system. This system is also, to a very large extent, replacing the spark system for medium and low-power stations. It is therefore, important that wireless men should be acquainted with continuous wave working, and the small book under review has been written to supply this need. The three methods of producing continous waves, by the Poulsen Arc, high-frequency machines, and valves, are all described in as much detail as the limits of the book permit. The special methods used to receive continuous waves are also described.

The book is very clearly written, the printing is good and the diagrams are very well reproduced. It is an excellent summary of a subject which is of great and growing importance.

POST OFFICE ENGINEERING DEPARTMENT'S DINNER.

A VERY successful and well attended dinner was held on Feb. 17 at the Connaught Rooms, Sir William Noble being in the chair. We append extracts from the chief speeches :

The RIGHT HON. H. PIKE PEASE, M.P., proposing the health of the Engineer-in-Chief's Department coupled with the name of Sir William Noble, paid a high tribute to Sir William's energy and initiative. He said that the amount of work which was being done by the Post Office at the present time was enormous, and he would think it was greater than that done in any other country in the world. At the present moment there were six thousand million postal packets posted every year. And in contratulating the engineers on the work accomplished he hoped they would forgive him if he said something in regard to that work. With regard to the main underground, good progress continued to be made and during the past year 720 miles of single way duct were laid and 116,000 miles of double were drawn in. Numerous new cables between large towns had been brought into use since March 31 last. With regard to the local underground, in connexion with the extension of local telephone facilities approximately 1,000 miles of single duct were laid and about 100,000 miles of double were drawn in. About 500 overhead trunk circuits were provided, involving the erection of approximately 10,000 miles of double wire. In regard to internal telephone works, in addition to a large number of minor exchanges there were no less than 22 new manual exchanges opened during 1921, providing accommodation for approximately 33,000 subscribers. There were also 11 new exchanges and 13 extensions ordered during the year. These would be completed by degrees to provide for a further 16,000 lines.

Among the new exchanges was the London Toll Exchange and this plant was designed and installed for the purpose of affording rapid service over shorter trunk lines and had enabled relief to be given to the London trunk exchanges by removing a large number of circuits working between London and the nearer Provincial towns.

He would like to say one or two words also in regard to telegraph works. The chief feature of telegraph development was the large extension of machine-printing apparatus, mainly Baudot Duplex, relieving the operator of the nerve-racking system of Morse. Questions on this subject were often raised in the House of Commons, and he had had the opportunity on many occasions of arranging visits to the C.T.O. from men who hold important positions. The speed of the Imperial Cable in the westward direction had been improved by the use of new apparatus. The extended use of the Post Office "G" relay had enabled additional circuits to be worked without the use of repeaters, saving considerable expense both in first cost and maintenance. Also a new method of automatic through switching of telegraph circuits based on the same principles as the automatic telephone, had now been developed and promised good results.

The Chairman, SIR WILLIAM NOBLE, thanked Mr. Pike Pease on behalf of the engineering department for filling the breach caused by the absence of Mr. Kellaway, and undertaking the duty for which he was to be responsible. He would like to mention one or two points to which he referred last year. One of the things was that shortly before their dinner took place in 1921, a Parliamentary Committee had been appointed to inquire into the telephone service. Little did he think that this year he would not be able to give his opinion of the report of the Committee, but Parliamentary Committees moved slowly as a rule. This particular Committee must have found its task very much more difficult than a certain other Committee which was appointed at a much later date, and which covered the whole field of Government Departments, took evidence from all these departments, had issued two voluminous interim reports, and would furnish a final report by the end of the month.

One other matter that he referred to last year was the conditions in regard to telephone work. He stated that there was a great shortage of material ; that prices were high ; and that contractors were giving long dates for delivery and even these dates they did not keep to. He was glad to say that in these respects things are now much better. There was more raw material ; prices had fallen and dates for contracts were very much shorter. Unfortunately, however, work had fallen off. They knew that good trade and good telephone business go hand in hand. There had been a great slump in trade and it had its effect on the telephone work. That was shown in the department by this fact ; that last year at this time they had a staff of over 26,000, this year it was about 24,000, a falling off of over 2,000. This was very regrettable at such a time of unemployment. They were only hopeful that trade would revive and the telephone business would revive along with it.

One other matter. They know that there was an economy campaign. He had referred to a Committee which has been dealing with the subject. They might save the millions from departments which are not revenue earning departments if they would only keep their hands off the revenue-earning departments. They had never had a chance to bring the telephone plant up-to-date so that they could meet every demand promptly. This was an excellent opportunity when trade was not good, and telephone business had, as he had said, fallen off, to bring their local and trunk systems right up-to-date so that when trade revived no business man would have to wait for weeks for his telephone. He hoped, therefore, there would be no cutting down of their programme for next year.

MAJOR PURVES said that his duty was the light and pleasant one of giving the toast of their visitors. In the course of his speech he made references to Mr. Pike Pease, the Secretary, Mr. L. B. Atkinson, Mr. Wordingham, Sir John Snell, Sir W. L. Mitchell, Sir Alex. Richardson, Mr. McQuarrie, Sir W. J. Noble, Sir Tom Callender, Mr. Raven, Mr. Kidner, Sir Andrew Ogilvie, Sir Robert Bruce, Messrs. Morgan, Kempe, Stubbs and Moir, and Dr. Walmsley.

They were pleased that members of the great Bell organisation thought it worth their while to come over here to see what the Post Office could show them.

He heard that Mr. McQuarrie a few days ago, after having a conversation on one of their high-frequency carrier wave channels between London and Bristol, expressed the opinion that the transmission of speech was uncommonly good. He did not know that he actually said it was much better than anything of the kind he had heard in America, but it was rather inferred, from the excited expression on his face, and the trembling of his hands, that that was so.

The department had recently been a target for many ill-balanced attacks on account of the backwardness of British telephone development as compared with that of the United States, and they were aware that the manner of these attacks had made their friends at the head of the American Bell organisation both sorry and indignant. They knew that there was nothing more irritating to a well-disposed man than to have his perfections and accomplishments used, ignorantly and malevolently, as a rod to be laid on the back of his friends. Mr. McQuarrie was sailing for home to-morrow and he would ask him to assure their friends in the States that in that matter they had their sincere and affectionate sympathy.

SIR JOHN SNELL said he would like to take the opportunity of making some reference to the telephone position. He had often thought in reading of the complaints in the press against the department for what was termed inefficient telephone service, how little the public and the press really knew of the true position. Without in any way attacking the National Telephone Company, or his old and trusted friend, Mr. Gill, it was the sheer force of circumstances prior to 1912, namely, the purchase, the impending purchase of the Company's system which, not unnaturally caused those who were directing their affairs to spend as little money as possible on the expansion of the system. And it naturally fell to this department and the Post Office, when the telephones were transferred, to have to buckle to and make up the lee-way in order to bring the system up to a most efficient position. He ventured to say, without fear of contradiction, that had it not been that some 18 months later they were met by the circumstances of the Great War, the department would by now and for several years past, have overtaken the arrears of work and put the telephone system in as high and efficient a position as any engineering work of that kind could possibly be.

It seemed to him that the knowledge of the Engineer-in-Chief of a great department like that and of the principal engineering officers must be almost enclyclopædic, because not only had they to deal with past telegraph systems; not only land, but marine, with wireless telegraphy on a big scale, but even with great engineering problems which, if anyone would only visit such a place as Mount Pleasant or some of the other big distribution centres of the Post Office Engineering Department, he would see for himself the mechanical devices and time-saving devices indicative of engineering skill of the very highest character. The public, he was perfectly convinced, did not in the least appreciate the real and immense engineering knowledge which is necessary to the staff conducting this great work.

SIR EVELYN MURRAY, K.C.M.G., in proposing the toast of the Chairman, said he personally had the highest respect and admiration and some feelings of awe for engineers in general. They provided us with many services that were useful and indeed necessary. He had especially a feeling of awe because

he knew perfectly that if by any chance one cornered them in a discussion, they could always relapse into a technical jargon, which, to him, was equivalent to an unknown tongue quantity. He had specially an affection for Sir William Noble because, in the many discussions which they had from day to day, he had always refrained from using his natural advantages in that respect. If he had any complaint it would be this: the pertinacity and vigour with which he pressed what he considered the legitimate claims of his staff, but in that assembly that quality would not be regarded as a defect.

SIR WILLIAM NOBLE, in reply, said that he would like to endorse heartily that the Secretary did not obstruct the Engineering Department. There are some people who said that you could not get successful telegraph and telephone business with the management in the hands of the Secretariat. It was entirely wrong. Every business must have a General Manager and there was no business in which a General Manager interfered ess with the technical work than did the Secretariat. He had been most ably supported by the whole of the staff. Any success he might have as Engineer-in-Chief to the Post Office would be largely due to the hard work and the loyalty of his staff.

THE BAUDOT—XXXI.

BY J. J. T.

The Selector Levers.—Should it become necessary to remove these levers they should be replaced in the same order, and to this end it is usual to number them 1 to 5. Once correctly fitted, and frail as they may appear to the eye, it is seldom that they need repair. Should one become broken it should be replaced by one of identical number. It may happen that the foot of a selector lever may prove very slightly longer or shorter than normal. This will evidence itself in certain irregular vibrations producing irregular and unlooked-for movements. This may be recognised by the fact that if the pressure of the propulsion lever spring be *increased* (by gentle pressure of the finger upon it), the irregularities will become accentuated by selector levers *other* than the one the foot of which is of abnormal length.

The axles of these, when in action, should not protrude sufficiently to touch the propulsion lever. The thickness of an ordinary piece of Baudot slip will prove an index of sufficient clearance.

Be sure that the head of each lever is perfectly free in its movement with respect to its neighbours, or false letters will result.

The Propulsion Lever Spring.—This (Fig. XLVIII S. Vol. VII, No. 70) should have a tension sufficient to permit of the easy movement of the selector levers. It will be recalled that the propulsion lever (Fig. LXVIII OO^1) governed by this spring forms part of the sixth or foot-less lever and thus controls the pressure upon the entire combination of selector levers. Too strong a tension of this spring produces abnormal wear and tear both of the selector levers and also of the combiner itself, together with an undue rebound of the former upon their replacement.

The Propelling Rod (Fig. XLVIII R).—The freest possible play should be given to this rod. To prove, slacken the propulsion lever spring. The rod R, the short arm *f*, and the pedal P should all fall back easily.

The Pedal Spring (Fig. XLVIII F) should only have sufficient tension to just hold the retaining click C in its rest position of engagement ready for release by the down-thrust of the hammer head H.

That all the various moving parts mentioned above should be kept carefully lubricated will be fully appreciated without further comment.

The Impression Wheel (V^1 Figs. XLIX and L, Vol. VII, No. 72).—The 31 slots on this wheel correspond with the 31 possible positions on the combiner discs. To ensure correct printing the impression lever and cam Ca (Fig. LI) must engage in the slot which corresponds with the letter desired to be printed. To obtain this position it is necessary to fix the impression wheel V^1 upon the axle X^1 in correct relationship with the combiner discs.

The method suggested as the most practicable is the following: Bring the first selector lever only into action (this represents the letter A of the Baudot code) and turning the combiner wheel gently with the hand watch the impression lever and its releasing mechanism very closely, adjust the impression wheel on the printing axle X^1 to that position where, when the hammer head H shows the maximum gap between it and the cam of the impression lever, Ca is exactly opposite the first tooth of the impression wheel. The adjustment of the impression wheel to this position is made possible by loosening the binding screw *e* so that the catch E can be moved to the required point, thus carrying the wheel round with it.

The Type-Wheel.—The adjustment of this wheel is made by means of the screws fixed on the face of the wheel, taking the letter M or W for preference as a standard for adjustment. Faintness of the right or left side of the type may be corrected by scrupulously fine movements of the type-wheel in the necessary direction, the wheel being finally fixed in position by means of the screws mentioned. M and W being correctly printed make a further test with C and O. Then prove the entire alphabet. To ensure perfect printing of letters and figures it is at times necessary to adjust the inversion or figure and letter shift lever. For example, if the left leg of the letter M is faint and the right heavily typed, the inversion lever has moved through an arc larger than the $4\frac{1}{2}°$ which is the limit allowed for the movement of this lever, *i.e.*, the type-wheel has also shifted to a similar point of inaccuracy. The limiting screws are the cause.

(To be continued.)

THE IDEAL SUPERVISOR.

FROM the point of view of both department and staff, the ideal supervisor must possess certain attributes, one of the most important of these being the power to control. It is necessary for her to possess a distinctive personality in order to maintain discipline. She must be firm in her manner without adopting an overbearing attitude, for that produces either open rebellion or a sullen rendering of duty. She should also possess self-control to enable her to act with promptitude and decision in all cases of emergency.

Adaptability.—She must learn to adapt herself to her surroundings, and depend upon it she will be all the happier. It stands to reason that while in the service of the department she will do well to adopt the methods or systems which prevail.

Sympathy.—Sympathy in the broadest sense of the word, is also an indispensable quality; that is, not merely the sympathy one extends in cases of illness or bereavement, but a feeling of real human interest in the members of the staff, who should be able to feel instinctively that when difficulties arise with which they are unable to cope they can rely upon the ready sympathy and better judgment of their supervisor, whose wider experience will enable her to be helpful in effecting a remedy.

Tidiness.—It is an undisputed fact that children reflect the virtues and vices of their parents, partly as a result of environment. This may be said to be true of staff and supervisor, though perhaps in a lesser degree. Human nature is perverse and there is always a tendency to copy the faults and failures of those in authority, or rather, should I say, to excuse one's own faults because one has recognised similar weaknesses in a supervisor. The fault of untidiness, for instance, is one which renders itself open to imitation only too readily. A switchroom strewn with pieces of paper and presenting a general air of untidiness, is the reflex of an unmethodical brain, besides being a most unpleasing sight to anyone who enters. The value of tidiness, both personal and in the arrangement of papers, &c., cannot be over-estimated. "A place for everything and everything in its place," is an old maxim, but the principle is one which means considerable economy of time, and ensures much tranquility of mind in times of stress.

Consistency.—Above all a supervisor must not be erratic, nor must she be influenced by personal likes and dislikes. If she would gain the confidence of her staff she must be consistent in her demands upon their efforts. If she succeeds in making them understand that only their most conscientious work will be acceptable, and that such work will meet with her approbation, she will have done much towards securing the harmonious working together of herself and staff.

The ideal supervisor will take a broad outlook on life, and although during working hours she will throw herself heart and soul into her work, she will not let it be her companion in her leisure hours. She must be able to enter into the social life of the department, for it is during our social hours, when strict discipline is relaxed, that sometimes hidden virtues reveal themselves, and help us to understand each other. Social life and widened interests will help her to throw off the hundred and one worries of the day, and will enable her to return to her duties morning by morning with a clear brain and renewed energy. Thus she will be able to tackle more successfully whatever the day may have in store.

"OPTIMIST" 2.

TELEGRAPHIC MEMORABILIA.

DOUBTLESS few readers interested in telegraphy have missed reading that highly interesting paper by Mr. J. Stuart Jones on "Telegraph Mechanical Aids from a Traffic point of view," published in the March issue of the T. AND T. JOURNAL.

One cannot, however, quite agree with perhaps the only dogmatic statement in the entire paper when he says:—"The evolution of the multiplex should clearly be in the direction of page or form printing." Why? "The pasting of Baudot tape on a form is a rather messy operation, and the result is not a pretty form of telegram," is apparently the reply. There are in the C.T.O. some of the daintiest attired women in the City and yet they manage very deftly to gum up slips without making either a fuss about it or a mess of it. There are in the C.T.O. men also who well-groomed, accept the task without pother and turn out thousands of telegrams per annum which certainly do not present anything approaching a discreditable appearance. I would even venture to say that the "messy" operation of gumming slip does not leave the hands in half so hopeless a mess as handling carbons when making "multiples." Mr. Jones gives pride of place to Creed for Press, and rightly so, but here again gumming of slip is an essential part of the operation. Who grumbles? In the same paper appears the following: "We must not overlook, for example, the Siemens-Halske apparatus." Again agreed, but here also an essential part of the reception is the gumming of slip. It may be that the Government telegraphs have not yet devised the method par excellence of dealing with the gumming of slip. In Germany and also in France, scissors are used for cutting the slip, a method which does not appeal to the writer. The Eastern Telegraph Company have a small device the cost of which cannot be more than a few pence, which certainly facilitates the gumming process admirably. It would be interesting to know, too, what constitutes a "*pretty* form of telegram." Much depends upon the actual form provided. What the business man desires is a clearly printed telegram. He really doesn't care a jot about aught else unless it be a form sufficiently sturdy to survive handling and ultimate filing.

The paper read by Miss Herring of the C.T.O. before the members of the T. and T. Society on "Women as Civil Servants," was in all respects an admirable effort. Logical to a fault in some respects, it was indelibly marked by that sincerity of purpose and that quiet confident conviction which is a feature of Miss Herring's personality. Whether it was that so far as the male audience was concerned the speaker was preaching to the converted or whether the presence of Miss Liddiard in the chair made the men speakers stumble at the outset in the unusual form of address "Madam Chairman," one cannot say. The truth must, however, be told that except in the case of the speaker who practically closed the comments of the audience, the remarks of the sterner sex were particularly stumbling and halting. On the other hand, of the ladies who were present in the audience, strangely enough there were very few, not one rose even to express appreciation of the paper which must have meant hours of hard work on the part of the reader of the paper. I recently came across in the columns of of *The Bookman's Journal*, the following item, which although probably known to Miss Herring, may possibly prove interesting to the wide circle of our readers. It is the undebateable evidence given of an actual printing and publishing business carried on by a woman in the 16th century. It appears in the title page of an old book and runs as follows: "*Endimion, the Man in the Moone*, by Lyly, printed and published by Widdowe Broome, 1591."

The *Manchester Guardian* is responsible for the following:—A trial is to be made or is at the moment being carried out with a view to the development of a rapid telegraph service in Germany. Berlin and Hamburg are to be the testing points of the experiment." *Lightning wireless* stations will be established in both towns. A telegraph message can be telephonod to one of the stations. It will be transmitted by wireless to the other, and from there it will be telephoned to the person to whom it is addressed. The charge per word is to be 50 marks, with a minimum charge of 500 marks for the entire telegram. It is assumed that once the service is in working order it will be possible to receive a telegram a few minutes after it has been sent.

Very large orders for telegraph and telephone equipment will be placed by the Australian Commonwealth during the coming few years. It is possible that a loan of about £10,000,000 will be issued on this account. British manufacturers will doubtless keep an ever open eye on these possibilities.

From all I hear the workshops of the Indian Telegraph service at Alipore are making considerable strides. A system of apprenticeship has been introduced as an experiment which it is hoped will gradually produce a type of better skilled workmen. The extent of these works on a nullah of the Hoogley may be gathered from the fact that telegraph apparatus, telephone switchboards, steel poles and masts, cable plant, tubing, nickel plating, galvanising and the maintenance of no less than forty motor lorries, form only part of the regular output of this undertaking.

In the second Interim Report of the Committee of National Expenditure, the following appears under "Telegraph Subsidies:"

"There are only two subsidies now covered by this Vote of £10,800, viz.: (1) to the Eastern Extension Telegraph Company; and (2) to the West India and Panama Telegraph Company. As regards (1), this is a subsidy of £2,800 a year, paid to the Eastern Extension, Australasia, and China Telegraph Company in respect of the cost of maintaining the cable from Chefoo to Wei-hai-Wei. This arrangement may be terminated at any time by three months' notice. We are informed that, as part of the recent general agreement with China, the Government have already agreed to give up Wei-hai-Wei. In these circumstances, we recommend that the arrangement with the Telegraph Company should be terminated at the earliest possible moment, with a consequent saving of the subsidy."

A correspondent reminds us that Mousehole, the landing place of the Imperial Cable, was also the scene of another and unique landing, namely, that of the Spaniards, and was the only piece of English soil upon which they ever set foot Mackerel and pilchards also land there, was the further comment of a local fisherman!

The Swiss Government has issued the first printing of 10,000 telegraph forms upon the back of which an advertisement of a butter substitute is displayed. This has been done to assist in reducing a deficit.

The *Westminster Gazette* recently informed its readers that a new wireless telegraph station, built entirely by Russian workers, is nearing completion at Detskoje Selo. It has for some time been known that the Russians were actively engaged in developing the most modern features of telegraph. There is, for example, a wireless laboratory at Nijni Novgorod, where, according to Soviet information, one of their engineers has successfully demonstrated his automatic radio-telegraphic apparatus for receiving dispatches and printing them automatically with remarkable rapidity. One surmises something after the pattern of the Siemens system in this connexion.

Ordinary telegraphic and wireles communications were programmed to be resumed between Italy and Russia about the commencement of last March.

British wireless amateurs may be interested in the following information culled from the columns of the American *T. and T. Age* referring to "Broadcasting" and wave-lengths:—"The wireless wave-lengths assigned by the American Government to the different classes of stations are roughly as follows:—Trans-Atlantic, from 12,000 to 16,000; limited commercial service, from 2,600 to 2,700; Post Office, from 3,000 to 4,200; Navy, from 600 to 1,600; commercial, from 300 to 600; special amateur, from 275 to 350; and general or restricted amateur, 200 metres. Wireless inspectors have recently been authorised by the Department of Commerce to insert in all general and restricted amateur station licences the following:—'This station is not licensed to broadcast weather reports, market reports, music, concerts, speeches, news, or similar information or entertainment.'"

As is well-known in wireless circles, the Westinghouse Company of the U.S.A. opened a radio service at E. Pittsburg, Penn., twelve months ago. This has been taken advantage of by many folk across the Canadian border. The broadcasting programme of this enterprising service includes the usual musical items, but adds what must be unique features in its "Talks to farmers and sailors" and "Bed-time stories for children."

The celebration of the jubilee of the Institute of Electrical Engineers has naturally given added interest to the development of wireless telegraphy. Correspondence in *The Times* claimed on behalf of David Hughes that as far back as 1879 the latter had discovered electric radiation, but had permitted himself to be argued into the belief that the efforts observed were those of ordinary electro-magnetic induction. Evidence of this is given in a letter to the *Electrician*, of May 5, 1899, Vol. XLIII, and an interesting forecast was also made by the late Sir William Crookes in the *Fortnightly Review* of February, 1892, in an article entitled "Some Possibilities of Electricity." Another correspondent maintains that long before 1879 Joseph Henry of the Smithsonian Institution of Washington as recorded in his "Collected Scientific Papers," noted certain effects which he suggested were those due to the action of electric waves at a distance. The whole history of human knowledge is a repetition of these examples of men widely parted by time and space stumbling upon the same secrets of Nature yet only half-recognising them. Thus sings Alfred Noyes:—

> Have you no song, then of that nobler war?
> Even of this victory that they helped to win
> Silent discoverers, lonely pioneers! . . . . .

There will probably always be a number of phenomena which we humble folk, moving about at our daily tasks, pass over unnoticed every day which, if observed by the *right* man or woman, might open new vistas of electrical exploration. It was a professor of science who once observed that he wished he could have the same facilities of watching the effects of an electric discharge through a long submarine cable as was the good fortune of many a telegraph test-clerk. The writer some years ago was asked by a little messenger boy why when we turned the motor switch of the Hughes instrument from "off" to "on" the needle of the *line* galvanometer gave a slight swing over. Shame on me I had never noticed it till then. However, he "supposed" it must be the disturbance caused by the first rush of the current. Fortunately, I was able to save myself from complete self-contempt by realising that this youngster also had discovered wireless.

I was really jealous of Youth and its twentieth century facilities for acquiring knowledge when, on a recent occasion a privilege ticket permitted me to be present at a students' lecture of the Regent Street Polytechnic. There, Mr. Gill, the European Manager of the Western Electric Company, presented their admirable film of the Action of the Thermionic Valve to a keenly interested crowd of young men—budding engineers. A few grey-heads managed to hide themselves in the back or side seats, otherwise it was Youth with a big Y, and yet not unduly assertive. Whatever of haziness may have possessed the slow-moving brain of the writer prior to his view of the film and its clear-cut exposition of valve action, certainly one felt a sense of having thoroughly gripped the subject as the last few feet of the reel rolled off and left the blank screeen before us.

We note with extreme pleasure that the Edinburgh Telegraphs have started a T. and T. Society under the presidency of Brigadier-General Price, C.B., C.M.G. Now we wonder if our old friend Major Jayne had anything to do with the inception. London will have to look to its laurels, for once the city of light and learning with all the talent which it is well-known lies latent therein sets its hand and will to a work of this kind it will not be satisfied with the mediocre.

So there is dissatisfaction in Bombay, Calcutta and Rangoon over the telephone service of these cities, and yet they are in the hands of private companies. The Government have intervened apparently and one learns from Indian engineering and other papers that "the companies are willing to extend their systems, and to install improved apparatus on condition that they are guaranteed security of tenure under their licences for a further period of at least 20 years. They insist that in view of the increase in working expenses, and the additional capital outlay that is involved, *some enhancement in the maximum connexion rates charged the public shall be allowed.*" The italics were not in the original press statement !

Spain, by the way, is nationalising her telephone system, and it is expected that within five years all the circuits will become Government property. Although concessions to operate telephone systems in Spain were granted for periods in some cases of over forty years, all contained a reversion clause whereby the Government had the right to take over the lines without remuneration at the expiration of a certain period.

Mr. R. Hill, Superintendent, C.T.O., "handed in his checks," as he once put it, so far as his official career was concerned just before our last number went to press. "Bob," was one of those bluff hearty types of the old rough and tumble days of telegraphy, when at race meetings and other special events all sorts of conditions of "temporary accommodation" were provided for, or annexed by the special staff delegated for the duty, and when the strict application of *per noctem* and other similar accountancy terms were neither requested or enforced. His knowledge of telegraphy was of a very practical and efficient character, and he was enthusiastic of the efficiency of the good old times. That the excellent health and strength with which he quitted the service may follow him through many long years is the united wish of the C.T.O. May he live long to sit by the fireside of some cosy way side inn and recount his many cheerful reminiscences of old-time telegraphy and that behind the smoke of a "*churchwarden.*"

Liberty.—It is important to give the freest scope possible to *un*customary things in order that it may in time appear which of these are fit to be converted into customary things.—JOHN STUART MILL.

Light.—The pressure of light on the whole surface of the earth is about 75,000 tons weight. A wave of orange light completes about five hundred million million vibrations in one second.—P. PHILLIPS, D.Sc., B.Sc, &c.

J. J. T.

LONDON ENGINEERING DISTRICT NOTES.

Carrier Current Telephony.

A PAPER on the above subject was read before a meeting of the Institution of Post Office Electrical Engineers on Wednesday, March 8, by Messrs. C. A. Taylor and R. Bradfield, of the engineering department. The subject is one that has received considerable attention of late, particularly in the United States of America, where, owing to the great distances between some of the important towns, there is a greater field of usefulness for the system. It came as a surprise to many in the audience to learn that moderately successful experiments in carrier current telephony were carried out as far back as 1895. In the words of the authors the theory on which the system rests is simple. An alternating current of frequency above the audible range is generated by any suitable means. The amplitude of this carrier current is then made to vary in accordance with the slower oscillations of the voice impressed upon it and the carrier current so modulated is sent out to line. At the receiving end the whole received current is rectified, and the result of this operation in effect is to eliminate the carrier waves and leave only the slower audio oscillations by which the carrier wave had been modulated. By selecting a number of different frequencies for carrier purposes, a corresponding number of channels can be provided and multiplex telephony attained. It goes without saying that the modern magician's wand—the thermionic valve—plays an important part in the system as an oscillator for producing the high-frequency currents and in conjunction with the transmitter as a modulator. For practical telephony some form of signalling over the circuits is necessary, and the authors described two practical methods of providing for this.

The conclusion arrived at by the authors as a result of their experiments is that the system is not likely to be of value in this country for providing trunk circuits between large centres because such circuits can be supplied more economically by means of light gauge cable and repeaters, but that it should be useful as a means of adding one or more trunks to distant or out-of-the-way exchanges where the number of circuits would not justify the laying of telephone cable.

Things not mentioned by the Press.

As probably all readers of this JOURNAL will not purchase the Geddes Committee's Report, and may form the opinion by reading the daily papers that the Committee had nothing good to say about any of the Civil Service departments, they will be pleased to have an opportunity of reading the following observations on the Post Office engineering department culled from the Third Report :—

"We have examined very carefully the various methods which are employed to secure a satisfactory output of work from each workman. The total time occupied by the workmen on maintenance is divided by the number of units maintained and the average cost of maintenance per unit per week is arrived at. By this means the Engineer-in-Chief keeps in close touch with the cost of maintenance in each of his districts, and is able to compare the results obtained in various districts.

In regard to construction work, progress reports are compiled which enable the Engineer-in-Chief and the Superintending engineers to ascertain the cost under each item of work.

We find that the results for the various districts are circulated to all Superintending engineers, so that a laudable spirit of rivalry is encouraged

In this department there is a systematic compilation of results and circulation of information."

Convivial Gatherings.

Two events of interest to engineers took place during February. The first was the annual dinner of the Post Office engineering department which was held at the Connaught Rooms, Great Queen Street, on Friday, the 17th, and of which a report appears elsewhere.

The second event was the annual dinner of the Institution of Electrical Engineers, held at the Hotel Cecil, on Tuesday, the 21st. Owing to the sudden illness of Mr. Highfield, the chair was taken by Dr. W. H. Eccles, D.Sc., F.R.S. The gathering was of especial interest to Post Office servants by virtue of the fact that the Postmaster-General was the principal guest of the evening. In giving the toast of the Institution of Electrical Engineers, he referred to the fact that the Institution was founded by telegraph engineers fifty years ago, and that the original membership of 100 had increased to 10,000. Mr. Ll. B. Atkinson in proposing the toast of "Our Guests," paid tribute to the good work done by Sir W. Noble in helping to swell the membership by inducing so many Post Office engineers to join the Institution.

Western Telephone Cricket Club.

A really excellent concert in aid of the Western Telephone Cricket Club, which is formed from the members of the West External and Internal Sections, was given at the Town Hall, Chiswick, on March 8. There was a large attendance, and it was pleasing to note the presence of Mr. and Mrs. McIlroy, with whom were Messrs. Cardrey and Wilson, the joint presidents of the Club, together with Mr. J. L. Brown, the popular chief of a neighbouring section. The Committee are to be congratulated on a successful evening, and a special word of praise is due to Mr. H. F. Walker (Park Fitting) for arranging such an excellent programme. Such social events bring the staff into closer relationship and tend to produce a better understanding all round, which is to the good of the service.

The "Denman" Chess Club has signalised its entry into the Civil Service and Municipal Chess League by winning seven of the first ten games played. Needless to say keen rivalry exists between the League Clubs, and the Denmanites are to be congratulated on their progress in the first year of their League experience. As results stand at present, there is a chance of the club's promotion to the second section of the League. Much depends on the result of a match game to be played within the next few days, and it is hoped that the efforts made by our chess colleagues will be crowned with success. A considerable augmentation in the membership of the club occurred this season, and it is anticipated that next year, if the satisfactory increase in membership is maintained, the formation of two match teams will be practicable.

The possibilities attending the formation of the new Civil Service Chess Association, to which the "Denman" and other service clubs may be affiliated, will not, it is thought, be lost sight of, and indeed should be an additional inducement to unattached players in the service to join their respective clubs. The Association will be affiliated to the larger service organisation recently formed, the Civil Service Sports Club. When it is mentioned that one of the primary objects of the Association is to obtain club premises centrally situated in London, the advantages accruing to membership will be apparent, the fee being purely a nominal one. The future may yet see some of our zealous colleagues playing in "Civil Service" *v.* "Rest of England."

A MILLION TELEPHONES IN THE UNITED KINGDOM.

The total number of telephones in the United Kingdom exceeded one million at the end of January last, and reached about 1,000,500, of which 984,395 belonged to the Post Office system, upwards of 13,300 to Hull Corporation, and 2,806 to the States of Guernsey.

EXTRACTS FROM THE THIRD REPORT OF THE GEDDES COMMITTEE ON THE POST OFFICE.

"We have been supplied with the following forecast of the Exchequer and commercial accounts for 1922-23 compared with the actual revenue and expenditure in 1913-14, and the estimate figures for the current year:—

EXCHEQUER ACCOUNT.

	1913-14 Audited Account.		1921-22 Estimate.		1922-23 Revised Estimate.	
	Revenue.	Expenditure.	Revenue.	Expenditure.	Revenue.	Expenditure.
	£	£	£	£	£	£
Postal ..	21,190,000	14,717,000	40,000,000	41,440,000	42,000,000	35,760,000
Telegraph ..	3,080,000	3,734,000	5,400,000	8,780,000	5,500,000	7,660,000
Telephones ..	6,534,000	5,748,000	10,500,000	16,905,000	15,000,000	13,940,000
Total ..	30,800,000	24,199,000	55,900,000	67,125,000	62,500,000	57,360,000
Excess or deficit	+£6,601,274		—£11,225,000		+£5,140,000	

COMMERCIAL ACCOUNT.

	1913-14.		1921-22 Estimate.		1922-23 Revised Estimate.	
	Revenue.	Expenditure.	Revenue.	Expenditure.	Revenue.	Expenditure
	£	£	£	£	£	£
Postal ..	23,471,000	17,299,000	46,311,000	43,850,000	46,750,000	37,640,000
Telegraph ..	3,120,513	4,332,000	5,648,000	9,315,000	5,660,000	8,000,000
Telephones ..	6,191,000	5,952,000	13,720,000	15,670,000	15,670,000	14,340,000
Total ..	32,783,000	27,583,000	65,679,000	68,835,000	68,080,000	59,980,000
Excess or deficit	+£5,200,000		—£3,156,000		+£8,100,000	

2. The volume of Post Office business is governed largely by the trade, and industrial situation, and we are informed that the Estimates for 1922-23 are based upon the present traffic, charges, and services, and that no allowance has been made for any general revival of trade. A margin has, however, been allowed for the expansion of the telephone system.

7. *Telegraphs.*—In this department quality of service and economy of operation have to be kept equally in mind.

We have made inquiry as to how the checks of the department are exercised, and find that returns are furnished to headquarters for one day per month by the smaller offices and one day in alternate months by the largest offices. By this means a check on the quality of the service is maintained.

A periodical check on staffing is also maintained by headquarters, and the following table shows for the last five half-years how the staff and traffic have varied at the 97 largest offices:—

Date.	Staff Hours.				Total Traffic (Valued).	Average Hourly Number of Telegrams dealt with per Officer— (a) By the Manipulative Staff. (b) By the Total Staff.	
	Supervising Force.	Non-Manipulative Force.	Manipulative Force.	Total Force.			
						(a)	(b)
October, 1919* ..	13,350	42,325	115,359	171,034	2,411,955	20.9	14.05
April, 1920 ..	13,652	44,280	102,744	160,677	2,254,379	21.9	14.02
November, 1920..	13,322	44,296	94,861	152,480	1,785,597	18.9	11.75
May, 1921 ..	13,640	42,060	86,042	141,743	1,975,834	23.0	13.95
October, 1921 ..	12,892	39,968	87,548	140,409	1,698,204	19.4	12.10

* Traffic inflated by Railway Strike.

It will be seen that the average hourly number of telegrams dealt with between 8 a.m. and 8 p.m. on the day of the test shows considerable variation. The Post Office regard an output of 24 telegrams per hour per operator employed on manipulative duties as reasonable for an average office; and it will be seen that the average in October, 1921, was only 19.4 per hour, a reduction of 3.6 per hour compared with the previous test, and 4.6 below standard. Similarly, although here the figure is a little more difficult to compile, 14 telegrams per hour is regarded as the average over-all output for all staff, and this figure was actually reached in October, 1919, and April, 1920. At the last test, however, the output was only 12.10.

These figures show, we think, that while there has been a steady decrease in the force employed, this decrease has lagged behind the fall in traffic. It is admitted that there is an estimated surplus of telegraph staff of about 15 per cent. over bare necessities. Telegraph traffic, however, is not regular, and we append a diagram, Appendix (B), showing the fluctuations in the average daily number of telegrams handed in throughout the United Kingdom during the last three years. We recognise that in the case of a sudden increase in traffic the staff cannot be immediately augmented by trained personnel, as it is some time before an operator can give a reasonable rate of output. Some reserve of force is therefore necessary; but we find it difficult to justify the retention of 15 per cent. surplus staff, especially as there is a staff of about 11.1 per cent. carried as a relief force to cover sick and holiday absences. Further, holidays are given during the period of maximum traffic.

The present rate of wastage is about 7¾ per cent. per annum, and this has been allowed in the Estimates for next year. We think unless there is an increase in traffic, the rate of wastage might be slightly accelerated during next year and a saving of a further £30,000 a year effected.

In reviewing the Telegraph Service we have been impressed by the full information regularly compiled as to the volume of traffic, the staff employed, and the efficiency of the service.

8. *Telephones.*—As in the case of telegraphs, quality of service and economy in operation are equally important.

A check on the traffic and staff is maintained by means of a return for one day in each quarter in the case of the larger exchanges, and for one day in six months for the smaller exchanges. We have examined the individual returns and also the summary, and are satisfied that the figures produced enable a very complete check to be kept on the efficiency of the various exchanges, and we are told that the operator is not aware when the check is being taken.

From the beginning of 1921 the traffic rapidly decreased, and the decrease was accentuated by the introduction of new rates in April, 1921. By May, 1921, when the steps taken after the Armistice to strengthen the telephone staff had produced the maximum trained staff, the busy-hour load of originating traffic per operator had fallen to about 155 "valued" calls. The standard busy-hour load recognised by the Post Office as efficient is 200.

It was estimated by the Post Office that at May, 1921, there was a theoretical surplus of 16.9 per cent. of the staff at exchanges of 300 lines or more. Recruiting was suspended, and while the staff has been reduced the number of lines had increased, which has resulted in a reduction in the theoretical surplus.

Appendices (C) and (D) give a summary of the lines, traffic, staff, and service of these exchanges from November, 1918, to January, 1922, with notes which may be of interest.

In this case also we have been favourably impressed with the information regularly compiled with a view to securing economy of operation and efficiency of service.

Of the 15,800 operators, 13,300 are employed at the larger offices, and we think that, failing a growth in traffic, recruiting should remain suspended, retirement accelerated, if possible, and an additional saving of £10,000 realised next year."

(We do not reprint the appendices owing to lack of space.)

In conclusion, the Committee are of opinion that the cost of telegraph and telephone staffs can be reduced by £40,000.

RETIREMENT OF MR. A. H. HOPKINS.

A UNIQUE RECORD.

To have spent 50 years in the service of the State is an achievement of which any one may well be proud, and we congratulate our colleague, Mr. A. Hopkins, on the attainment of this mark of distinction.

The fact that the whole of this service was in an unestablished capacity is something which the oldest member of the Department finds it hard to understand.

Mr. Hopkins was during the greater part of his official career employed as a mechanic in the Factories Department. As such he was engaged in the making, testing and repair of high-speed apparatus. Actually he was associated with the development of fast Wheatstone working, taking part in, and helping to carry out most of the experimental work in this direction. His experience was such that he was regarded rightly as a Wheatstone expert. For the last 10 years he was attached to the Instrument Testing Branch of the Engineering Department.

On the occasion of his retirement on Jan. 9, 1922, Mr. Henley, Staff Engineer, on behalf of the staff of the Instrument Testing Branch, presented Mr. Hopkins with a gold albert and with a gold brooch for his wife, as slight tokens of the esteem in which he was held by his colleagues.

A feature of the proceedings were the sentiments expressed by the various speakers testifying not only to the ability of Mr. Hopkins, but to his integrity and to his willingness to place the benefit of his knowledge and experience at the disposal of the younger members of the staff.

On Feb. 24 the presentation was completed by handing Mr. Hopkins an illuminated address signed by 107 of the staff attached to the Test Section, Studd Street, and Holloway Factory.

THE EDINBURGH TELEGRAPH AND TELEPHONE SOCIETY.

THE above Society held its monthly meeting on Feb. 28, Major A. A. Jayne in the Chair. A discussion "That temperamental suitability should be the first essential qualification for promotion," was opened by Miss A. R. Douglas, followed by Miss M. D. Moffat. There was again a large attendance, and an interesting discussion took place. The following are some of the points made during the discussion.

Miss Douglas: "In an individual sheer ability without the saving grace of sympathetic consideration of human nature should be ignored. I do not make a claim for the tolerance of inefficiency. Administrators in the service who have themselves been elevated first by virtue of temperamental suitability have it in their power to develop not only happier co-operators in the work of a public service, but a state of real efficiency as a direct result."

Miss Moffat: "The problem seems to be that with the ideal in view we must treat our present difficulty by training those who, against their wills, have been crowded into Post Office life and have little or no means of escape. Temperament is a very subtle thing, and it would be difficult for selectors to assess it in varying individuals. May not the necessary temperament be developed or even created? The training would naturally contain a new concept of the place of the Supervisor. Is he there as the master's watch-dog or as a policeman—or is he there as a guide and consultant to whom to turn in difficulty, whose training enables him to straighten out tangles, deal with a refractory individual (public or official) in the ablest manner, and generally to make him captain of the team. It is pleasing to note that such a vitally essential qualification as suitability of temperament has been organised by the National Whitley Council, in their scheme of promotion. With men and women at the heads of our departments possessing personality, enthusiasm, practical knowledge and powers of leadership and of organisation, Post Office conditions will be revolutionised."

Mr. Cormack: "If we have two Supervisors both equally efficient, but the one with a suitable temperament and the other not so suitable, we are all agreed that the one with the better temperament is the man who will get better work from the staff. At the end of 20 years' service a man may find that he is really inefficient—all that he can do is to sit down, take a sounder, and take down a message. We have Baudot, Creed, &c., and yet it is possible for a man to be in the service for 20 years and not be able to work the Baudot, Creed or Circulation. The way we can improve that, is by attention to vocational training as outlined by Miss Moffat. If we could regard our Superintendents as captains, I think the point of temperamental suitability would solve itself."

Mr. Ingram: "I have endeavoured to define the word 'temperament,' and find that Chambers's Dictionary divides it into four classes. This word 'temperament' is so very vague that we do not know where we are getting. I agree that efficiency is at the bottom of the whole thing. Efficiency will dominate temperament."

Major Jayne: "With regard to Miss Douglas's reference to efficiency, this must, of course, in its widest meaning, play a vital part in our work. It seems to me most important, particularly for us, a technical side, that we should encourage everybody to be proud of their profession. If we find things dull, as we are sometimes bound to in our daily work, let us make things brighter by making our profession nobler. This Society will, I hope, help towards that end. What we are really trying to get at in Miss Douglas's paper I sum up in the word 'leadership.' I do not think a man is a leader at all unless he has a suitable temperament. A man cannot be a leader unless he is so temperamentally suitable that everybody will follow him. The first thing for a leader to consider is the efficiency of the personnel on his section. He could, for example, ask himself 'Now, first of all, is there anything in this section that, in addition to getting the work done efficiently, is going to make life more amenable to the staff? Are the duties in my section absolutely suitable for the requirements of the traffic? Are the circuits properly arranged to meet the traffic that is coming over them? Do my subordinates in my section regard me as their leader—as a person they can come to in any difficulty—and do they regard me as being somebody who is not only willing, but able to help them?' The leader would naturally try to make himself a properly fitted person to meet all the needs of his section, and such a one would not only be temperamentally suitable from the staff point of view, but from every point of view. Administration as an applied science is, to put it in two words, 'common sense.'"

THE RETIREMENT OF MR. A. E. COOKE.

A notable personality took his leave of official life when Mr. A. E. Cooke, Principal Clerk, of the London Engineering District said "Good-bye" to his colleagues on Feb. 27 last. Mr. Cooke entered the Post Office Service at Cheltenham in 1877. He was transferred soon after to Birmingham, where he joined the engineering department in 1883. In 1887 he removed to Nottingham, and in 1901 was appointed Chief Clerk of the Metropolitan Central District. At that time there were three engineering districts in London, but by 1912 these had been combined into the present London Engineering District and Mr. Cooke was subsequently appointed Principal Clerk. Coming to London at the time when the Post Office were opening their first telephone exchange in London, Mr. Cooke had full scope for his unique organising ability. He has done his part in the development of the telephone service from its commencement with noteworthy success. He was a man of great kindness of heart, and many of his staff will treasure the memory of cheery letters received by them while serving with the colours during the war. Perhaps his chief characteristic was an untiring energy and enthusiasm for his work. The inexhaustible nature of these qualities, which years of service left practically undiminished, was always a source of wonder to his colleagues who unite in the belief that a large part of his power is still latent and also in the hope that the setting of his official sun will prelude the dawn of a bright personal life.

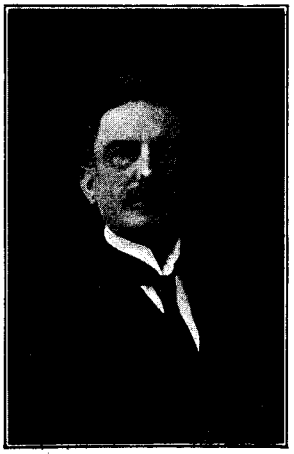
An interesting ceremony took place on Feb. 21 when a large representative gathering of the district staff met at Denman Street to do honour to Mr. Cooke. In the unavoidable and regretted absence of the Superintending Engineer, Mr. McIlroy, the chair was taken by Mr. Greenham, his assistant, who, in a few well-chosen words, expressed personal regret on parting from Mr. Cooke, gratitude for help and advice always willingly given, and best wishes for a long and happy private life.

After tributes by Mr. Freeman, speaking for the clerical staff, and by Captain Hines, on behalf of the technical staff, Sir William Noble, Engineer-in-Chief, on behalf of the united staff of the district, presented Mr. Cooke with a canteen of cutlery and a gold watch and chain in token of their regard and esteem. In doing this Sir William referred to his official association with Mr. Cooke at the commencement of the telephoning of London in 1901. He said that the four hard and strenuous years he spent as Assistant Superintendent Engineer in the London District are the only years he would not like to live over again. He recalled the nine years during which he was in the London District and paid high tribute to Mr. Cooke by saying no chief had a more hard working or a more loyal chief clerk.

RETIREMENT OF MR. T. J. CLARK, CHIEF CLERK, TELEPHONES, NORWICH DISTRICT.

IT is with regret that we have to announce the premature retirement, owing to ill-health, of Mr. T. J. Clark, who has been Chief Clerk in the Norwich District since March 1, 1909.

Mr. Clark was born in Cardiff on April 29, 1864, and entered the service of the old Lancashire Telephone Exchange, Ltd., at 38, Faulkner Street, Manchester, on Dec. 3, 1879, which was eventually absorbed by the National Tlephone Company. Following on a re-distribution of districts, by which Manchester was divided into Manchester, Bolton and Oldham Districts, Mr. Clark was appointed Chief Clerk to the newly created Bolton District with Mr. John Macfee as District Manager, and since then, has held similar appointments at Liverpool, Manchester and Norwich respectively.



MR. CLARK.

Mr. Clark was an ardent literary enthusiast and gave valuable aid to local telephone societies at the various districts in which he was engaged. He has also submitted helpful suggestions in connexion with District Office working, several of which were adopted wholly or in part by Head-quarters. Mr. Clark was best known as an ardent musician, and his services in this capacity have been frequently requisitioned in connexion with staff functions, irrespective of the important organist and choir master appointments which he held while resident in Lancashire.

On the occasion of the annual social of the Norwich District Telephone staff which was held at the Café Royal on the evening of March 7, 1922, the gathering was made to embrace both the annual meeting of the staff and a farewell to the retiring Chief Clerk.

On behalf of the staff, the District Manager, Mr. C. F. Ashby, asked Mr. Clark to accept an oak secretaire and a framed photograph of the whole of the staff with whom he was associated, with the best wishes for his future happiness. The District Manager, who spoke in the highest terms of Mr. Clark's services, was supported by various members representative of all Departments of the Norwich District Telephone staff, and, in an interesting résumé of his official career, Mr. Clark responded. Mr. Clark was also asked to accept a gold and pearl brooch on behalf of Mrs. Clark as a small token of the esteem in which that lady was held.

During the evening, an excellent musical programme was provided by members of the staff, Mr. Clark occupying his recognised position at the piano.

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 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. VIII. APRIL, 1922. No. 85.

THE JUBILEE OF THE SOCIETY OF TELEGRAPH ENGINEERS.

THE outstanding event of the month of February, in the electrical world, was undoubtedly the celebration of the fiftieth birthday of the above Society.

The Society came into existence on Feb. 28, 1872, and by the end of its first year possessed a membership of 110. Of these, many have indelibly impressed their mark upon electrical history, and especially the history of the electric telegraph, thus, Captain C. E. Webber, R.E., and Major F. Bolton (founders), Mr. C. W. Siemens, the Society's first president, (afterwards Sir W. Siemens), Latimer Clark, Graves, W. T. Henley, C. E. Spagnoletti, C. F. Varley, John Bourdeaux, and W. H. Preece. It was the far-seeing Varley who realised that the interests of the Society would have to widen and who prophesied that electricity would some day prove to be the force encompassing every operation in Nature. Thus, wisely guided, the Society changed its name to indicate its wider sphere and outlook and became, in 1880, the Society of Telegraph Engineers and Electricians. Its membership by this time had nearly touched four figures. Three years later, the Society became The Institution of Electrical Engineers, thus throwing off for good any semblance of parochial tendencies or nomenclature. The policy was that of the liberal view, the catholic sympathy, the wider horizon and has tested itself out successfully in its present membership of over 10,000 individuals all keenly interested in one or more branches of electrical engineering.

We tender heartiest congratulations to our contemporary *The Electrical Review*, which featured the jubilee of the Institution so excellently in its special numbers. This periodical is, we believe, the lineal descendent of *The Telegraphic Journal and Electrical Review* which, first appearing in November, 1872, was the only newspaper then extant dealing exclusively with electrical matters.

Telegraphic engineering to-day, it is true, is but one of the many ramifications of the far-reaching science of electricity, although with the more modern developments of the telephone, machine telegraphy, and Wireless systems, the study of high-power electrical production and distribution are more and more becoming part of the regular curriculum of the go-ahead telegraph and telephone engineer. We then, of the telegraphs, may well feel proud of our craft, and are none the less so that our own little branch of electrical science was the pioneer of manifold other electrical developments.

The Institution of Electrical Engineers is the custodian of a fine library bequeathed to its predecessor, the "Society," by Sir Francis Ronalds, who, in 1818 laid the first experimental underground telegraph line in his garden at Hammersmith, insulating the conducting wire by passing it through glass tubing. It has, however, inherited something even more precious, the *spirit of indomitable enterprise*, that spirit which enabled the early engineers with but fragmentary knowledge to overcome both the electrical and mechanical difficulties of land and submarine telegraphy and finally to bridge the Atlantic Ocean with a copper thread. An undying possession, handed down from generation to generation, and still animating those who follow the footsteps of Charles Morrison, the real prophet and seer of British telegraphy; of Cooke and of Wheatstone; of John W. Brett, who laid the first deep-sea cable between Corsica and Sardinia, and who afterwards placed the first practicable submarine cable between Calais and Dover; of the persistent pioneers of trans-Atlantic cable-laying; of the far-sighted Varley; or of those disciples of quiet earnest thought and study like Kelvin, and Fleming, and Crooke and Lodge. We are not unmindful of the earlier pioneers of telegraphy in our own and other countries; Strada of Rome (1572), Lesage, Geneva (1774), Lomond, Paris (1787), Cavallo, London (1795), and Soemmering of Munich (1808). These and many others added their quota by slow and painful advances to the sum total of human knowledge. We have travelled far since the inventions of Soemmering and Ronalds, which needed more than twenty wires wherewith to signal the ordinary alphabet, since those first efforts of Cooke and Wheatstone which needed five, since the next device which demanded three, followed by another which called for but two, and the accidental discovery that led to the abolition of the return earth, thus to the use of but a single line for each circuit. The pace became faster. High speed automatic, for ever to be associated with the name of Wheatstone, the invention of the relay, the duplex and quadruplex systems followed one another or advanced co-temporaneously into use. Gradually multiplex systems came to the fore, whereby two, four, or six telegrams may be simultaneously transmitted over a single wire. These systems were again duplexed (by a present member of the I.E.E.), thus doubling the traffic capacity provided only that the electrical conditions of the line permit. Mark well then the advances made by this evolution! From the painfully slow process by which it necessitated over twenty single wires to carry a single telegram, it has to-day become possible to transmit a dozen such telegrams in at least a tenth of the time and that by the use of but a single wire. Yet one other

step have we taken and that the most unexpected. Wireless telegraphy is to-day a practical proposition at hand-speed, or high-speed automatic, with multiplex clear on the horizon. How marvellous has been the progress and that well within the span of a hundred years!

PRIVATE BRANCH EXCHANGE WORKING.

THE rules issued by the Controller of the London Telephone Service for dealing with calls at the extension points of a private branch exchange, which we reprint in another column, admit a wider application than that for which they are designed, and we commend them to the attention of all our readers. Private branch exchanges exist wherever a large office exists, either within or without the Service, and the excellent precepts laid down in these brief rules might with advantage be laid to heart alike by Government officials and the employees of commercial firms. We do not propose to give an allocution on the value of courtesy, of promptitude in answering the telephone, and other well-known telephonic virtues; we will content ourselves with observing that to take good counsel for granted is not necessarily to act upon it, that though we often imagine we know the better way without specific guidance, we sometimes neglect to walk in it.

It is a truism with telephone men that the calling and called subscriber play as important a part in the successful transmission of a call as the telephonist. This is peculiarly the case with private branch exchanges, where negligent attention to calls can make telephoning a misery. We should like to draw especial attention to the maxim: "In no case should a member of the public be obliged to give his message twice to the Controller's office." Change the word "Controller's" to "Smith's," "Jones's," "the General Manager's," or "the Engineer's," as the case may require, and an incalculable benefit to the efficiency of the telephone service will result.

HIC ET UBIQUE.

THE London Telephone and Telegraph Advisory Committee has made exhaustive enquiry into the Post Office system of registering calls, and has issued its report. It is instructive to note the method in which different newspapers summarise the report. Whilst *The Times* and the *Daily Telegraph* give it at some length, the majority of papers condense it very fairly, as follows:—

While satisfied that the Telephone Department is anxious to do everything to ensure accuracy, the Committee does not commit itself to the view that no further improvements towards this are practicable, and recommends that the Department be urged to continue efforts at improvement.

As the result of their visit to the Central Exchange, the members of the Committee were satisfied that the most stringent instructions are given to the operators in regard to registration of calls, and point out that these instructions include the following: "If uncertain whether a call is effective, always give the subscriber the benefit of the doubt."

The report states that the opportunity should be taken to impress upon telephone users generally that the efficiency of the service itself, that is to say, the ease and celerity of working, is a matter which depends as much upon the user, and particularly the person called, as upon the operator.

The *Daily Mail*, however, heads the paragraph "Phone Blunders: Subscribers Charged for 3,273 Extra Calls," omits all reference to the satisfaction of the Committee, and gives a select list of the worst cases of overcharging reported to the Committee. Such is the gentle art of conducting a Telephone Ramp.

THE American Telephone & Telegraph ("Bell") Company's report for 1921 shows an increase of 580,176 telephone stations by their 26 associated companies during the year, in addition to which 9,264 independent companies connected with the system show an increase of 198,108 stations. The totals are:—

Bell-owned	...	...	8,914,155
Bell-connected	...	...	4,466,064
			13,380,219

The development of the Bell system has risen from 1 telephone to every 90 people in the United States in 1900, to 1 telephone to every 8 people in 1921.

A BILL has been presented to the French Chamber of Deputies in the names of the President, the Minister of Public Works, and the Minister of Finance, for the total abolition of the flat rate. The rates proposed are 125 francs a year for areas with up to 2,000 subscribers, 200 francs for areas with over 2,000 subscribers (except Paris), and 250 francs for Paris, plus a charge of 15 centimes per call on the first two cases, and 20 centimes in the case of Paris. The subscriber must make or pay for a minimum number of calls—which is 1,500 in Paris, making the minimum charge for service 550 francs.

THE balance sheet of the States of Guernsey Telephone Department shows that the number of telephones on the system increased by 144 in 1921. The total is now 2,806. The net profit is shown as £811.

TRIOLETS.

I.

The line was engaged
And I couldn't get Maud.
I fumed, much enraged
When the line was engaged,
For I quickly presaged
She was flirting with Claud,
Since the line was engaged
And I couldn't get Maud.

II.

Behold the result
Of frequenting the "Pictures!"
Of that curious cult
Behold the result!
He dares to insult
Nice girls with his strictures!
But what else could result
From frequenting the "Pictures?"

W. H. G.

ABERDEEN ENGINEERING DEPARTMENT'S RE-UNION.

THE engineering staff of the Aberdeen Post Office on Feb. 10 held their annual re-union in the Bon-Accord Hotel. There was a large gathering, presided over by Mr. F. E. W. Cowie, executive engineer. Amongst those present were Mrs. Cowie, Mr. James Fraser, late executive engineer, and Mrs. Fraser, and Mr. David Smith, assistant engineer. After supper, Mr. Cowie referred to the good work done by the whole staff during the recent serious breakdown caused by snowstorms. Mr. James Fraser spoke of the pleasure it gave him of meeting his old friends once again, and complimented the staff on their efficiency. Mr. James Kerr, chief inspector, thanked Mr. John G. Dean, the secretary, and his committee for their success, and Mr. Dean, in reply, said he hoped they had all enjoyed themselves, and wished to associate the names of the committee, consisting of Messrs. C. G. Smith, J. Davidson, J. M'Leod, W. Leith, W. Geddes, G. Smart, and J. Murray, with all the praise that had been given. During the evening songs were given by Miss Ritchie and Mr. Alexander Bain, and were much appreciated. Excellent music was supplied by Mr. Alexander King's band.

TELEGRAPHY IN AMERICA.*

BY H. H. HARRISON, A.M.I.E.E.

(1). LITTLE more than a year ago I had the good fortune to spend three happy months in America on behalf of my company investigating telegraph and telephone methods from the manufacturing and operating points of view. The object of my pilgrimage was very completely attained by reason of the extraordinarily generous reception I received at the hands of the Western Union and Postal Companies, the Western Electric and the American Telegraph and Telephone Companies, and such other manufacturing concerns as the Morkrum Co., E. Kleinschmidt, the Stromberg-Carlson Co., the Kellogg Co., and the Automatic Electric Co.

If any of my audience expect to-night a racy and piquant comparison between what a section of the British press describe as an effete Government administration and the product of private enterprise they will be disappointed. Comparisons are only possible where *all* the facts are known and even then it is as well to be careful. My paper is merely a record of observations. I *will* say however, that I found the telephone service in New York no better than London, and for precisely the same reason, as explained to me, viz., the difficulty of getting suitable operators during the War. Also, another thing that may comfort us all, is that the privately-owned and worked telephone companies had to take steps to raise their rates.

Although, strictly, off my subject of to-night, I cannot refrain from quoting below one of the many interesting posters exhibited by the New York Telephone Co., while I was in that city.

IF YOU WONDER WHY WE ASK FOR HIGHER RATES
READ THIS.

Cable Costs have increased 69 per cent. over 1914 prices.

Pay roll this year is $13,000,000 greater than in 1919.

A switchboard that cost $638,000 in 1914, costs $1,342,000 to-day.

In 1914 we could splice a 600-pair cable for $21.00. To-day it costs $41.00, and so on all the way.

NOW READ THIS.

Our revenue in January, 1920, was $751,291,000; since then it has dropped steadily until in July last it was less than our expenses by $731,670.

WHAT WOULD YOU DO IF THIS BUSINESS WERE YOURS?

One of the first things realised by the telegraph and telephone visitor to America when he has recovered from the truly "stunning" effect of New York City, is the extraordinary part played in the business life of the community by the telegraph branch of the art of communication. Small telegraph offices are dotted all over the streets of the big cities. Every hotel of any size has a Western Union and Postal Co. telegraph counter, and the first thing you hear on entering is the merry click of the sounder, and the "mill" (typewriter). Such hotel circuits are omnibus circuits, having several stations in series and being on the closed circuit system, the only equipment is a key and sounder with, of course, the inevitable "Vibroplex" or auto-dot sender.

When visiting the stockyards of Messrs. Armour & Co., in Chicago, I was told they had their own telegraph system and, at my request, was shown the telegraph office in which about thirty operators were hard at work.

One of the big insurance companies in New York having an up-town and down-town office, has two duplex single-channel Kleinschmidt printing telegraphs and one duplex Morkrum Teletype, for conducting inter-official business. Transactions are rapidly and accurately recorded at the head office, and the service rendered is one that would not be possible with the telephone, at least, in my opinion.

Having noted the extent to which the telegraph is used, I naturally looked for an explanation, and it did not take long to find it. America is a country of great distances. Big industrial centres are situated at anything from ten to thirty hours apart, even on the crack trains. Market fluctuations must be known quickly so that decisions may be made; or orders have to be transmitted at the earliest possible moment to meet sudden unforeseen demands. Herein lies the reason for the extensive use of the telegraph.

So far from the long distance telephone service ousting the telegraph it would almost appear that a contrary tendency exists. This was explained to me by one of the traffic officers of a big telegraph company as follows:—

A definite instruction to buy, sell or dispatch can be transmitted by telegraph more cheaply than by long-distance telephone. An "executive," as a manager or director is termed, once he has made his decision, requires the instruction dispatched at once. When it is on its way to the telegraph office, so far as he is concerned, it is finished with. Rather more formality is encountered when long-distance telephoning is contemplated, which, quite apart from difference in cost, if any, does not appeal. It is only when a heart-to-heart talk is needed that the telephone is used. The big business man of America is frequently a bundle of nerves and any process which is short and direct, provided only it carries no attendant disadvantages, is the one adopted.

(2). As most of you know there are two big companies in America handling telegraph service, the Western Union, and the Postal Co. The Western Union is well known to us all, but it is not perhaps realised that the transatlantic link between this country and the Postal Co., is furnished by its relative the Commercial Cable Co. The American Telegraph and Telephone Co., furnishes leased wire service only, and the same remark applies to other companies whose names indicate the two types of service. I shall refer to such services later. To the telegraph student then, for practical purposes, there are two telegraph administrations competing with one another over one big territory, and a study of their methods reveals two striking differences of policy.

The Western Union, like a huge octopus, spreads its tentacles far and wide. At the little "way" station on the railroad hundreds of miles from civilisation, the familiar blue and white sign can be seen displayed.

The Postal Co., on the other hand, do not carry civilisation to the hamlet. They link up all the big cities and towns of medium size, and messages for the backwoods have to be handed over *en route*.

This is not the only difference in policy. The Postal Co., has remained faithful to hand Morse working. They tried out the Rowland Quadruple—duplex system, and then turned their back on machine telegraphy. All their important routes have wire plant equal in capacity to the traffic to be dealt with, and Morse telegraphy reigns supreme.

The Western Union have adopted machine telegraphy whole-heartedly, and must own the largest equipment of machine telegraphy in the world, if it is not even greater than the equipment of the rest of the world put together. The system adopted is the five unit duplex-multiplex system, developed by themselves and the Western Electric Co., with Donald Murray's patents as a basis. The economies in wire plant which are realised as a result are very great, and here, again, the distances to be covered, are a contributory factor in making the policy pursued a success.

Both companies adopt standard styles in decoration and furnishing of main and branch offices which can be recognised at a glance after a short residence in the country. In comparing the two companies with our own British administration, the observer cannot fail to be struck with the great advantage accruing to them from being "single purpose" utilities.

The hundred-and-one services rendered by the British Post Office makes it difficult to have distributed about a large city innumerable little one-man or one-woman offices with the simple equipment possible where telegraph service is the sole commodity for sale. The single-purpose office can be small and tucked away in any odd corner, provided only it is not out of sight. The usual equipment is a key sounder, counter, small writing desk and two chairs for the telegraphing public, and, of course, a telephone.

(3). A casual examination of the traffic results reveals immediately a rapid service between big cities second to none. The American citizen insists on speed and always has the whip hand of the telegraph company by the threat of transferring his traffic to the hated rival. Both companies are compelled, therefore, to give the best possible service though it would be unjust to suggest that this is the sole stimulus. To all right-minded telegraph people, good service is a tradition and delay to traffic, even where this cannot be avoided, is anathema. I sometimes think that our Continental friends do not feel so strongly on this point as we do, and some things which I have seen in central telegraph offices on the Continent indicate a light-hearted free-and-easy disregard of the telegraphing public rather upsetting to a British-trained telegraph man. There is no indication of slackness in the American telegraph office. "Get on or get out" is, I should imagine, the prevailing sentiment and "keep on keeping on" another. The young lady who was at once counter clerk and telegraphist at the hotel where I lived for some weeks in New York spoke French, German, and Spanish, in addition to her other qualifications, though I cannot say if this is exceptional or general.

The night letter, week-end letter and deferred cablegram were not in force, as a result of the War, while I was in America, but I was told that all these services were to be re-introduced as soon as practicable as they considerably reduced standing charges on wire and office plant as is only to be expected.

Money could be dispatched or received by telegraph as in this country and this service was exceptionally well carried out. I have telegraphed before breakfast from New York to Chicago for money and received it an hour later without leaving the hotel premises. At times of peak traffic the time might extend to two hours, but even then the result cannot be considered other than satisfactory.

The education of the public in the direction of making them feel the utility of the telegraph, is at once instructive and amusing.

The most remarkable evidence of this propaganda for stimulating the use of the telegraph is furnished by the small booklets issued. These are admirably printed, illustrated and bound, and of a convenient size enabling them to be slipped into the pocket.

(1) "Helpful hints in the preparation of telegrams and cablegrams." 19 pages full of useful matter and with computing tables for calculating message costs.

* Paper read before the London Telephone and Telegraph Society.

(2) "Forms suggested for telegraph messages." 24 pages suggesting messages appropriate to all occasions with, however, one omission. There is no telegraphic proposal of marriage included.

(3) "The telegraph gets results." 30 pages, relating instances of effective application of the telegraph in selling, advertising, purchasing, and in the general conduct of business.

(4) "The telegraph in selling." 32 pages. Shows how day and night letters bring results in selling. They are salesmen who require no expenses, no train fares, they do not stop for sleep, or miss trains, and the customer in never too busy to see them personally.

(5) "The telegraph, its history and present development." 23 pages, beautifully illustrated with photographs of the earliest Morse apparatus with, of course, a picture of Morse the man, and the latest multiplex apparatus.

If you are expecting the arrival of friends from England, the Telegraph Co., maintains a signal station at Sandy Hook for the purpose of reporting the approach of in-bound vessels. Long waits at the docks are not necessary, the Company will advise you in ample time to enable you to meet your incoming friends. If you desire to send flowers to your wife, mother or sweetheart one or two thousand miles away, it will be done in an hour or so. You go to the telegraph office and state the amount you wish to pay. This with the cost of the telegram is all that you have to worry about. The florist in the town in which the recipient lives gets telegraphic instructions, and the money, from the Telegraph Co. Correct time will be distributed to your house or factory and a stock ticker news service is available.

(4). Despite the stupendous advance of machine telegraphy, manual Morse telegraphy is very far from a dying industry. I saw many instances of good Morse working, but I did not see anything marvellous. When the visitor first gets within range of a sounder, which is usually within half-an-hour of his leaving the ship, American Morse working sounds very rapid indeed. This is, however, partly illusory. The American code has several letters consisting of dots and when these are sent by vibroplex, they appear very rapid and clear. After a few days residence and when I had managed to substitute the American equivalents for some of our letters, I found that I was able to "copy" from the hotel sounders without any difficulty and that the overall speed is nothing to write home about.

On the bonus wires, that is wires where the operators are paid by traffic results, the Phillips code is used. This is a code of several hundred abbreviations, and though I was told it is officially banned, its use appears to be winked at. With typewriter reception, the receiving operator can always beat the sender; but the Phillips code equalises matters and incidentally increases the speed at which traffic is handled. When we hear of speeds of 40 to 45 words per minute on American wires, these facts have to be remembered.

All Morse reception is accomplished on the "mill" or typewriter. Formerly the operators owned their "mill." Nowadays the company provides it. This is good practice as the type is standard and all messages have a uniform appearance when issued to the public.

Nearly all Morse sending is done on auto-dot senders of the "Vibroplex" type. The operators own these, and the companies maintain them. This, I was told, was found expedient, as a prolific source of trouble at repeater stations was caused by defective contacts on auto-senders. I learned to use this apparatus, but I was not impressed with its advantages for the Continental code, though I had to admit that the American operators' apparently effortless sending on these machines is very good. I was told that many operators could not use a Morse key.

All balancing apparatus for duplex and quadruplex apparatus is placed apart from the instrument itself with special attendants. The instrument room has keys and sounders only. An operator does not know if he is on the A or B side of a quadruplex circuit. In the event of trouble, a key is depressed for a few seconds, after which a lamp lights calling the attendant to the circuit. This arrangement impresses me. The balancing and adjusting is in the hands of trained men and the apparatus is in a quiet clean room where there is no dust arising from the stream of foot traffic, variable it is true, but never entirely absent from a large instrument room. When there is trouble on a "bonus wire," the attendant soon hears of it!

American telegraph apparatus is very different from ours though one can notice a tendency to adopt British apparatus or, I should say, apparatus modelled on British lines. The standard B relay is made in America in very large quantities. It is, however, shorn of much of its glory, the polished and lacquered brass case being made of Micarta tube, and cheaper forms of terminals are used. Nearly all "polar" or "main line relays" are provided with Gulstad auxiliary windings. Apparatus and repeater tables are made of angle-iron with teak shelves. No polished mahogany and gleaming brass here! A stern utilitarian note is struck. The polarized sounder is in use to a limited extent.

The Americans make much fuller use of wire plant than we do, the A.T. & T. Co., leasing the wires of their toll circuits for telegraph purposes. There is nothing startling in the circuit arrangements for doing this. Both Morse and printing telegraph circuits are furnished in this way. No noise whatever due to this super-position is in evidence at the toll boards, but the American telegraph-telephone engineer is fortunate with his climatic conditions.

Balancing of duplex and quadruplex circuits is no longer accomplished by feeling the relay tongue with the fingers. They use differentially wound ammeters made by the Weston Co. These and the American type "B" relay are the best apparatus in the equipment, switches, rheostats and condensers appearing shoddy to English eyes. The American point of view in this respect differs widely from ours, and provided that the apparatus gives good service, its appearance doesn't worry them "any." I have a feeling that in these matters they sometimes go too far in the wrong direction.

(5). Machine telegraphy in America, with the exception of the stock ticker services, is carried out by apparatus designed to use the five unit alphabet. Main line service is furnished by triple and quadruple duplex apparatus while lines carrying small traffic are provided with simplex or duplex "stop-start" systems.

Stop-start circuits are interlinked with main line circuits, resulting in very flexible and efficient methods of handling traffic.

The American multiplex has the following leading characteristics.

(*a*) Distributor motors are of the phonic wheel type driven by massive forks.

(*b*) The distributors are of the single plateau variety having four concentric sets of segments, receiving, transmitting, correcting, and local, the latter for stepping up the tape transmitters and closing printing magnet circuits.

(*c*) Keyboard perforators and tape transmitters are universally used even on single channel stop-start apparatus.

(*d*) Correction is always obtained from the signals.

(*e*) The circuits are permanently duplexed.

(*f*) Printers are of both type-wheel and type-bar patterns, the original Western Electric and the Morkrum belonging to the former, and the Kleinschmidt and "Dreadnought" printer of the Western Electric, the latter all being page printers.

(*g*) Instrument tables are of solid teak or angle-iron frames and legs.

(*h*) All connexions are made up in colour code cable forms.

(*i*) Each piece of apparatus is instantly removable without disconnexion of a single wire.

(*j*) Balancing, synchronising and phasing apparatus together with the distributor and driving fork are all mounted together adjacent to the traffic channels, as in British practice.

(*k*) Time stamps controlled by an electrical-master clock are provided at all operating positions. (The electrically-controlled time stamp is in general use in business houses in America.)

Before considering some of the more interesting technical details, the operating conditions require a little attention.

I found the work of the perforator operators had reached an extraordinarily high standard, a standard that was general and not exceptional. 45-50 words a minute was accomplished with ease, and with remarkable freedom from error. This is largely due to the efficient method of instruction and the insistence on "touch" typing. I was shown over a school of instruction, and the reason for the state of affairs above was at once apparent. From the very start, the operator to-be is not allowed to look at the keyboard, and, to prevent surreptitious peeps, a metal shield is interposed between her hands and eyes. She gropes for the desired character by the aid of a full-sized drawing of the key tops placed in front of her, and certain keys are invariably assigned to the same finger. All fingers and the two thumbs are used, the latter for spacing only. She is first taught to select letters in a row, then the various rows, and suitably designed exercises are given to her. She is also taught to depress the keys at an even rate. The method, which is no method, used in British typing schools, where the student "picks" up a knowledge of the keyboard without any guidance whatever, finds here no place. If only typists would realise how easy their work becomes when they have mastered the "touch method," the bad old way would soon be relegated to limbo. Keyboard perforators seem to me to be less nerve-racking than a typewriter, as there is less noise, and no transmitted shock to the tips of the fingers as when a typebar strikes a typewriter platen.

The Western Union Company have made very thorough traffic studies to enable them to determine the number of circuits and the transmission speed to handle a given volume of traffic.

In America no charge is made for the address, only the text being counted and paid for. The name and address averages 14 words per message (13.93 actually). The average text, which is paid for, amounts to 12 words, while the function signals controlling the distant page printer impose a load of 4.75 words per message. The average message, so weighted gives a total of 30.68 words of which only 12 or 39.1 per cent. is paid for. The earning capacity of the circuit is further reduced by allowances which have to be made.

(1). RQs and BQs equal to 5 per cent. of the total number of messages. The length of an RQ is approximately one half the average message so that an RQ with its BQ amounts to one complete message, but as only five such loads are imposed per 100 messages, the load per message is 30.68 by .05 = 1.534 words per message.

(2). Repetitions of figures involves 3.51 words per message.

(3). Signals for re-runs, re-punch, start, stop, reduce the capacity per channel by about 0.2 words per minute.

(4). Loss of capacity due to re-run messages before they are completely transmitted is about three messages per hour.

The equated length of a message is thus :—

31.00 + 1.65 + 3.51 = 36.16 words.

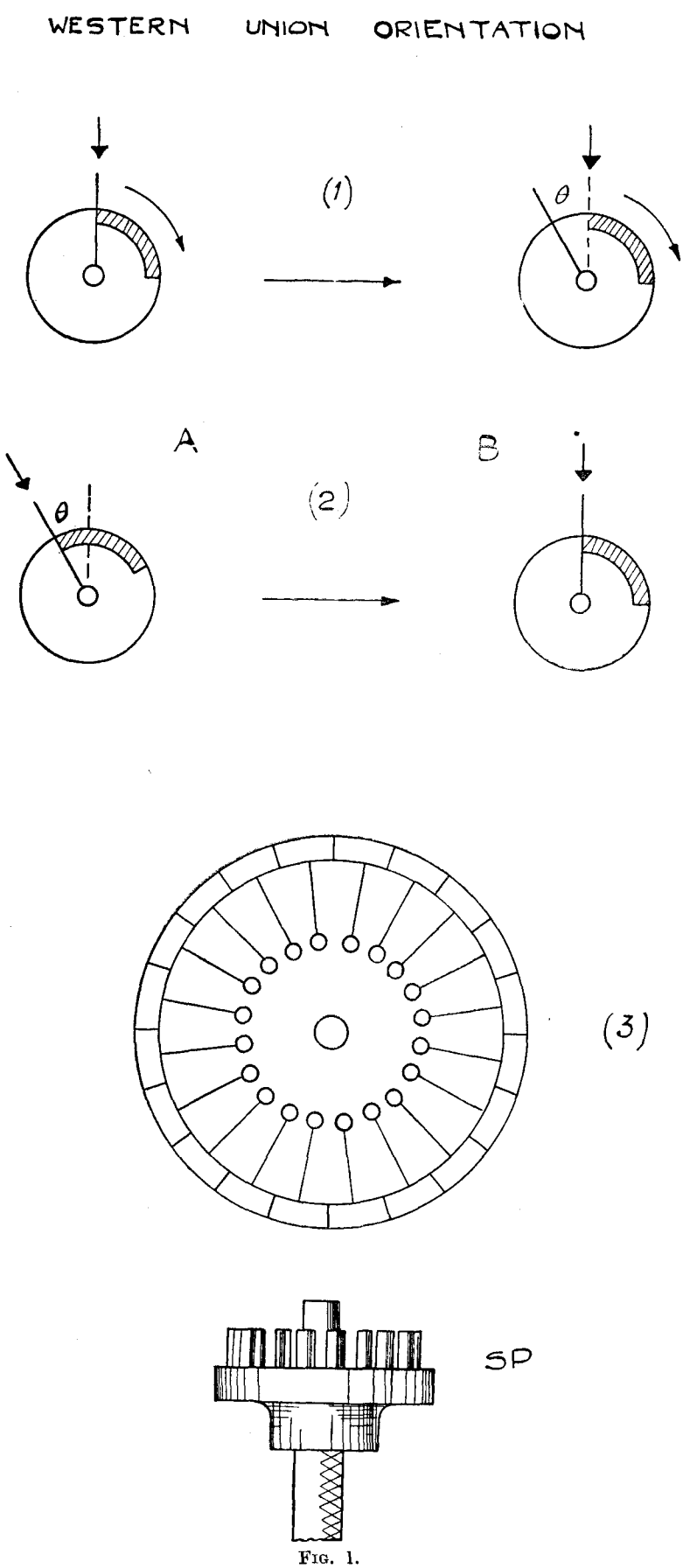


FIG. 1.

The capacity of a channel in messages per hour is speed in words per minute multiplied by 60 and divided by the equated length of the message. At 45 words per minute this works out to 45 by 60/36.16=77.7 messages per hour. Taking the average message at 30.68 words the theoretical capacity per channel is 88 messages and the actual capacity is thus 0.88 of the theoretical.

Single channel stop-start circuits when operating on YQ circuits, are on the closed circuit system, and if duplexed on the d.c. plan, only one operator attends to both the transmitting and receiving of traffic. I have seen such duplex circuits on traffic and can confirm that a good operator can manage quite well and without any appearance of strain.

Turning to technical considerations it is not too much to say that American engineers have revolutionised the duplex-multiple system particularly in respect to quick methods of obtaining correct speeds and phase, and it can be stated with perfect confidence that a man needs only to know the routine of the various adjustments without in the least understanding the reasons to get a multiplex circuit going and keep it so. They have learned all that Baudot had to teach, plus ideas from Murray, Crehore and Rowland—or rather Dr. L. M. Potts formerly of the Rowland Co. The system which has emerged is flexible and fool-proof, and far in advance of the European Baudot system. In this work, the engineers of the Western Union, Western Electric & A.T. & T., have taken part, and the modern American multiplex is the product of such men as G. M. Yorke, G. R. Benjamin, W. A. Houghtaling, P. M. Rainey, A. F. Dixon, J. H. Bell (formerly of the British Post Office Engineering Dept.), S. R. Rothermel and others. There are fundamental differences in the American multiplex as used in the Western Union and that made and supplied by the Western Electric.

They both employ phonic wheel distributors and correct from the signals. The Western Union, however, keep to the Baudot clock hand method with the difference, that the epicyclic train can be operated at any part of a revolution and more than once in the same revolution. The Western Electric method is in use in the British P.O., and needs no explanation. It is, of course, a speed correction arrangement. Both systems give very stable synchronism and both adopt the advance and retard correction segments first used by Picard between Marseilles and Algiers. Methods of orientation differ widely in the two systems. The present pattern of distributor used by the Western Union provides for slight orientation of the receiving segments, but this is only used as a refining or Vernier adjustment. The orientation is effected at the transmitting end. Reference to Fig. 1 will make this clear. Sketch 1 shows station A about to transmit to station B. Due to line and instrumental lag a certain time represented by angle O will be required before A's signal becomes operative at B. To ensure correct reception at B, we can (*a*) either move the receiving segments through an angle O in the direction of brush rotation or (*b*) set the brushes backward by an angle O as shown in the sketch. At the moment when A commences to transmit, the *instantaneous* position of the brushes is that shown in the full lines. Instead of adjusting at B by *retarding* reception we may *advance* transmission at A as shown in sketch (2). Here the brush is moved counter clock-wise at A by an angle O so that, correction taking place at the moment when A's brush is in the position shown then after a lapse of time amounting to O, B will run in at 12 o'clcok as shown. It is evident that reception will be satisfactory. In this case, the *instantaneous* position of the brushes will always be identical in space. The adjustment at A is effected by connecting all sending segments of the distributor to a circularly arranged set of sockets, as seen in sketch 3. The 20 transmitter levers are connected to wires in a cable terminating in a plug having a row of pins and the plug can be inserted in the sockets so as to secure 1, 2, 3, or any desired amount of orientation expressed in segments. The orientation at A is thus coarsely adjusted and the final desired result secured by B moving his receiving segments slightly. The rotatable sending plug and row of sockets at A is obviously equivalent to angular displacement of the brush arm.

Fig. 2 shows the arrangement for securing orientation in the Western Electric system, and while I was in New York I was privileged to see this apparatus at work.

One advantage of the duplex balance method of securing both-way working is that no propagation segments are necessary on the distributors. Sketch 1 shows the sending and receiving segments at two stations A and B, of which A is the correcting station. Two segments lag is assumed and the distributor at B runs in at the position shown. Reception at A is obviously incorrect. Now it is convenient for reasons which will be clear later to adjust for lag at the corrected station. The reception from the correcting station will be automatically adjusted, but in order that it shall be equally so at A, B must advance his transmission, as shown in 2.

The *advance* of transmission and *retard* of reception at B can be secured by brush orientation as will be clear from the previous figure, and the sketch at the bottom of the figure shows a method for doing this. The motor PWM drives a shaft arranged to control two sets of brush gear sweeping over plateaus or faces DF_1 and DF_2. The brushes are coupled to the motor shaft by an epicyclic train of gears consisting of one mitre wheel supported by a bearing carried on a disc OD_1 or OD_2 which is loose on the motor shaft and normally stationary by reason of friction between its left hand surface and the face of a disc carried by a support mounted on the base. The brush arm carries a third wheel gearing with the idler, and the motor shaft is thus coupled to the brush arm, but rotates in the opposite direction. Now we can effect a shift of the brushes backwards or forwards by momentarily increasing or reducing their velocity with respect to the motor shaft. This speed variation is the function of the discs OD_1, OD_2. If they are moved backwards or forwards and while they are in motion they change the velocity of the brushes and so adjust their phase relation to the shaft in a very convenient manner.

Orientation may be entirely confined to the corrected station with this apparatus and the method is as follows:—B (sketch 2) sends out a signal to A which is received on a set of storing relays arranged to re-transmit the

signal to B. B's distributor having previously been put into phase with A, B now adjusts his sending brush until he correctly receives from A the signal he is sending to A. This method is of great advantage when A is a rotary repeater either forked or straight. Each out station orientates as described above, and they will then be correctly adjusted to send through the repeater to the stations they are to have access to.

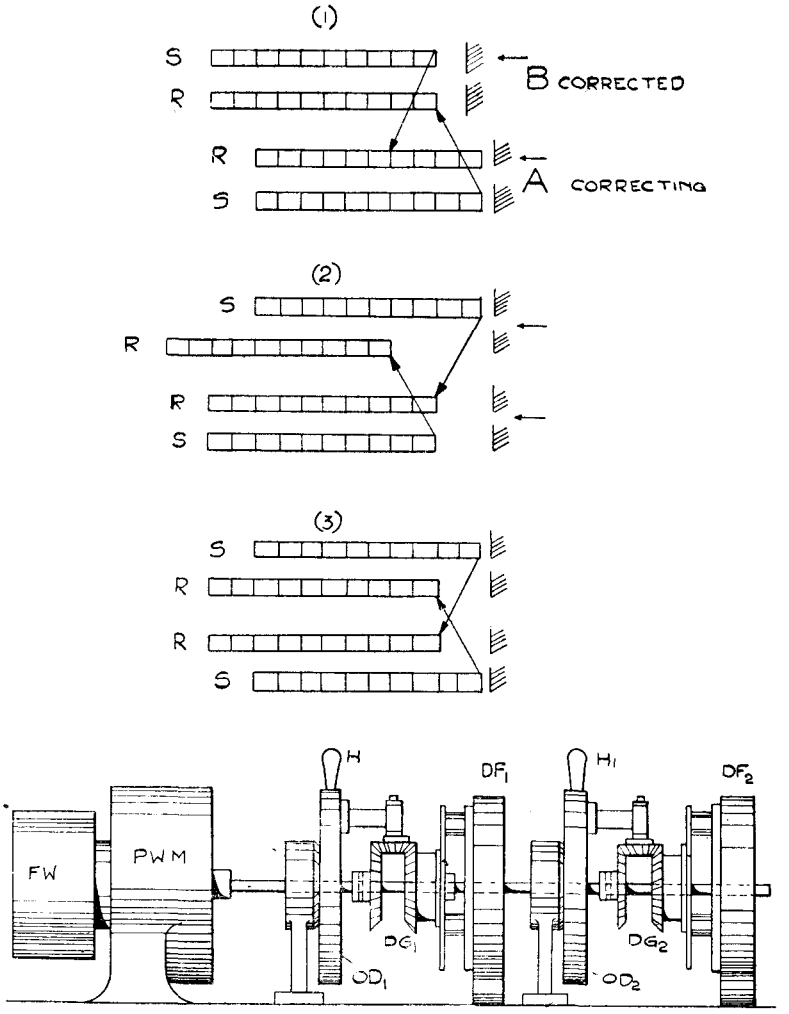


FIG. 2.

Phasing or synchronising is accomplished very neatly. At the correcting station, the distributor having been got up to speed, the twenty printer magnets are switched out and a circular bank of lamps on an observation panel are substituted. If one pre-arranged marking impulse is sent out from station A it will be received on one of the lamps and the brushes are simply orientated until the correct lamp lights up. This is equivalent to the observation of printer slips when adjusting a Baudot set, but is a much more convenient and scientific way of doing it. The same arrangement of lamps forms a stroboscope by which the speed of the motor may be adjusted, but it is the practice to calibrate their driving forks so that the setting of weights, for a given speed of rotation of the phonic motor, is pre-determined.

Sketch 3 shows a case where separate sending and receiving motors are provided at each end of a circuit. This is used where, through want of electrical symmetry of the line, the speed may be different in the one to that possible in the other direction. Orientation of the receiving sectors only is necessary here as there is no reflected line lag to be taken up.

The American phonic motor has a very massive fly-wheel and would take some time to get up to synchronous speed. The Western Union employ a small auxiliary motor for this purpose, but the Western Electric method is shown in Fig. 3.

With the switch S thrown to the right the magnets of the phonic motor receive impulses of current from the local rings LR of the distributor if the brush arm is momentarily rotated. The motor will then commence to rotate by itself still under control of the local rings. The fork offers an alternative path through a synchronising lamp SL which will flash intermittently while the motor is accelerating. When the correct speed is reached, the lamp flashes almost continuously and if S is then thrown, the fork will take up the work of driving the motor.

Rotary repeaters are rapidly coming into use in America. Fig. 4 shows one in use by the Western Union at the time of my visit. The receiving segments are in two groups, one a receiving group and the other a locking or holding group. From the solid rings of the distributor a path to earth is taken through a sending relay SR and a locking relay LR. When a signal from L_1 is received, the main line relay reverses and a marking current is applied to the receiving group of segments and transferred to the relays LR and SR by the brushes. SR sends on the signal to line L_2 while LR applies a marking current to the locking group of segments to hold SR and also itself in the marking position so long as a marking current is coming over line L_1. When spacing current arrives the relays SR and LR go to spacing and are held there by the action of LR. Thus good firm rectified signals go out to line L_2.

The Western Electric Rotary Repeater is shown in Fig. 5. Signals from L_1 are received through the distributor RD, and alternatively, by a pair of polarised storage relays SR and SR_2 and from then repeated to the sending disc SD of line L_2. While SR_2 is being set, SR_1 repeats the signal just stored in it. Notice that SR_1 receives on the odd numbered segments of RD, but transmits on the even numbered segments of SD. This allows the setting cycle to precede the sending cycle by a segment and there is no overlapping of the two functions.

The start-stop system before alluded to is being very vigoriously pushed in America. The Morkrum Co., initiated it, followed by the Western Electric Co., and later still by Kleinschmidt. Time will not allow of discussing this system at any length, but the general principle will be gathered from Fig. 6. The brush arms are frictionally coupled to the continuously running shaft of

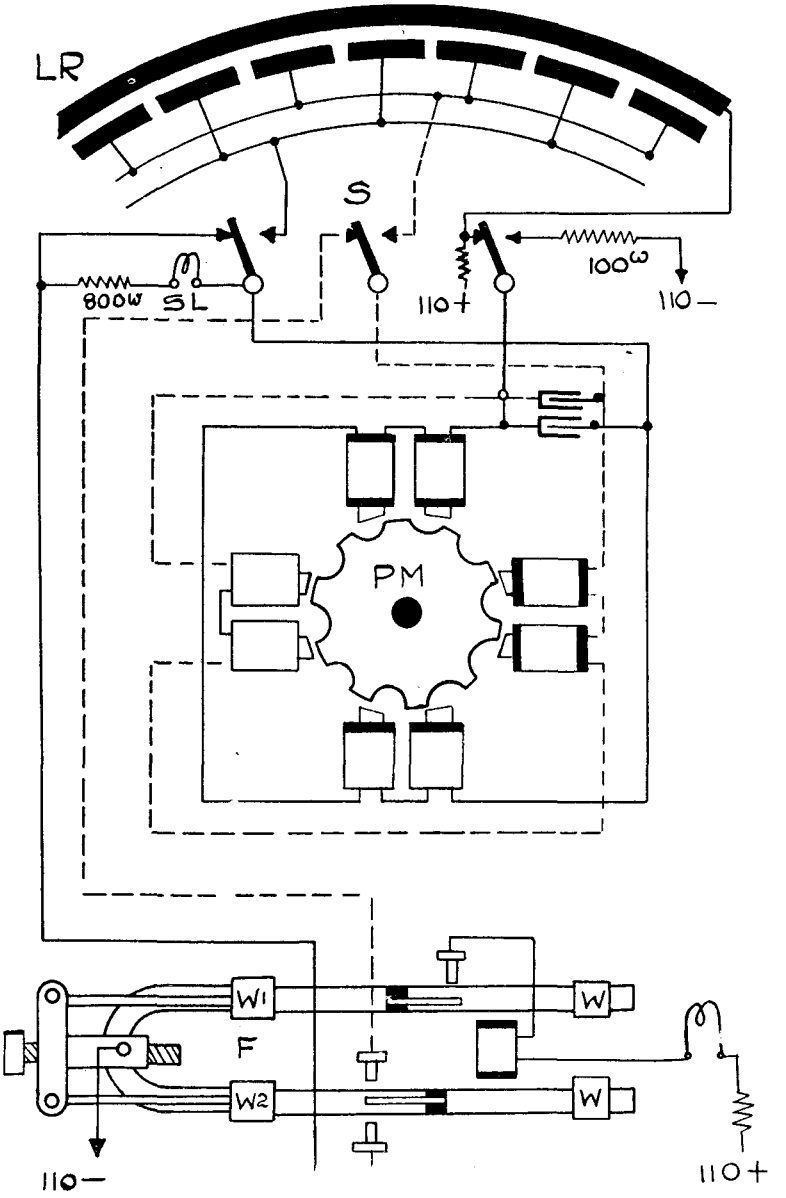


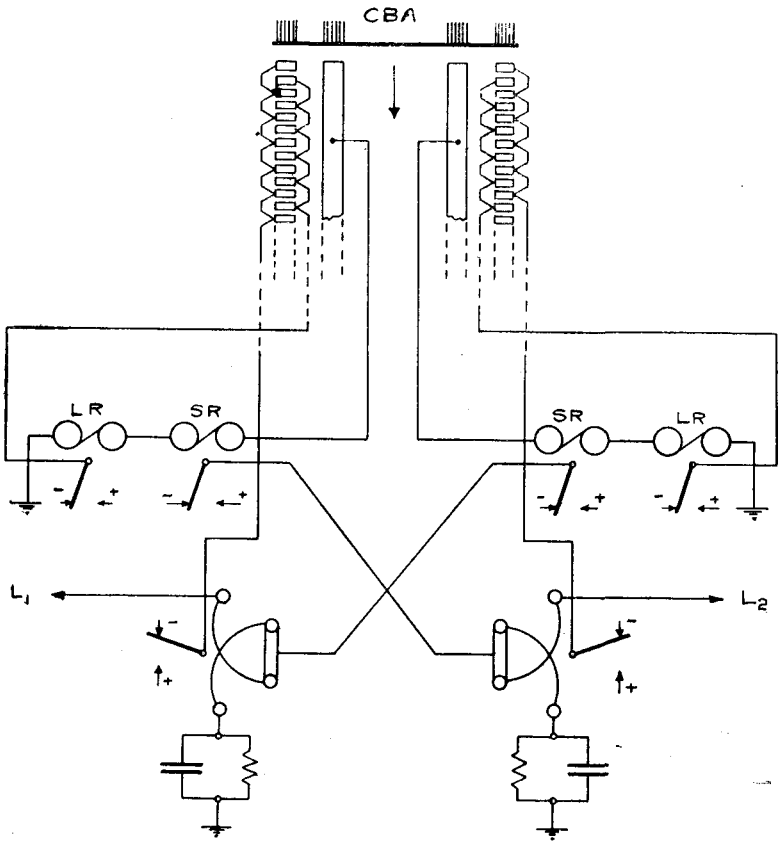
FIG. 3.

a small DC motor, but are restrained from rotation by means of latches controlled by release or latch magnets LM. When a character is set up at station A to the contact CC which is closed whenever any keyboard lever is operated, LM operates and releases the brush arm. When this leaves segment 6 the closed circuit for the battery in the line—the system shown being arranged for closed circuit working—is opened. The line relay at B releases

and closes a circuit for battery LB through the latch magnet. The brush arm at B starts to revolve and sweeps over the segments 1 to 6 in practical synchronism with the brush arm at A. Wherever one of the contacts KBC is operated the line circuit is completed and the line relay LR at B is energised, closing a circuit for the corresponding printer magnet PM *via* its distributor segment, brush arm, battery LB, left-hand armature of relay and the common conductor to magnets PM. No orientation is needed since the effect of line lag on the receiving relay, delays the start up of distributor B and secures automatically the necessary relationship for correct receptions. The motors have a small centrifugal type governor which controls a lever normally short-circuiting a resistance in series with the motor. If the motor speed rises this short-circuit is removed and the motor slows down. The motors are adjusted to the correct speed by varying the tension of spring S and the speed can be examined at any time by means of the stroboscopic disc on the motor shaft. A calibrated tuning fork TF with the usual shutter is struck, and SD observed through the shutter aperture. The maintenance man makes this observation about once a fortnight, and I was told rarely has to make any re-adjustment. The stoppage of both distributor arms at the end of each letter prevents accumulation of phase difference.

(6). Of large American telegraph offices I inspected, the New York offices of the Western Union and Postal Companies and the Chicago office of the former. I also went over the new Chicago office of the Western Union, but the equipment had barely commenced at the time of my visit.

In both companies' offices, dynamos are used in place of batteries, and I came away a thorough convert to this method of operation. The cleanliness of the generator room, the automatic regulation to the load to be carried, and the fool-proofedness of the arrangement impressed me tremendously. The cabling of these large offices, with fire-proof cable in fire-proof ducts, and the system of preparing cable forms for all instrument tables which are about three times the length of our tables, leave nothing to be desired. I was struck by a simple and effective method of concentrating lines with little



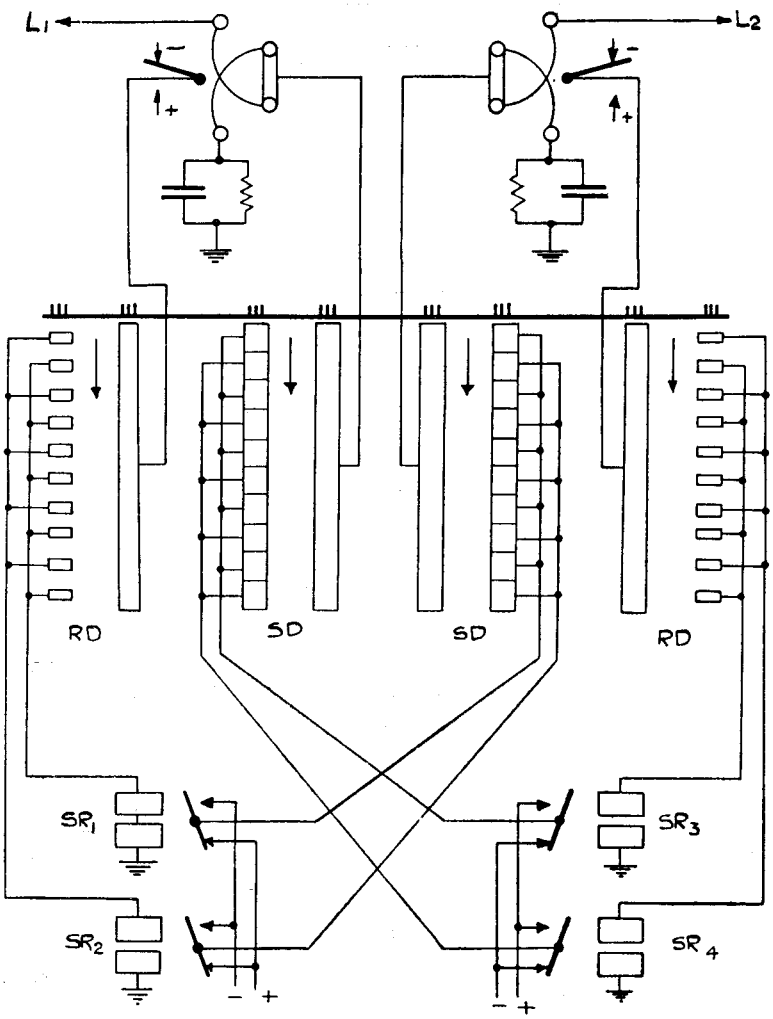
ROTARY REPEATER.

FIG 4.

traffic. In place of a big switch with attendant operator, smal panels with about six jacks and lamps are provided at operating positions, and the operator is his or her own switching operator. Lamp signals are used a good deal as a calling means and enable supervisors to readily see an unattended call.

Belt conveyors are extensively used. A belt runs along the middle of each operating table and drops its messages down a shute at the end on to a second belt running just below the floor level, from which the messages pass to the distributing operator. The chase in which the floor belts run is covered by glass panels so that messages slipping off the belt can be seen.

The test boards of a large office have no special points. The equipment is of the telephone type, plugs and jacks, but much heavier than usual. This is necessitated by insulation requirements, as voltages rug high, 200-250 on some circuits.



ROTARY REPEATER

FIG 5.

Lavatory arrangements are beyond all praise, and I have seen nothing like them in Europe.

The lavatories for the messenger "boys" in the New York Western Union cable office are in white marble with nickel plated fittings. The boys (they are in reality young men) can get their uniforms pressed and repaired when off duty by a tailor kept on the premises.

The offices for public use are commodious well lighted and, in the case of the newer ones, actually architecturally beautiful. They form a striking contrast to the average big European office, with its appalling dinginess.

(7). Cable telegraphy in America does not call for special remarks. Great speeds are not aimed at. Amplifiers are used, but mainly to improve the definition of signals. Cable signals come direct into New York. They are read by an operator who sends them on an auto-dot sender to another operator sitting with a receiving sounder and typewriter. This strikes one as wasteful, but I was told it was not so, and it had the advantage that the message went out typewritten. Typewriting direct from recorder slip is slower. Experiments on Trans-Atlantic typeprinting telegraphy were going on and are still proceeding.

WHERE TO STAY.

The attention of our Readers is directed to the following list of Boarding and Apartment Houses.

BOURNEMOUTH.—"Glen Cora" Boarding House, Hawkwood Road, Boscombe. Superior and Comfortable "home from home." Central and few minutes from sea. Liberal table. Highly recommended. Stamp for tariff. Mr. and Mrs. Halliday.

BRIGHTON.—Rusthall Boarding Establishment, 11-12, Cannon Place Central. One minute West Pier. From 2 guineas weekly.

DEAN FOREST.—Severn-Wye Valleys. Beautiful Holiday Home (600 ft. up). 60 rooms, extensive grounds, motors, golf. Boarders 47*s.* 6*d.* to 63*s.* Prospectus—Littledean House, Littledean, Glos.

EASTBOURNE.—Convalescent men not requiring nursing receive thoughtful attention at the Y.M.C.A. Hostel, Eastbourne. Moderate.

JERSEY.—The Ritz Private Hotel, 83, Colomberie. Central, gardens, dancing, young society. From 45*s.* weekly. Tariff.

JERSEY.—The Sandringham, Colomberie. Near sea. Gardens. Young society. From 42*s.* weekly. Tariff.

MARGATE.—Board-residence from 2 gns. weekly. Splendid position facing sea and close amusements. Liberal table. Stamp for tariff. "Bidston," Marine Terrace.

SHANKLIN.—Glenavon Private Hotel. Comfortable, homely. Brd.-res. Electric light, billiards. Excellent cuisine, first-class reputation. New management. Mrs. Geere.

TORQUAY.—Homely board-residence, central for everything, 3 minutes Strand, Shops, Trams, Harbours, Piers, Promenade, Sea-front, Pavilion. Good cooking, recommended, no children,—Pridham, 2 St. John's Place.

HOLIDAYS IN NORTH WALES.—Sea and mountains, mild climate, beautiful excursions. Golf course near. Comfortable, refined and magnificently situated Guest House, in extensive grounds. Produce from own gardens. 42*s.* per week, inclusive. For prospectus write. Manageress, Bryn Corach, Conway.

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(8). I had opportunities for investigating the position of Radio telegraphy so far as it concerned long-distance work, but the results at present appear to be disappointing. I was amazed at the severity of the disturbance experienced over that side, we have nothing like it here. I was told that few hours of the day were absolutely clear of disturbance, and, until some remedy is found, high-speed work or Trans-Atlantic telephony is impracticable. The much-boomed devices for interference-prevention have proved very broken reeds and much remains to be done. Nevertheless the American radio people are working with extraordinary energy and if we may pride ourselves in having the lead so far as cable telegraphy is concerned, we shall have to wake up if we want the same proud position in radio telegraphy.

The big station at Long Island was commenced while I was over, but there was nothing to be seen. I discussed the long-distance problem with the many American radio men and they all agreed that much remained to be done before a regular 24 hour service at high-speed could be obtained. When the goal is reached the cables are bound to feel the competition. At present they can smile at it.

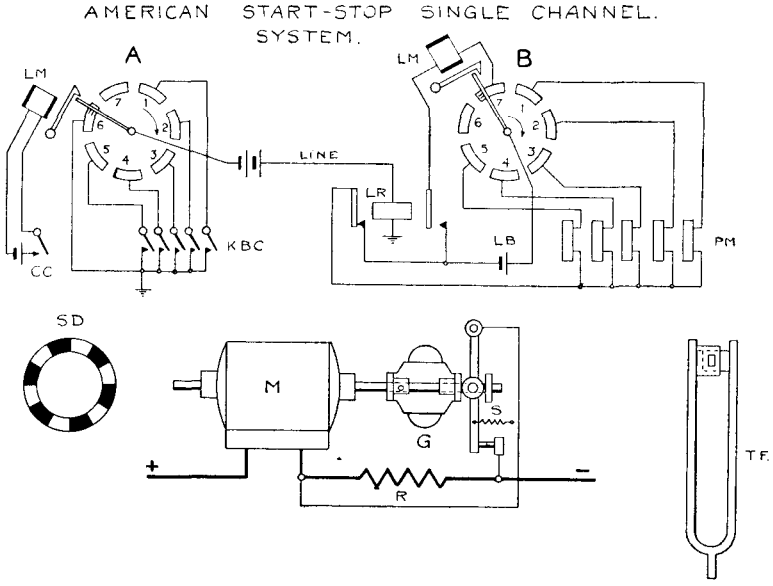

FIG. 6.

(9). By courtesy of the A.T. & T. Co., I saw a carrier current circuit in operation with fifteen separate channels. The telephony is very good, clear and free from foreign noises. The telegraph is really a high-frequency harmonic multiple system made much more efficient by the use of valve generators with their pure waves which, of course, make for selectivity and by the adoption of methods borrowed from radio technique made possible by the high frequencies used. The interference beats which hampered older methods are filtered out by band filters and the results obtained with this new art are impressive. The ordinary calculations from telephone transmission do not seem to apply to high-frequency guided waves, and at the time of my visit a discussion was raging as to the law connecting energy needed and distance attainable.

(10). I have to acknowledge the extraordinary courtesy and kindness of the leading officials of the Western Union, the Postal Co., the Western Electric and the A.T. & T. Co. This welcome was not confined to administration officials. I had a most cordial reception from Messrs. Morton & Krum of the Morkrum Co., from Mr. Kleinschmidt and many other manufacturers.

The manufacturer of telegraph equipment in America is much to be envied by an English manufacturer. Orders such as 1,100 keyboard perforators, 2,000 standard B relays, 200 quadruple duplex distributors permit of an organised and efficient manufacture not possible to those catering for European demands, which can only be termed paltry by comparison.

The American telegraph and telephone industry has live technical journals and I spent pleasant and informative hours with Mr. Donald McNicol, Editor of the *Telegraph and Telephone Age* and others.

H. H. HARRISON,

WEST YORKS SOCIAL AND DISCUSSION CIRCLE.

AT the February meeting of the West Yorkshire Telephone Social and Discussion Circle, eight of twenty three-minute papers submitted were read. The eight papers were adjudged the best in a competition open to all members of the Circle. The paper awarded the first prize is published in this issue.

The judges had considerable difficulty in making their decision, as several of the papers were of outstanding merit. After the papers, there were games and dancing, which rounded off a very enjoyable evening.

SUMMARY AND RECOMMENDATIONS OF THE SELECT COMMITTEE ON TELEPHONE SERVICE, 1922.

IN drawing up this Report your Committee have endeavoured to avoid repeating statements in the two recent telephone Reports upon which they have no special comment to make, or with which they agree, and also have aimed at not unduly prolonging it by including every possible item, large or small, of which there are many, which might conceivably be discussed on home and foreign telephone services. For greater convenience we have attempted to classify our recommendations in some relation to their importance as they appear to us, but we feel that from the nature of the subject the following curtailed summary is almost necessarily imperfect without reference to the specific paragraphs and to the Report as a whole, and this must emphatically be borne in mind.

MAIN RECOMMENDATIONS.

(i) Re-organisation on more commercial lines, and separation of the telegraph and telephone departments from that of mails, and constitution of an administrative board of heads of departments under the Postmaster-General or Minister of Communications.

(ii) Division of the country into telephone areas for healthy competition and financial comparison, with local consultative committees and co-ordination as far as possible of community of interests.

(iii) Greater encouragement of co-operative enterprise where the Post Office do not see their way to develop, notably in rural areas, under Government supervision, with sanction in each case of the Railway and Canal Commission.

(iv) Telephone charges should be reduced with the reduction in the cost of living and cost of materials.

(v)—(*a*) The setting aside of £200,000 annually for *extra* depreciation should be discontinued and the charge for ordinary depreciation should be revised, which would result in a further reduction in 1922-23 of £276,000, with proportionate reductions on the Estimates for future years.

(*b*) Salaries and overhead charges for new construction work and for renewals should be debited respectively to capital and to the depreciation account, not to revenue, which would have meant savings on revenue account of about £400,000 and £186,000 in 1920-21, and will be perhaps more later.

N.B.—These two recommendations together (£1,062,000) represent probably at least 8 per cent. off existing telephone charges.

(*c*) The Post Office telephone accounts should be kept in a more commercial form, and more extensive use should be made of a capital account.

(vi) The basis of the method of charging should be the message rate. The flat rate, although theoretically objectionable, may be admitted as the means of accelerating development in very small places or for residences in certain restricted areas.

(vii) The extra mileage rate should be reduced from £10 to £5 a mile.

(viii) A certain differentiation or elasticity of rate is sometimes advisable where it assists development, and as an example there should be a lower annual installation rental for residences than for business premises.

(ix) If our conclusions are approved, we recommend an immediate reduction of 10 per cent. on subscribers' accounts provisionally and without prejudice to any subsequent re-arrangement to carry out our recommendations.

SECONDARY RECOMMENDATIONS.

(x) Judicious extension of automatic telephony.

(xi) More trunk lines and less steeply-graded scale of trunk rates for the shorter distances.

(xii) More latitude in standard of materials to allow of cheaper extension into rural districts.

SUBSIDIARY RECOMMENDATIONS.

(xiii) Following on re-organisation (*a*) disappearance of the office of surveyor from the telegraph and telephone department; (*b*) transfer of the Holloway and Birmingham factories from the Department of the Controller of Stores to that of the Engineer-in-Chief, and (*c*) special care not to detail an unnecessary number of men on one piece of work or to put it through a needless multiplicity of channels.

(xiv) Extension of public call-boxes.

(xv) Fuller permission to the public to employ existing Post Office telephone wires when not in use officially.

Other recommendations are made as to the use of hand-micro telephones for press reporting purposes; retention of telephones on changes of tenancy; lower charges when no night service is given; reduced charge on trunk calls on Saturday afternoons and Sundays; and prolongation of interrupted trunk calls.

Your Committee are very much alive to the fact that the financial success of some of these recommendations is dependent upon a better spirit of co-operation between the Post Office and the public as expressed in § 2. To secure this success a more sympathetic recognition is vital by the Post Office, on the one hand, that the public are human beings with human feelings and frailties, and not mere automatons for making the telephone accounts balance; and by the public, on the other, that there are often real hidden technical difficulties and that an attitude of chronic suspicion does not help to solve them.

THREADNEEDLE STREET B.O. ANNUAL STAFF DINNER.

THE annual staff dinner was held on Friday, Feb. 10, at the Abercorn Rooms, when about 130 sat down to a well-served repast. The chair was taken by the Controller, Mr. J. Lee, supported by Mr. Percy Denham (Vice-Chairman), Messrs. A. W. Edwards (Deputy Controller), D. M. Ford (Assistant Controller), F. W. Miles, W. H. Offord and others. It was pleasing to meet Mr. J. G. Hopgood, late Superintendent, who was recently pensioned, and Mr. E. Fulcher.

The Controller, in proposing the toast of "The Staff" said at length he could meet the T.N.S. staff with the certainty of the erection of the new building. It might be that there were large developments in front of an office having so unique a position in the city as the Threadneedle Street Office. Possibly they would have to discuss the relative merits of machine telegraphs and the Morse system for that office and, therefore, they would do well to maintain an open mind as regards the respective merits. He felt sure that they would all continue to co-operate in every branch of the Central Telegraph Office for retaining the respect and confidence of the public in respect of the Telegraph Service, and that no possibility of improvement would escape them. He had now been nearly three years in the position of Controller and he felt that in that three years we had not stood still. He was more than grateful for the wonderful experience he had had among them all and for the wonderful spirit of cordiality, loyalty and co-operation which had been manifested in the advancement of the Service in which their lives and careers were wrapped up. In wishing prosperity and health to the staff he hoped that they would realise that they formed the vanguard in the march of the future progress of the Telegraph Service, and this idea should provide inspiration to them all.

Mr. D. O. Caldelough responded to the toast in his usual humorous vein. Mr. E. Spencer proposed the toast of "The Chairman," his speech being enthusiastically received.

The musical programme was specially enjoyed and the talent displayed was of a very high order, the staff being fortunate in possessing such personalities as Messrs. Emelyn Jones, Reg Lucas, Frank Hudson, Fred Brown, A. G. Jordan, Sam Wheller and A. G. Thain. Miss Bertha Willmott pleased the audience with her light comedy songs, Mr. Arthur Belrose with his humorous pieces and Mr. W. H. Rutt of the C.T.O. contributed to the programme.

THE OLD GUARD OF THE C.T.O.

The Ashburton Club, Red Lion Square, was the scene on Jan. 18 of a delightful and memorable gathering of men now retired from the C.T.O. and its activities. All ranks were represented, though the occasion was one upon which rank took wings unto itself in retirement and only the *man* remained. The gathering took the character of a brotherhood of goodwill, in which the spirit of old times was a predominant factor. It was not the least remarkable feature that nearly fifty old colleagues should be able to meet hale and hearty after their life's work, with a margin of time and leisure for recreation. Many regretfully unable to attend sent their good wishes. Mr. A. Earnes, a former Controller, being one of the number, Amongst those present was Mr. Ben. Packham, who some may recall was compelled to retire some forty years ago through partial blindness. Escorted by Mr. A. McEwan, his reception was affectionately enthusiastic.

An excellent tea was provided in the hall, after which the company made its way to the Club Smoking Room, where the hum of conversation soon became general, here and there knots of old-timers exchanging news of old friends, &c. and thus "getting fresh balances." Impromptu speeches, songs, and anecdotes, of which latter most of the old guard seem to have a considerable store, were succeeded by the singing of Auld Lang Syne, but not before it had been practically decided to renew acquaintances in the summer, probably at Kew.

A. C. M.

MR. C. F. FINDLEY, Assistant Traffic Superintendent, Birmingham, who left on Sept. 21 to take up duty as an Assistant Inspector of Telegraphs and Telephones at Headquarters, was, on the 19th, the recipient of tokens of goodwill from the Traffic and Trunk staffs and the Telephone Cricket Club of which he was captain.

The suit case from the Trunk staff was handed to Mr. Findley by the Supervisor, Miss Chivers, who wished him good speed on behalf of the donors, whilst the kit-bag and case of pipes from the Traffic staff and Cricket Club respectively were presented at a concert presided over by Mr. C. W. Piggott, Traffic Superintendent. The bag in which was placed a wrist purse for Mrs. Findley, was presented by Mr. Piggott and the pipes by Mr. H. Bristow, Traffic Superintendent II, the former speaking in highly eulogistic terms of Mr. Findley's official worth and the latter of his sterling services to the Cricket Club. Mr. Hunter (Contracts) also spoke as an active member of the Cricket Club, and Mr. Findley responded in appropriate terms.

The musical programme was ably sustained by Mr. C. P. Price, Mr. W. Brown, Mr. L. Marsh, Mr. Lowe, Mr. Engleman and Mr. C. Llewellyn, who was responsible for this part of the proceedings. A representative gathering was present, including Mr. Findley, senior, Mr. A. Murray, Contract Manager, Mr. J. Wilkinson, Traffic Superintendent II, Messrs. T. R. Hughes, J. W. Tilley and A. C. Jones, Assistant Traffic Superintendents.

BIRMINGHAM TELEPHONE DEPARTMENT.

Mr. J. S. Rhodes, Contract Officer, Class I, was the recipient of a complimentary dinner, a gold fountain pen and gold pencil on the evening of Feb. 27, on the occasion of his retirement from the Telephone Service.

MR. J. S. RHODES.

In making the presentation, Mr. A. K. Murray, the Birmingham Contract Manager, who presided, referred to the outstanding qualifications possessed by Mr. Rhodes in dealing with the public and to his remarkable trait of character which made him so popular with the staff and with the public. Mr. John Scott, the Surveyor, paid many compliments to Mr. Rhodes on his high standard of business dealings and dwelt particularly on the theme of the pleasure gained in successful dealings apart altogether from an adequate or inadequate remuneration. Mr. P. F. Currall, the District Manager, and Mr. C. W. Piggott, the Traffic Superintendent, also spoke, after which musical honours were indulged, and the company wished health and happiness to "Our Guest."

Messages containing best wishes were received from Mr. Williamson, District Manager, of Glasgow, Mr. Taylor, D.M., Brighton, Mr. Maclure of Headquarters, and other friends.

LONDON TELEPHONE SERVICE NOTES.

London Telephonists' Society.

THE Society held its sixth and last meeting of the session on Wednesday. March 8. Three prize-winning competition papers were read. The first, entitled "A Day in the Life of a Telephonist," was by Miss Dorothy Turner of Regent, a frequent contributor to these columns. It was read by the author in a vigorous and happy manner. She told in realistic fashion of the stars in their courses fighting against her in the morning in her efforts to reach the exchange—and the ubiquitous Radials—in time. "Be it known," she announced dramatically, "that it is easier far to bluff the Angel Gabriel and pass into Heaven, than wangle the demon Radial and punch an early." Miss Turner remarked amidst much amusement that it might interest the P.M.G. and the Controller, who was present, to know that about 75 per cent. of hardest cases amongst unreasonable subscribers claimed relationship with them. The impression the paper left was that such a radiant spirit would get in anywhere, and be granted anything. Truly, if all that Miss Turner related falls within a day's experience, then the average telephonist does not suffer *ennui*.

The second paper was by Miss J. G. Graves of Toll Exchange. The subject was "Reminiscences of the Operating School," and it was told in an interesting way, how her first feelings of confusion at so much that was strange and new were subsequently restored to correct orderliness.

The third competition paper was read by Miss J. McMillan of the Traffic Branch. Miss McMillan has cultivated the habit of carrying off a prize each year and her effort this year, as formerly, was in logical form, entitled "Trial by Jury," in which an erring subscriber is tried for his misdemeanours. Amongst other crimes:—

"Though much indebted to the State,
He railed against his lawful rate;
Demanded, too, a large rebate,
Or else advance of his rental date.

The allegation is that he
Refuses to consult the free
Fair preface to Directory.
And graver still, let all agree,
He will not roll the "R" in three.

Finally, the Judge, after hearing evidence, addresses the prisoner:—

Prisoner, you may go,
But don't ingratitude show
By any disaffection.
And whether soon or late,
Always co-operate.
(Plus a rising inflection)
And if you cannot capture
That first fine careless rapture
Of "R's" rolled roguishly,
The Court will make an order
To take you o'er the Border
Where many "R's" there be.

* * * *

During the evening several short essays on interesting official experiences were read, and prizes were awarded to Miss Elsie Cave of Hampstead Exchange, Miss M. Porter of Regent Exchange, and Miss G. L. Williamson of Dalston Exchange.

The proceedings terminated with the presentation of prizes by the Controller, Major G. F. Preston, C.B.E. The Society is fortunate in having this function performed each year in such happy mood by the Controller, who so obviously enjoys this opportunity of sharing the staff's recreations.

The Society has had a most successful session under the presidency of Mr. M. C. Pink, assisted by Mr. E. S. Thirkell as secretary, and chiefly owing to their efforts, next year's president, Mr. G. Buckeridge, will take over a going concern.

* * * *

Culled from the Exchanges.

Mayfair Exchange.—A most successful whist-drive was held at the Cabin Restaurant, Strand, on Feb. 28. The Mayfair staff and friends have the gift of enjoying things to the full, and were not backward on this occasion. Mr. Howe of the engineering staff made an admirable M.C. The ladies' prizes were won by: 1st, Miss Bird, 2nd, Miss Tringham, 3rd, Miss Maggs, half score, Miss Dempsey. Gentn.: 1st, Mr. Fitchett, 2nd, Mr. Holdway, and 3rd, Miss Amay (playing gentleman), half score, Mr. Hollis. The Committee hope to arrange another drive during April.

The Mayfair Dance.—A most successful carnival dance was held by the Mayfair Exchange on Saturday, Feb. 11, at Holborn Hall. The hall presented the appearance of a dazzling kaleidoscope, for the brilliance and variety of costumes displayed by the medley of dancers was added to by the varied hues of the balloons which they trailed aloft. The costumes were certainly most successful and effective as the fancy dress parade proved. We congratulate all and would especially mention the winners of the originality prizes,—Miss Overed as "Coal Black Mammy," Mr. Hiscock as the multilated recipient of the "*Daily Chronicle* Insurance Benefit." Other prize winners were Miss Shearman as "Aladdin," and Miss King as a "Harem Lady," Mr. Cooper as "Pearly King," and Mr. Vaughan as "Harlequin." Mr. Coombs "Bon Accord Band" especially amplified for the occasion, performed with their customary zeal and charm. We feel sure that all present readily join the M.C. in according his thanks to the committee whose efforts had received such success and we feel that they join us in thanking Mr. Collins for so kindly officiating as M.C.

Paddington Exchange.—On Saturday, Feb. 11, the Paddington Exchange staff gave their annual tea and entertainment to the poor children of the district. The children attending the L.C.C. School in Cosway Street were the invited guests and over 300 tickets were distributed. By a quarter to four the helpers had everything ready, the tables looked very pretty with their varied artistic colours, gained by green tea-cups and saucers, coloured bon-bons and a jelly in its own pretty case, for each child. The children were marshalled to their places and at a word from the school-master said Grace and set to work on the good fare provided. Soon, however, in answer to an S.O.S. the helpers raided the store-room for more, and plate after plate of cake and other good things were rapidly disposed of. The musical entertainment following was provided by members of the exchange staff under the direction of Miss A. L. Powell, who formed themselves into a pierrot concert party. Judging by the hearty response "to join in the chorus," the children fully appreciated each item as it was rendered. As the children left, a bag of fruit and sweets and a golden penny were put into their hands, and all went home having thoroughly enjoyed themselves. A subsequent letter of hearty thanks from Mr. Mortimer, the headmaster, is an eloquent testimony of the appreciation of the school authorities and the children of this effort on the part of the Paddington Exchange. The committee wish to thank all those who in any way contributed to make the afternoon an unqualified success.

Regent Exchange.—The usual order of things at Gifford House, Roehampton, were pleasantly reversed on the occasion of Feb. 18, when Regent was invited to a tea and concert given entirely by the men and nurses as a means of showing their appreciation of the many occasions on which the girls have entertained them. Fifty were able to respond to the invitation, and spent an exceedingly enjoyable afternoon. A very talented performance was given by the Gifford House Orchestra and Concert Party. Regent desires to express its sincerest thanks to the men for their kind thoughts and good efforts.

A dance was given by Regent at the Shaftesbury Hotel, on Feb. 23, and was attended by even more than the usual measure of success and enjoyment. Mr. Buckeridge was M.C.

The social given by the Regent Swimming Club on March 1 was one of the merriest little functions of the season. The programme showed a pleasing variety of items, including coon songs by an infant girl in costume, a short play and songs by members of the staff. Financially too, the social was a great success.

Maryland.

Of course its very topical, but what we want to know
Is will it *stop* at Maryland, or will they make it so
The next Exchange is Tennessee or maybe Ohio?

And will telephonists be called "some great big baby girls?"
Or "honey-bunch," or "kid" perhaps, or "peach with teeth like pearls?"
And is it on the cards that we shall wed with belted earls?

Must we repeat our numbers, since this trans-Atlantic craze,
With a syncopated hiccup in the middle of the phrase?
And may we keep on chewing gum and sucking sugared maize?

Of course with these conditions we can call the male staff "guys,"
I s'pose they're scarcely "doughboys" now they never get a rise;
But, if we've *got* to imitate the Yanks—please "put me wise."

DOROTHY TURNER.

Sydenham Exchange.—On Feb. 11 instant the Sydenham Exchange staff gave a tea and entertainment at Wesley Hall, Lower Sydenham, to 120 poor children. Tickets of admission were kindly distributed through the agency of the Salvation Army and a local missioner. After tea the children were entertained by a ventriloquist and games were indulged in, followed by choruses sung with much energy to concertina accompaniment. Before departing each small guest was the recipient of a toy from the bran tub and a bag of eatables.

Trunk Exchange.—The ancient order of London Trunkards met for the second time on Monday, March 13, to greet their late chief, Miss Breden, on her annual visit to London before her return to Yorkshire. Her reception expressed the very sincere affection still felt for her by her old staff, and was also shown by the flowers presented to her from the day and night staffs. They mustered 89, 40 of these still in the service, including Mr. Trayfoot and Mr. Pink, and also traffic and night staff officers. There were three members who claimed to be the earliest associated with Miss Bredon in the early building up of the Trunk Exchange, and quite a number who commenced their career at the Central Telegraph Office. The most senior could remember an earlier chief, Mr. Covington, but Miss Breden held office for the longest period on record, and her influence together with Mr. Trayfoot's, is the foundation of the high ideals of duty, loyalty and comradeship which permeate the present day efforts.

THE

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CONTENTS.

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A DAY IN THE LIFE OF AN AVERAGE TELEPHONIST.*

BY DOROTHY TURNER (*Telephonist, Regent Exchange*).

LEST this topic should be deemed too ordinary to prove of interest, let me hasten to affirm that each and every day is cramfull of incident, if only we had time to notice it. A fellow feeling makes us wondrous kind, and it may give a certain little satisfaction to know that our daily adventures, good and otherwise, are shared by those around us. This shall be a perfectly truthful account, and may the powers that be close their eyes to the relations herein.

Time: 6 a.m.

Place: An average bedroom, conspicuous in which is a red-haired "Fumbs Up," scantily attired in a jade green bow, a huge glass powder bowl, and an alarm clock.

Dramatic Personæ: You—me—or any telephonist.

Brrrrrrr! Oh hateful, fateful sound! The insistent, brazen notes of the alarm spurs you reluctantly to open one eye and look at the time—Six o'clock! No need to hurry, you think, turning over. Another quarter of an hour in your warm, snug bed will do you the world of good, and there will be plenty of time for you to be right in the exchange by five minutes to eight. You close your eyes for exactly two minutes—wake in terrific alarm, and discover you have slept soundly for nearly half an hour! In a fever of haste and fright, you wash and do your hair in the style which is popularly known as the "eight o'clock chuck-up." Your mother, with privileged intimacy, tearfully implores you "not to go out on an empty stomach," so you swallow a cup of tea and a piece of bread and butter, mentally praying that a benevolent supervisor will permit you a "casual" at ten o'clock to get a glass of hot milk.

When you get to the top of the street a horrid suspicion comes to you. Hastily you search your bag. Yes, you remember now, you have left your keys dangling from your drawer, which you are obliged to keep locked on account of your sisters taking ways with your blouses and handkerchiefs.

And what is a telephonist without her locker key? One might just as well try to imagine a certain cinema comedian without his funny feet and baggy trousers!

Back you rush and wait an age on the doorstep for your sister to put the towel round her shoulders and open the door. Making sure that you are quite complete this time, you sally forth again, and catching sight of the church clock, feel quite reassured to find that it is not nearly so late as you thought it was, so you feel entitled to slacken down a little.

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In a flash you reach the exchange, tear off your hat and coat, adjust your instrument and rush to punch "On duty," for, be it known, it is easier far to bluff the Angel Gabriel and get into heaven, than it is to wangle the

* Prize paper read before the London Telephonists' Society.

MANCHESTER TELEPHONE SOCIAL CLUB.

THIS club held a very successful fancy dress masked carnival at the Grand Hotel, Manchester, on Friday, Feb. 10, 1922. All sections of the Telephone Service were represented, and a very enjoyable evening was spent. The dancing floor presented a brilliant spectacle with its gay throng of revellers. In the absence of their president, Mr. Wallace, through sickness,

Mr. Stewart (District Manager) and Mrs. Stewart, Mr. Staite (Traffic Superintendent) and Mrs. Staite, assisted by Mr. and Mrs. Bailey (Grand Hotel), officiated as judges of costumes. Their task was by no means an easy one, but the final selections met with unanimous approval.

Mr. Hollerton's orchestra contributed in no small measure to the success of the evening, and the dancing programme was ably carried out by the M.C., Mr. G. Butler. Great credit is due to the organisers, Messrs. H. W. Short and H. K. Hamilton, Chairman and Secretary respectively, assisted by a hard-working committee.

MANCHESTER TELEPHONES—RETIREMENT OF MISS HAWKINS.

THE passing of the Trunk Supervisor, Miss Hawkins, into the ranks of the pensioned owing to ill-health marks a period in the annals of the Telephone Service, for she has been intimately connected with its development for many years. Miss Hawkins was a Supervisor under the National Telephone Company and came to the Post Office at the transfer of the Trunks in 1897. Since that date her large experience and exceptional ability have been devoted unstintingly to the service, and it is generally recognised that these have been of the highest value to the Department.

MISS HAWKINS.

Feb. 27 was the occasion of a social gathering held in the Houldsworth Hall, when Miss Hawkins' "girls" past and present, together with friends from other exchanges and other branches, were present in large numbers.

During the evening, the Surveyor, Mr. Maddan, presented Miss Hawkins with a gold wristlet watch from the Trunk Supervisors, an easy chair and a reading lamp from the Trunk Exchange staff, and a cushion from the Engineering staff, with expressions of goodwill and wishes for health and happiness in her retirement. She had, on other occasions, received a clock from telegraph friends, a satin eiderdown travelling rug and ebony brushes from the staff of the Traffic Section and the Supervisors of the local exchanges.

Letters were read from Mr. Sanderson, Controller of the London Postal Service, formerly Postmaster-Surveyor, Manchester, Mr. John Lee, Controller Central Telegraph Office, and Miss Chippendale, Trunk Supervisor, Leeds, regretting inability to attend.

Mr. Maddan, in his remarks, said that he had known Miss Hawkins by repute before he came to Manchester, and he spoke of her unusual record in supervising the telephone exchanges in Manchester at the age of eighteen, whilst Mr. Stewart, District Manager, referred to her reputation as a Trunk authority, not only locally but throughout the United Kingdom.

The other speakers, Mr. Wadsworth of the Telegraphs, Mr. Staite, Traffic Superintendent, Miss Johnson, Trunk Supervisor, Liverpool, and Mr. Jackson, of the Engineers, have been associated with Miss Hawkins in varied capacities and all paid tribute to her capabilities and her untiring efforts for the well-being of the staff. Miss Hawkins briefly replied, and the enthusiasm of those present was audibly expressed.

Once more through these pages, we wish for her many years to enjoy her well-earned rest.

PERSONALIA.

LONDON TRAFFIC STAFF.

The following officers have resigned for marriage during the month of February :—

ASSISTANT SUPERVISORS, CLASS II.

Miss M. E. TAYLOR, Regent.
Miss F. A. CLARKE, Regent.
Miss E. A. BULL, Regent.
Miss E. L. BISHOP, Avenue.
Miss B. BRYANT, Gerrard.
Miss S. E. EARLE, Holborn.

TELEPHONISTS.

Miss I. C. COLLINS, City.
Miss E. E. LOWRY, City.
Miss C. E. WALLER, City.
Miss W. BROOKER, Regent.
Miss H. B. LONSDALE, Regent.
Miss D. R. H. COLE, Regent.
Miss G. G. KEENE, Regent.
Miss D. A. HILLIER, Regent
Miss HAVELOCK, Victoria.
Miss NORRIS, Victoria.
Miss M. B. A. JOHNSON, Victoria.
Miss W. ARNUP, Avenue.
Miss A. C. LUSCOMBE, Avenue.
Miss E. M. FREEMAN, New Cross.
Miss E. R. ADAMS, Sydenham.
Miss F. HADDON, Gerrard.
Miss M. L. COX, Gerrard.
Miss A. E. SPARKES, London Wall.
Miss D. H. WOODFORD, London Wall.
Miss M. D. BOLTON, London Wall.
Miss V. E. WETTEN, Hammersmith.
Miss A. BOND, Mayfair.
Miss D. SPRATLEY, Paddington.
Miss E. SMITH, Paddington.
Miss E. M. THOMAS, Central.

COMING EVENTS.

April 24.—T. & T. Society. General meeting and paper by Mr. A. B. Hart (Asst. Staff Engineer), "High-Frequency circuits."

FOOTBALL.

April 13.—Centels (2) *v.* Victoria United. Away.

ANSWERS TO CORRESPONDENTS.

Harry.—As you will see from Memorabilia, the Imperial Cable, English end is landed at Mousehole, Mount's Bay.

Radio.—Yes, wireless between this country and Hungary is actually a *fait accompli*, but the service is not at present a very regular one, owing to conditions not governed by our own island.

Cableite.—The entry on page 522 of *Whitaker* is of course, quite inexact when it states that "the submarine telegraph cables connecting the British Dominions and Foreign countries, are maintained and worked by private companies. We were surprised to see the statement in a publication generally so very reliable.

THE

Telegraph and Telephone Journal.

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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.

A DAY IN THE LIFE OF AN AVERAGE TELEPHONIST.*

BY DOROTHY TURNER (*Telephonist, Regent Exchange*).

LEST this topic should be deemed too ordinary to prove of interest, let me hasten to affirm that each and every day is cramfull of incident, if only we had time to notice it. A fellow feeling makes us wondrous kind, and it may give a certain little satisfaction to know that our daily adventures, good and otherwise, are shared by those around us. This shall be a perfectly truthful account, and may the powers that be close their eyes to the relations herein.

Time: 6 a.m.

Place: An average bedroom, conspicuous in which is a red-haired "Fumbs Up," scantily attired in a jade green bow, a huge glass powder bowl, and an alarm clock.

Dramatic Personæ: You—me—or any telephonist.

Brrrrrr! Oh hateful, fateful sound! The insistent, brazen notes of the alarm spurs you reluctantly to open one eye and look at the time—Six o'clock! No need to hurry, you think, turning over. Another quarter of an hour in your warm, snug bed will do you the world of good, and there will be plenty of time for you to be right in the exchange by five minutes to eight. You close your eyes for exactly two minutes—wake in terrific alarm, and discover you have slept soundly for nearly half an hour! In a fever of haste and fright, you wash and do your hair in the style which is popularly known as the "eight o'clock chuck-up." Your mother, with privileged intimacy, tearfully implores you "not to go out on an empty stomach," so you swallow a cup of tea and a piece of bread and butter, mentally praying that a benevolent supervisor will permit you a "casual" at ten o'clock to get a glass of hot milk.

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You arrive at the tube station in good time. The lift, as usual, is out of order, so you run downstairs. The sound of a train in the distance spurs you to a frenzy of effort. You almost fall on to the platform—to discover the train is going the other way. Then—Oh! horror!—you see flaunting you in malevolently brilliant letters, "Next train passes this station." "Ugh!" you bitterly reflect, "Of course it does. No train ever stops at this station when *you* want it!" Sure enough, the next train does pass through. You get well to the edge of the platform, risking instant destruction in your determination to board the next train. It enters the station with a defiant whistle, and—also passes through, a non-stop from the terminus to Timbuctoo.

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In a flash you reach the exchange, tear off your hat and coat, adjust your instrument and rush to punch "On duty," for, be it known, it is easier far to bluff the Angel Gabriel and get into heaven, than it is to wangle the

* Prize paper read before the London Telephonists' Society.

Demon Radial and get in early. Viciously you punch—breathlessly you look—eight o'clock exactly! A glow of lovely satisfaction passes through you—you have "just done it!"

The sleepy-eyed night staff thankfully depart, and from eight o'clock until five minutes past, you gather yourself together, breathe freely and surreptitiously "do up" little ends of hair. Then you test the cords and busy-backs. Of course, every other cord is L.G.* Whereupon you earn the wrath and contempt of the exchange inspector and his youthful minions—for whenever they appear, the cords seem to have mysteriously come O.K. At eight-thirty and nine o'clock fresh batches of your colleagues appear, and you enquire after each other's health and feelings, and comment on new blouses and jumpers *in between* answering the few desultory subscribers who call so early in the morning. After nine o'clock you become more occupied in taking calls. At nine-thirty, a heaven-inspired supervisor grants you your prayed-for "casual." A glass of hot milk or a cup of Bovril works wonders and you return ready and fit for anything.

You have your own position, you know your subscribers from A to Z. You know exactly which is reasonable and which of them need to be answered *before* they lift the receiver. You are familiar with their numbers, and you work steadily with a liberal application of the "rising inflection." Life seems to be nothing but a perpetual series of "pushings in," "pullings out," and "pressings down." Yet you are quite happy. You feel like work and you want to be busy. An occasional encounter with an impudent office boy, or an old lady tied up in a call office, enlivens the proceedings a little. Presently a really poignant incident calls forth an indulgent smile for the unreasonableness of the male sex in general, and subscribers in particular.

It is something after the following:—

Impatient Subscriber (flashing furiously ten seconds after challenge): "They haven't answered me, miss."

Telephonist: "I'll ring them again."

Impatient Subscriber (five seconds later in an irritatingly plaintive voice): "Are you going to give me my number, or shall I write to Preston?" (Apparently he thinks by mentioning Mr. Preston with such familiarity he will reduce the telephonist to a state of abject submission).

Telephonist: "I'll ring them again, will you please repeat the number?"

Impatient Subscriber: "I shall *not* repeat the number. You ought to know it. It is your business to remember my numbers."

Telephonist changes junction and finally advises "No reply."

Impatient Subscriber (resignedly, more plaintive than ever): "Very well then, I shall have to write to Preston after all, and God knows I'm busy enough!"

And this, oh! heavens, is a perfectly true story. I wonder if the Postmaster-General and Mr. Preston would feel flattered if they knew that three-quarters of the troublesome subscribers claim to be closely related to them and use the relationship as a threat to have questions asked in Parliament every time they get a wrong number? At eleven-thirty, the exchange presents a scene of pleasant animation. Fresh telephonists come on duty and you are relieved for lunch. There is little time—three quarters of an hour—and it passes so very quickly. Oh! would that every other three quarters of an hour during the day would be as brief! At twelve-fifteen you return to relieve others—the Radial still grimly keeping guard over your exits and entrances. About one o'clock there is scarcely a subscriber calling, and you are beginning to feel the effects of early rising and a good dinner. An insistent drowsiness pervades you. Your head nods in spite of yourself. If only you could get up and run about—if only something would happen. Its no use, you simply *must* go to sleep. Then—a hand on your shoulder—a voice in your ear—"Miss Smith, you are wanted by the chief." In the short distance from your position to the chief supervisor's desk, your past life rises up before you. You mentally review all the small occasions on which you have surreptitiously fallen from grace. Surely nobody saw you when you—no, perish the thought! But what on earth can the chief want you for? You haven't been late for weeks and weeks. After all this agonising, the chief is very nice to you and only wants to tell you a belated increment has been granted. The news is sufficiently pleasing in these riseless days—moreover, it has certainly had the effect of thoroughly rousing you. When you return to your position you find the betting subscribers are becoming active. How you hate them, you think: how you wish they would lose their money until they could not afford a telephone. Full surely betting *is* a vice. Their voices appear coarse and avaricious in your ears, and their dreadful impatience gets on your nerves. Still, it is all in the day's work, and you "carry on" quite happily.

Three o'clock with its promise of tea is the next landmark in your day. A tiny quarter of an hour and you are back again, hard at work and gradually paying the penalty for swallowing a scalding cup of tea and eating new bread and butter in so short a time.

Only another hour and a quarter and you may go home. The last half hour is unbearably long. You simply cannot keep your eyes from first one clock and then another. At last it is four-thirty. You are relieved, and hasten to give the old Radial the most joyous punch of the day. With a tremendous sigh of relief you take off your instrument feeling that you could not have possibly worn it another second. Oh, it's good to be going home

* L.G. = Permanent Glow.

Your return tube journey is accomplished with ironical ease, considering you are not now restricted to time.

Arrived home, you have another tea, this leisurely and in comfort. Then happily and thinking you've a nice long evening before you, start upon many little jobs which have long demanded your attention. You iron some blouses, finish a jumper, mend various articles of apparel, help with the washing-up and do a little hurried shopping for your mother. Then you preen yourself and powder to look really beautiful for the one person in the world who really matters.

How completely you have forgotten telephones and subscribers! Some music and singing. Reading and discussions. Even dancing to the gramaphone if mother is out and you can turn up the carpet.

Your long evening goes far quicker than the hour and a quarter between "tea in" and "off duty," alas! Then, if you cannot prevail upon your brother, you clean your own shoes and leave your gloves, bag, everything, in readiness for the morning. Upstairs you make a face at the alarm clock and sleepily think "Thank goodness, I'm nine-thirty to-morrow." Then all is silence and the "Fumbs Up" in her jade green bow, smiles benignantly upon your slumbers.

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(*Continued from p.* 99).

Valve Transmitters.

We have now to consider the method of generating high-frequency oscillations and therefore of producing the radiation of continuous waves by means of the thermionic valve.

A simplified diagram showing how a valve can be used for this purpose is given in Fig. 31.

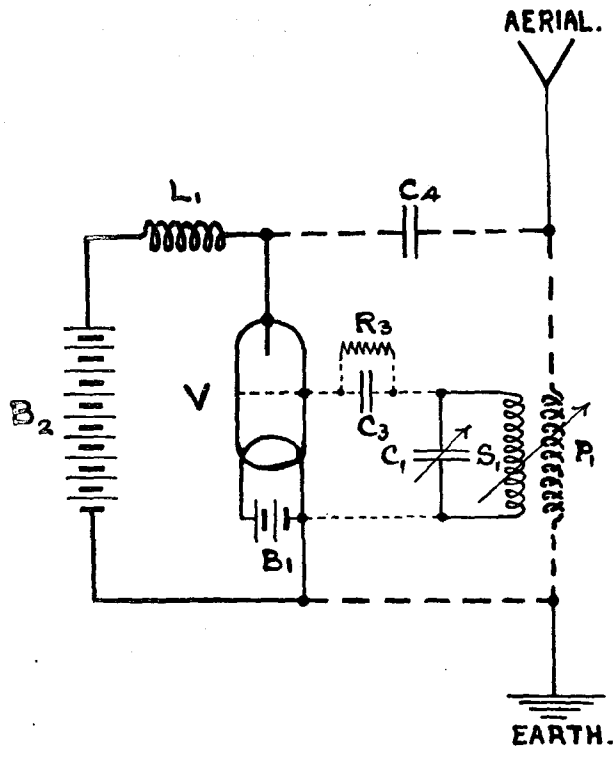

FIG. 31.

The positive pole of the high tension battery B_2 is taken to the anode of the valve V through an inductance coil L_1. The negative pole of B_2 is taken to the filament of the valve.

The condenser C_4 and the coil P_1 are joined between the anode and filament of the valve, and therefore offer an alternative

path between these points for the current from the battery B_2 to that through the valve itself. The condenser C_4 stops the flow of direct current through this alternative path and so prevents the battery B_2 from being short-circuited.

The grid of the valve is connected to the filament through the coil S_1, across which is joined the condenser C_1. The coil S_1 forms the secondary of an oscillation transformer, of which the primary is the coil P_1. Between the grid and the coil S_1 the condenser C_3 is interposed. This condenser is shunted by the high resistance R_3. The filament is heated by current from the battery B_1.

The aerial is joined to the end of the coil P_1 which is connected through C_4 to the anode and the other end of this coil is earthed.

The oscillatory circuits, consisting on the one hand of the aerial, the coil P_1 and earth, and on the other hand of the coil S_1 and the condenser C_1, are each tuned to the frequency corresponding to the wave-length which it is desired to transmit.

Suppose now that by some means a slight electrical disturbance is produced in the aerial circuit. If this circuit were detached from the rest of the apparatus the disturbance would die away in a damped train of oscillations of the frequency to which the aerial circuit is tuned. With the apparatus shown in Fig. 31, however, the alternating current pulses in P_1 will induce similarly alternating electro-motive forces in the coil S_1. The coil S_1 and the condenser C_1 form a second oscillatory circuit tuned to the same frequency as the aerial circuit. Consequently the impulses set up in S_1 by the oscillations in P_1 will set this second circuit into oscillation.

The resulting alternating differences of potential between the plates of the condenser C_1 will be impressed on the grid through the condenser C_3. When the grid receives a negative pulse the current flowing through the valve from the anode to the filament is reduced, while when the grid receives a positive pulse the anode current is increased. This current reaches the valve through the inductance coil L_1, and, in accordance with the usual effect produced when a current flowing through an inductance coil is varied in strength, electro-motive forces are set up in this coil in such directions that they oppose the changes of current by which they are produced. If the current be reduced a forward electro-motive force is set up, while if the current be increased the induced electro-motive force is in the reverse direction.

Thus when oscillations are set up in the aerial the potential of the anode of the valve alternately rises and falls above and below its normal value, and these changes in potential take place in step with the aerial oscillations.

The variations in the potential of the anode cause currents to flow round the path through C_4 and P_1, first in one direction and then in the other. By suitably arranging the connexions of the various pieces of apparatus the currents set up in this manner in the coil P_1 can be made to assist the oscillations already existing in the aerial circuit. Consequently the currents in P_1 are strengthened. These increased currents produce a larger effect on the circuit C_1 S_1, which in its turn causes increased changes of potential to be impressed on the grid and these again set up increased fluctuations in the potential of the anode of the valve, and so the train of operations is repeated.

Thus the oscillations, once started, continue to increase, the necessary energy being drawn from the high tension battery B_2, until the supply of energy from this source just balances the various losses of energy which occur in the different circuits. When this state of balance is reached the oscillations no longer increase in strength, but are maintained at a steady value.

During the operation described, the plate of the condenser C_3 which is joined to the grid accumulates a negative charge, due to the electrons picked up by the grid, and this charge gradually leaks away through the resistance R_3. The valve is so arranged that the best operating point on the characteristic curve corresponds to some particular *negative* value of grid potential, and the values of C_3 and R_3 are so chosen that the average potential which the grid attains by reason of the accumulation of electrons just mentioned is maintained at this particular negative value.

The long and short emissions of waves to form Morse signals are usually produced by a key which closes or opens the high tension lead to the anode of the valve. This key worked by an electro-magnet, which is in its turn controlled by a hand key.

Signalling may also be carried out by opening and closing the leakage path R_3 round the grid condenser C_3. It has been explained above that R_3 and C_3 are so chosen that when oscillations are taking place the combined effect of the accumulation of negative charge on the grid, and the rate of leakage of this charge through R_3 brings the grid potential to its correct working value. If now R_3 be disconnected the negative charge reaching the grid cannot leak away. It therefore accumulates and the potential of the grid becomes more and more negative. The anode current consequently decreases (see Figs. 13 and 20) until ultimately it is reduced to such a low value that the oscillations stop. When the grid leak is again joined up the oscillations recommence. These actions take place very rapidly, so that by manipulating a key placed in series with R_3 signals can be sent.

In Fig. 31 the high voltage supply to the anode, and the current for heating the filament were, for the purpose of explaining the action of the apparatus, shown as being obtained from batteries. In actual commercial installations an alternating current supply is used for both purposes. By means of a step-up transformer this current is raised in voltage, and by suitable devices the high voltage alternating current so obtained is rectified and the current pulses smoothed out, so that a steady unidirectional supply is obtained for the anode circuit. The current for heating the valve filament is obtained from the same alternating supply, a step-down transformer being used, from the secondary coil of which the filament current is drawn.

The complete arrangement is shown in Fig. 32, in which pieces of apparatus which are also shown in Fig. 31 have been lettered in a similar manner to that diagram.

The alternator A supplies current to the transformer primary P_2 through a controlling impedance coil L_2.

The secondary coil S_2 has its centre point joined to the filament of the transmitting valve V, while its extremities are joined as shown to the anodes of two "rectifying" valves V_1, V_1. These valves are only provided with an anode and filament.

Since the current is carried across a valve by means of the stream of negatively charged electrons shot off from the heated filament, it follows that a current, using the word in its ordinary signification (see page 171, vol. VII), can only be sent from anode to filament. If a reverse voltage be applied to a valve no current will flow.

The filaments of the two rectifying valves are joined together, and are connected through the inductance coil L_1, to the anode of the transmitting valve V.

As the current alternates in the primary coil P_2 each terminal of the secondary coil S_2 becomes first positive and then negative relatively to the centre point of the coil. When the upper terminal is positive the lower terminal is negative, and *vice versa*.

When one terminal of S_2 is positive relatively to the centre point, a current is sent through the corresponding rectifying valve, and through the transmitting valve V back to the centre of S_2.

During the following half period of the alternating current, when the terminal of S_2 which we have just considered is negative, no current can flow through the rectifying valve. The other terminal of S_2 is, however, now positive, and a current will therefore flow

through the corresponding rectifying valve. It will be seen that as far as the anode circuit of the transmitting valve is concerned the currents with which it is supplied are always in the direction from anode to filament, no matter which terminal of S_2 is positive.

Thus a series of unidirectional current pulses are sent through the anode circuit of V.

If, however, nothing more were done these unidirectional pulses of anode current, at the frequency of the reversals of the alternating current supply, would set up corresponding groups of high-frequency oscillations in the aerial and the radiated waves would not be uniform.

To get over this difficulty the condenser C_5 is joined between the lead to the anode of the valve V and the return lead from its filament. This condenser smooths out the pulses from the rectifying valves and so the anode current is made steady.

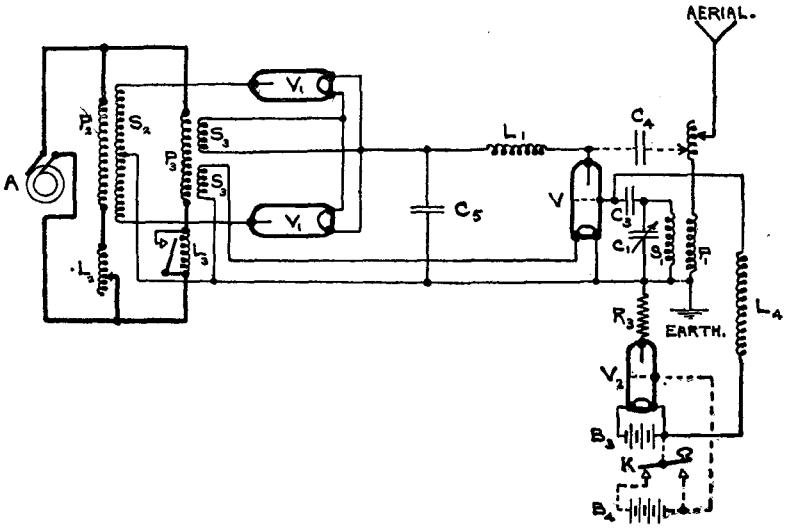

FIG. 32.

The action is similar to that produced by a long length of rubber hose when pulses of water are forced into one end from a pump. Each pulse is partly spent in stretching the rubber, while during the intervals between the pulses the stretched hose contracts and helps to keep the water flowing. Thus the irregularities in the supply are smoothed out, and a steady jet is obtained at the other end of the hose.

The filaments of all the valves are heated by alternating current obtained from another transformer. P_3 is the primary coil of this transformer. There are two secondary coils S_3, S_3; one for the filaments of the rectifying valves, and one for that of the transmitting valve. The filament supplies are separated in this way to keep the transmitting valve filament and the apparatus connected with it away from the high voltage supply to the anode.

The inductance L_3, in series with the primary coil of the filament current transformer, is automatically short-circuited when signals are being sent, and the filament currents are therefore automatically increased. In the intervals between the signals the filament currents fall. This prolongs the life of the valves.

In Fig. 32 is also shown a modification of the method of signalling by opening and closing the leakage path round the grid condenser. Instead of placing a key directly in this path the resistance R_3 (compare Fig. 31) is joined to the anode of a valve V_2. The leakage path is completed by a lead taken from the filament of this valve through the inductance coil L_4 back to the grid of the transmitting valve. A key K and a 200-volt battery B_4 are connected as shown between the filament and grid of V_2. When the key is at rest the battery B_4 is in circuit, with its *negative* terminal connected to the grid. The large negative potential which is thus given to the grid completely stops any current from passing through the valve V_2 from the anode to the filament, and thus no current can flow through the leakage path round the condenser C_3. The oscillations are accordingly stopped. It will be observed that the anode of V_2 is joined to the positively charged plate of C_3, while the negatively charged plate is connected to the filament, so that the voltage in the leakage path is applied to the valve V_2 in the proper direction for a current to flow if it were not prevented by the high negative grid potential.

When the key K is depressed the grid of V_2 is joined directly to the filament. The potential of the grid is therefore raised to that of the negative end of the filament, and a current can now flow across the valve from the anode. The accumulated charge in C_3 therefore leaks away, and the oscillations take place, as already explained.

The inductance coil L_4, placed in the leakage path, is to prevent high-frequency oscillations passing along the leak from the grid.

By the arrangement just described only a weak current has to be broken with the hand key to control the power actually used for signalling.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

WE are an insular people geographically and are frequently particularly so in outlook and mentality. Telegraphy, though world-wide in its ramifications and interests, though linking up continents and islands and bridging over huge spaces of the ether, and despite its appeal to wide view and wide interests, strange to say, does not always associate itself with that thought which studies questions from continental points of vantage or international interests. To some the existence of an International Telegraph Convention is a bane, whereas its inception was born of a real desire to unify the treatment of telegrams throughout the world. Nearly every country whose representative signed the various conventions has built up its own local system on the same or a similar basis so that it might dove-tail itself into the international system. Here in these islands we have developed telegraphy and especially the treatment of telegrams, on our own lines, probably expressing the Anglo-Saxon independence of thought and action. With that one has no right to quarrel. When, however, it comes to a desire to model European and International telegraphy upon British or American models one must expect some slight protest on the part of the representatives of at least a few of the other odd nations and states spread over this globe.

If some of our methods, or *all* of our methods appear to our conceit to be preferable to those adopted at periodical international gatherings of telegraph experts assembled from all parts of the earth, from China to Peru, these quinquennial sessions surely provide the opportunity for vocal expression of the faith that is in us. Once, however, having placed our nation's signature to the considered majority opinion there is nothing more to do than to settle down to the agreed-upon regulations and to faithfully adhere thereto. Provision is made in the existing convention for any variation in treatment upon which any two of the high-contracting parties may agree between themselves and this has been utilised from time to time between two contiguous nations. When criticism against certain procedure laid down by the International Telegraph Convention is made, may it not be that the root cause of the difficulties lies, not with the international system so much as with our own English system. One has heard of complaints against the identification of telegrams by numbering them, for example because we on our island prefer code time. One hears criticisms on the exactitude necessary regarding non-deliveries; or the handing-in time (whether a.m. or p.m.) or of the insertion of the date, and also the obligation for exactness as regards the number of words in Press telegrams hundreds of words in length, &c., &c. It is, however, international practice and the criticism savours very much of that of the dear old lady, who, watching her boy's regiment march past, remarked that "only my Jock was in step."

The matter of international *accounts* never seems to strike those not in daily touch with international telegraphs, and it has come to my ears that certain of our friends across St. George's Channel, who, with their new status, have been brought face to face with the financial side of international telegraphy have expressed unfeigned surprise at the international obligations which direct contact with the continental powers involve.

Mr. S. Evershed at the Jubilee Conference of the I.E.E. made the following sage observation on the evolution of telegraphy including what at first sight may almost appear to be the reversion to type portion of the cycle.

"Telegraphy began with a wireless telegraph (an optical system). Yet, the optical system was essentially an electric telegraph working on a wave-

length of about one forty-thousandth part of an inch, and using the human eye as the receiver. Then came the electric telegraph with wires to act as guides, and now we are using a wireless telegraph once more with a somewhat longer wave-length ! "

So the myth that the mysterious fires which occurred in the U.S. were due to the powerful wireless telegraph and telephone installations was soon exploded although very gravely explained by " a well-known scientific lecturer."

According to a statement issued by the Postmaster-General, the total expenditure to March 31, 1921, on the Tube railway which is being constructed for the conveyance of parcels and mails to and from the G.P.O. was £1,057,823, of which £185,775 was spent in the financial year ended at the date named. Tunnelling accounts for £767,710, and the other leading items are £73,103 for stations and £72,116 for earthworks, &c. The Ministry of Transport has extended the time for the completion of this railway until August 1923.

The *Sydney Morning Herald* states that the duplication of the telephone trunk line between Sydney and Melbourne has been completed. A duplex telegraph circuit has been superimposed upon each of the circuit wires. The length of the new cable is 580 miles, and it has cost about £36,000.

It has also been agreed between the Governments of France and Italy to open up a new telephone line between the two countries by linking the Susa office with that of Modana and making use of the existing connexion between Tunel del Frejus and Modana.

That the idea of ultimately succeeding in perfecting a system of photographic telegraphy has not been abandoned, may be gathered from the two following items from the Patent Office. The patents granted to Dr. Curt Stille No. 12,709 of 1912, and 9,061 of 1913 respectively, for " Improvements in telegraphic photography," and " Improvements in optical receivers for facsimile telegraphs," have been restored.

Before long, according to the *South Western Railway Magazine*, only nine long-distance telegraph circuits will remain between Waterloo Station, London, and certain stations below Woking and Guildford. as with these exceptions the whole of this company's telegraph circuits will be converted into telephones.

According to advices from Sydney the government has introduced the Murray multiplex system, combined with Baudot printers for telegraphic communication between Sydney and Melbourne.

Mr. J. Joseph in his paper on " Some Practical Applications of the Thermionic Valve," read before the I.E.E., accentuated the fact that the use of the thermionic valve in long-distance trunk telephony had reduced the weight of the necessary cable conductors from 200 to 600 lbs. per mile to as low as 20 lbs. per mile. Valves were placed at distances of every 30 miles. Incidentally the speaker made the gratifying statement that the best valves were being produced in this country. One of the latest applications of the valve was that of reproducing the sounds of heart-beats so that they could be heard in a large room.

By agreement with the Government the Amalgamated Wireless (Australasia), Ltd., of Sydney, is authorised to establish and conduct direct wireless communication between the Commonwealth and England, and also to take over and develop the entire Commonwealth Wireless Services. The Commonwealth will take the majority of the shares in the Australian Co. when its capital is shortly increased.

What must be an unique career for a Post Office telegraphist is that of Mr. R. E. Harwood, C.V.O., C.B.E., formerly of the Central Telegraph Office, who has recently been appointed as Temporary Deputy Treasurer to His Majesty the King.

As was most fitting a permanent wireless telegraph aerial has recently been installed on the building of the Institute of Electrical Engineers, Victoria Embankment, London.

Wireless telephone broadcasting in the United States has reached so acute a stage that President Harding recently asked Mr. Hoover to call a conference of Army, Navy, and commercial experts on wireless telephony with a view to the restriction of its use. It appears that the American ether is so fully charged with advertising stunts, &c., as to endanger the use of wireless for purposes of national defence.

Mr. Hoover has very decided opinions on the subject. At the opening of the committee's proceedings, he said :—

> " The use of the radio-telephone for communication between single individuals, as in the case of the ordinary telephone, is perfectly hopeless. Obviously if 10,000,000 telephone subscribers were crying through the air for their mates they would never make a junction ; the ether would be filled with franctic chaos and no communication of any kind would be possible.
>
> The wireless telephone had one definite field—in the spread of certain predetermined material of public interest from central stations. This material must be limited to news, to education, to entertainment, and the communication of such commercial matters as were of importance to large parts of the community at the same time. Wireless telephony was, therefore, primarily a question of broadcasting, and it became of primary public interest to say who was to do the broadcasting, in what circumstances it was to be done, and with what material. It was inconceivable that a service so important for news, for education, for entertainment, and for vital commercial purposes should be drowned by advertising chatter, or be used for commercial purposes that could be quite well served by other means of communication."

It is a great pleasure to place on record the appreciative letter which was recently received from two officials of the Dutch Administration who a few weeks ago spent several days in the C.T.O. London studying the organisation of that huge office. The size of the building and the thousands employed therein astonished the delegates. We must congratulate the two representatives upon the assiduous manner in which they conducted their studies and the keenness with which they followed every detail.

It is to be regretted that Germany should have found herself unable to fall in with the idea of adopting " summer-time," as have France, Belgium, Holland, &c. To the outsider it might appear that the goal of Universal Time has been reached as actually Berlin and London clocks now synchronise, but the incidence of London's traffic and that of Berlin do *not* stand in their G.M.T. and M.E.T. relationship for which staffing on this side is " keyed." There's the rub, but I wonder whether I have made myself understood ?

It was interesting to read the lengthy and detailed accounts in our daily papers of the elaborate arrangements made to provide for the telegraphic and telephonic communications at Genoa. " New telegraph wires have been laid to London, Paris, Brussels, &c.," said *The Times* on March 27. Here in London we did not recognise the newness ! After the first two or three days the Service settled down very fairly and knowing the difficulties with which our French and Italian colleagues had to cope the wonder is that the results were so good. The route *via* Germany in which Siemens apparatus was utilised at Genoa, Berlin and London proved very useful and was ready at a time when most needed.

Reperforated slip at Berlin gave practically one uninterrupted transmission from Genoa *via* Switzerland, Germany and the North Sea to London.

The death of Mr. A. L. Steel, late Chief Superintendent at T.S., is announced. The deceased who was a pre-transfer telegraph clerk commenced his career in the old Electric Telegraph Company in 1867, and for many years was attached to the Stock Exchange office. Coming to T.S. he was promoted in 1905 and became Night Superintendent and later was made Chief Superintendent, which appointment he declined in view of it adversely affecting his superannuation pay. He had a remarkable penchant for a vociferous vocabulary, and on one memorable occasion it brought him into conflict with a well-known subordinate officer who rebelled against his chief's continued insistence in mutilating the King's English. Mr. Steel retired November 1912 upon reaching the age limit.

Yet another " passing " has also added to the depletion of the ranks of our retired colleagues in the death of Miss G. S. Lynch, late Chief Supervisor of the female staff of the C.T.O., which took place at Brighton. The deceased lady had for some time past apparently been in failing health and at the end of last year went to Brighton to recuperate, but unfortunately on medical advice was compelled to go into the Sussex County Hospital, where she died on Monday, Feb. 20, after much suffering. " Georgie " Lynch, as she was so popularly known, entered the Service previous to the transfer, through the old Electric Telegraph Company, and came to T.S. in 1870, and on the retirement of Miss Dowdey became the Chief Lady Superintendent in 1911, and retired four years later on attaining the age limit. As showing the affectionate regard in which she was long held throughout her official career, we cannot do better than append the following appreciative lines written by one of her old office friends.

" The passing away of our dear old friend and colleague, ' Georgie Lynch,' has caused many hearts to grieve at the thought, that no more would she be present amongst the T.S. friends where she was such a welcome addition, and a few words from one who knew her well, will perhaps voice the sentiments of many concerning her.

From her earliest entry in the Service, to the end of her working days, ' Georgie ' was known as a faithful, devoted spirit, in the discharge of daily duties, and to have worked with her, was to gain a clear knowledge of one's own limitations, in the view of her superior business qualities, which were second to none.

Keen in observation, prompt in dealing with difficult questions, and able to rule so as to compel obedience, without hardness, she was a splendid type of a keen business woman, who was always available for guidance to those who were not so gifted as herself, but above the business view of her character, there was the loving personality which pervaded all her actions and intercourse with others.

That sympathetic, tactful way in dealing with the life around her endeared her to all. It was an atmosphere created by herself, and it was always present.

No one ever went to ' Georgie ' with a trouble, or a difficulty, but had a firm conviction that she would understand, and help them.

It was that wonderful spirit of love and sympathy, that was so attractive, and drew to herself the love and loyalty of others."

TWO PROVERBS.

He stole a pig and in God's name gave the trotters to the poor.—
The Spanish.

No man should open a shop who has not a smiling face.—
The Chinese.

J. J. T.

THE LATE MR. V. H. STEPHENS.

THE initials "V.H.S.," so familiar to the telephone staff throughout the country will appear no more on official papers, for, on March 31 a group of the relations and friends of Vivian H. Stephens stood at his graveside; and among these mourners were four who came from their retirement to pay a last tribute of affection to the colleague of bygone days.

An untimely call of Death, in that Mr. Stephens already stood on the threshold of the retiring age, and, with the vigour and apparent health of a much younger man had every reason to look forward, a few months hence, to a new period of life in the leisurely enjoyment of many activities, and to the certainty of a ready welcome in many a domestic circle.

His was a full existence, the expression of an upright character, a broad, kindly and sympathetic nature, and a receptive mind stored to overflowing: yet modest and unassuming withal, eager to please and pleasing unconsciously. He had many acquirements: a student of history of all times, of all countries and of all phases, his knowledge of languages was merely a means to an end, but he was as familiar with French, German, Russian, Italian and Spanish as with Latin and Greek. And these attainments were not without practical utility, for, 23 years ago, he translated into English a Russian work by Professor Kasansky on the "History of the Universal Telegraph Union," a task undertaken—as many such tasks are undertaken by servants of the State—*con amore*; unknown to any but to Chiefs and immediate colleagues.

Unknown, also, telephone subscribers of this country have lost a friend. It was in 1913 that Mr. Stephens left the comparative placidity of the Home Mails Branch of the Secretary's Office for the troublous region of Telephones—and at the most difficult of all the difficult periods of this long-suffering service. But to him it meant but a new and interesting study, the grammar of which must first be mastered; and volumes of instructions and regulations were as text books of a new subject to be understood and assimilated. So, he "crammed" at home, and soon became an authority; and, in regard to his special duty—the treatment of subscribers' complaints—was perhaps without a rival. Sympathetic, tactful and courteous, an interview with a member of the public usually meant a convert gained, and he who came to abuse, went away mollified if not convinced. Only to-day, the representative of an important firm called upon me, and remarked in the course of the interview, "Perhaps if I could see Mr. Stephens——" "My dear sir," I replied, "I wish you could."

Of all the friends he has left behind, none regret his loss more than the staff of our Branch. Helpful to, and untiringly patient, he was especially encouraging to the juniors, and it was no doubt his own sensitiveness that impelled him to deal generously and forbearingly with the faults or shortcomings of the immature or inefficient.

Mr. Stephens sought the company of all sorts and conditions of men. Denied in his latter years the felicity of a settled home, he found some compensation in cosmopolitan society; in the exchange of ideas, political, philosophical and literary, with men of various races and varied outlook. But he was equally at home with the poorly endowed and unattractive; ready even to learn from them; for in the East End of London there was a Mission for which he did much good and kindly work, striving to illumine for a season the monotony of dreary lives by the practical application of a comprehensive and sympathetic personality; and he had many a tale to tell of the grim humour and groping intelligence of the submerged struggling mind.

Perhaps, however, it was among the young of intimate acquaintance that he found his chief source of enjoyment. Without children of his own, it was part of his nature to draw to himself the attachment and affection of those of others who came within his circle; and the study of that elusive and puzzling problem, the Modern Boy, had for him a perpetual fascination. He took him seriously, but not heavily; and nothing delighted him more than argumentative encounters with the species, in which he could find exercise not only for good-natured banter—which, with a chuckle, he could take as well as give—but for his own lively intellect.

Among other things Mr. Stephens was a tasteful draughtsman and colourist, and I have seen some beautiful specimens of his handiwork in the style of ancient monkish manuscript and decoration. He would delve among the poets of old, and illuminate examples of their work with ornamental border and lettering in gold and blue and red and green. A specimen of his work lies beside me. It is a copy of mediæval verse by the Italian poet, Poliziano, entitled "Vision of Perpetual Spring," and is surmounted by a coloured landscape drawing which might have been the work of a contemporary artist.

Of an old Cornish family, Mr. Stephens was born in 1862 and joined the Post Office in 1884. He was attached successively to the Telegraph, Foreign and Colonial, Home Mails, and Telephone Branches, and the comprehensive number of Post Office staff who desired to be associated with his memorial wreath was a testimony of the regard of those whom he has preceded to the Greater Retirement.

E. H.

FIFTY YEARS OF ELECTRICITY.

PROF. J. A. FLEMING, F.R.S., who has been awarded the Albert Medal of the Royal Society of Arts for 1921 in recognition of his many valuable contributions to electrical science, has conceived the happy idea of recording the progress of electrical engineering since 1870, the year in which he attained his majority. Under the title of "Fifty Years of Electricity—The Memories of an Electrical Engineer," he tells in his own inimitable way a story as absorbing as any yet written on electricity and its applications. "1870,' says Dr. Fleming, "was a year of importance in electrical invention. Prior to that date electrical engineering may be said to have been limited to telegraphy, land and submarine." It will thus be seen that practically every phase of electrical work is covered in Dr. Fleming's book, and with a great deal of this work he has had a close personal connexion.

Not only is the matter interesting, but the style in which it is written is marked by a simplicity and clarity of expression, and a freedom from unexplained technical terms, which might well be a model for any writer on popular science.—(Crown 4to., published by the Wireless Press, Ltd.)

THE BAUDOT—XXXII.

BY J. J. T.

THE ratchet wheel G of the impulse cylinder $l^{I}l^{II}$ (Figs. LV, LVI, Vol. VII, p. 73) shown, Fig. LXVIII in greater detail, though but a small piece of the Baudot receiver demands some attention. The steel drum l^{I} should fit very easily on the sleeve l of the impression arm, which should be kept free from paper dust and should be well lubricated. The washer s should not be so screwed as to bind the drum l^{I} too tightly upon the sleeve l and thus impede the action of l^{I} and l^{II}. The adjustments of the two clicks K (the movement click) and K^{I} (the retaining click) and their respective springs K^{II} and K^{III} should be such that when *the retaining click and spring* K^{I} K^{III} *are brought to rest the click should be well home in the cog while its spring should be adjusted to only a moderate pressure.* The upper and *movement* click K should *at the same time* come to rest about the middle of a tooth, as shown, while, in this case the relative spring K^{II} should be given *considerable* tension.

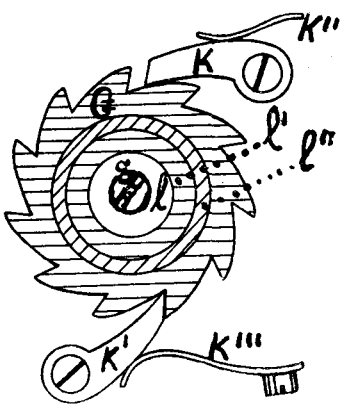

FIG. LXXVIII.

The faults which would result from mal-adjustments are as follows:—If the distance between the extremity of K and the succeeding tooth were too small, upon the return of the arm to its horizontal position the click K would *not* fall into the next slot. As a result there would be no pull on the paper slip, blurred printing of the first part of a letter, and irregular forward movement of the paper ribbon itself.

If on the other hand the distance between the end of K and the succeeding tooth were too great, a large portion of the movement of the impression arm would be lost, the paper becoming crumpled and the letters jumbled together.

The *Compression Cylinder* (Fig. LV, Z.).—Sufficient tension should be given by means of the spring R. Should the tension be too weak, when the impression arm returned to its position of rest, the paper band would not be sufficiently gripped, would not advance smoothly, and the impression would be faulty. If the tension were too great, the movement of the impression arm and its cylinders would be considerably hindered and probably the arm itself might not always engage with its retaining click. It could also happen from the same cause that the teeth of the impulse cylinder G would cut into the paper band and cause it to fold up, clogging the entire movement.

Be careful from time to time to see that the axle of this cylinder is perfectly horizontal and that there is no play caused by wear and tear. Such a defect will result in an irregular wavy movement of the paper and therefore of the letters printed.

(*To be continued.*)

REVIEWS.

"*Electrical Engineering Testing.*" *By G. D. Aspinall Parr, M.Sc., M.I.E.E., A.C.G.I.* (*Chapman & Hall*). *Price*

The fourth edition of the above-named work is now available. It is included in the D.U. (Directly Useful) Technical Series. The claim made for this series is that the books occupy a midway position between the purely theoretical and the ultra practical. The author's treatise on "Practical Electrical Testing in Physics and Electrical Engineering," was written for first and second year students, and describes 120 tests, most of which are included in the curriculum of all up-to-date electrical training institutions.

In *Electrical Engineering Testing* 159 tests are described which deal principally with heavy electrical machinery. Many of the tests, of course, form part of the normal laboratory instruction.

Amongst others the series includes the calibration of measuring instruments, photometric tests, localisation of faults in power mains, efficiency of dynamos and the measurement of the electrostatic capacity of concentric and other cables. Each test comprises —an *Introduction* giving the chief features, advantages, and disadvantages of the test; the *Apparatus* necessary; the *Observations* to be carried out, and, of course, a diagram of connexions. Only the formula necessary to obtain the desired result is given with the description of each test, and the derivation and solution of the formulae are given in an appendix. The last 160 pages contain illustrations and descriptions of testing apparatus referred to in the first part of the book and some useful tables. It is doubtful whether there is justification for the presence of the first chapter which explains the process of curve plotting, in a work of this description. A knowledge of the theory of electricity and magnetism is assumed, and it is reasonable to suppose in these days that the art of curve plotting has also been mastered before the student arrives at the stage of carrying out practical electrical testing. A short chapter is given up to an explanation of methods adopted in jointing electric light wires, cables and mains which at first thought may seem proper to a Wireman's manual, yet its presence is no doubt justified when the fact is borne in mind that many of the tests involve the jointing of wires and cables. The book is confidently recommended for the use of students and as a work of reference for all electrical engineers.

G.

ANSWERS TO CORRESPONDENTS.

J. F. S.—The treatment of telegrams for abroad received from the Irish Free State over the Anglo-Irish cables are now dealt with for account purposes in much the same manner as those received from the Continent. An accurate abstract is kept at the circuit detailing the exact number of words and all particulars necessary for account purposes.

Amateur.—Yes. President Harding is also a wireless enthusiast, and actually possesses a private receiving installation. It is said this installation is capable of hearing Hawaii and Panama, which transmit, not vocally, but by the Morse code.

Financier.—The cause of the delay in the making up of the Eastern Telegraph Company's accounts for 1921 is simply the great difficulty of obtaining the necessary returns from foreign administrations who have not yet caught up with arrears due to the war.

CHESS.

MR. BORIS KOSTICH, the Serbian chess master, gave a simultaneous display at the G.P.O. North Refreshment Club, London, on April 10, 1922, when he played 28 members of the G.P.O. North and G.P.O. Engineering Chess Clubs. He won 22 games, drew 5 and lost 1. Mr. J. Y. BELL was the successful player, whilst Messrs. S. C. Bartholomew, J. E. Pollitt, P. C. Dhonau, D. Southcott, and J. Webb secured draws. Play commenced at 6 p.m. and finished about 10 p.m. About 40 spectators being present. Mr. Kostich was cheered at the finish.

The
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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 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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FRIVOLOUS CALLS.

"SEVERAL business men," we learn from that instructive historian of the manners and customs of the moment—the Press, "are shocked by the number of conversations between office girls and their men friends." Under the indulgent conditions of the flat rate these conversations were indistinguishably merged in the prosaic body of general business traffic, but now when charges for calls are questioned and scrutinies result, the tender secrets of the telephone are threatened with diversion to some slower channel. "This will at least serve to check flirtations in office hours" was, we are told, the comment of a man who employs a large number of girls. Perhaps he is too sanguine, and perhaps business men are easily shocked, but certainly the abolition of the flat rate raises a question of ethics in respect of private calls. Hitherto they have only involved a presumptive loss of the employer's time—now his pence also are lost. Hitherto the frivolous call was made at the cost of the Administration; now it is made at the cost of the employer. Hence these tears.

For loss of time
Although it grieved him sore,
Yet loss of pence full well he knew
Would trouble him much more.

It is probable that a clerk of average integrity had small scruple in indulging in private telephone conversations during the slack moments which sometimes occur even in the busiest offices. His employer paid for unlimited service and his clerk's personal messages cost him no additional expense. The young lady thirsting for daily soul-communion with the beloved could sacrifice part of her luncheon-hour to the friendly telephone and not even rob her employer of five minutes of his time. Now all this is changed. To offer to pay would be to confess too much to unsympathetic ears; to continue the use of the telephone without paying would be to saddle the firm with numerous three-halfpences, the fruitful cause of bitter and insoluble disputes with the Administration later on. The third course is self-abnegation.

Thou shalt refrain! Thou shalt refrain!
This is the everlasting song
Which ceaselessly our life-time long
Each hour in passing hoarsely sings.

Whether flirtation in office hours is checked will be a gauge of the measure of her probity or of her willingness to pay.

But the whole question is precisely one which the advocates of the message rate took specially into account. The frivolous call—by which we mean that which is idly made because the telephone is at hand, and because it will cost nothing—has been an incalculable impediment to good service in the past and the cause of unnecessarily overloaded lines and engaged signals, for the mere fact of the callers having nothing of importance to communicate often results in the call degenerating into an interminable chat. We should not for a moment argue that the telephone service is not for the transmission of social messages equally with commercial and political calls. The telephone is as invaluable for fixing or altering appointments, for booking seats and so forth, as for commercial deals.

A rough criterion which distinguishes a frivolous from a legitimate social call is whether it is worth paying for. This distinction the message rate provides for. If the society lady or the girl clerk wishes to make an appointment or convey an invitation to a gentleman, she has to pay for the call; that is all.

HIC ET UBIQUE.

Electricity contains an interesting account of the substitution of telephones for single needle telegraph working on a large portion of the London & South-Western Railway. Switchboards exist at Waterloo (200 line manual and 50 automatic), Nine Elms (100 lines), Clapham Junction (50 lines), Feltham (100 lines), and at Woking, Basingstoke, Eastleigh and Southampton. Every station on the system between these points is or will be connected with one or other of these switchboards. In addition, Staines, Ascot, Windsor and Reading are served from Feltham, and Aldershot, Guildford, Farnham, &c., from Woking. Each branch line has several stations on it, which are called by means of code ringing, but at the large stations the various offices are connected directly with the exchange. When the scheme of substitution is completed only 9 long-distance circuits will remain at Waterloo, and any telegrams for stations below Guildford and Woking for stations above will be telegraphed to Waterloo and transmitted thence by telephone to the stations for which they are intended.

THE underground cable between Berlin and Cologne, according to the *Manchester Guardian*, has now been completed. Construction was begun in 1912 and by 1916 the cable had reached Hanover (*via* Magdeburg and Brunswick), and at the end of last year it was extended to Minden, Dortmund, Düsseldorf and Cologne. It weighs 12,000 tons, the coppers parts 3,600 tons and the lead casing 7,500 tons. It contains a total length of wires of 117,000 km.

The results obtained have surpassed all hopes of the engineers.

IN the meantime, the London to Manchester underground telephone cable, is now nearly ready for working, and will greatly improve telephone communication between London and the North. The ducts in which the cable is laid were finished in July, 1920, and the cable itself, which is 183 miles long, and contains 160 pairs of wires, was drawn in April, 1921, so that in all the work has occupied the best part of two years. The cable is the first trunk cable to be equipped with telephone repeaters, and on that account it has been possible to reduce the weight of the copper conductors to 40lb. per mile. In previous similar cables, such as that between London and Liverpool, it was necessary to have conductors as heavy as 300lb. per mile, and a great saving of copper has, therefore, now been effected.

Spur cables to Liverpool, Leeds, Birmingham, Sheffield, Nottingham and Leicester will be connected. Construction of the cable to Bristol and South Wales is also well advanced, and the new cables to the South Coast are nearing completion.

COMMENTING on the Prime Minister's telephone connexion between Criccieth and Downing Street, the *Manchester Guardian* says that the telephone might have saved Mr. Gladstone (had he had it at his disposal)—

"such desperate expedients as the 'flagging' of an express in order to get rapidly to town to deal with a situation, just as it might have saved Disraeli the rebuke he received from the Hughenden incumbent for travelling on a Sunday. Yet one feels that Disraeli would not have liked the telephone, and it is difficult to imagine Lord Salisbury making use of it.

When we get a little farther back imagination may take a wider sweep. Conceive, for instance, the oaths which would have poured from Melbourne had any mechanical defect interfered with his telephonic communications even with his pupil of Windsor Castle. Conceive a shivering Postmaster-General being 'carpeted' by Palmerston for a similar mishap; or the petulance of Lord John or Wellington addressing it in the third person; or Canning scribbling squibs on its imperfections. Think of the Duke of Newcastle stuttering and weeping at the telephone, or William Pitt struggling with it after the evening bottle of port. But there is one thing which defies even imagination—the majestic spectacle of Chatham telephoning."

The telephone was introduced into this country two years only before the death of Disraeli; but we find it difficult *not* to imagine Lord Salisbury making use of it. He last held office from 1895 to 1902, by which time the use of the telephone was widespread. Perhaps some of our readers in the London Telephone Service can assure us on the point.

UNSOLICITED testimonials as to the excellence of the telephone service occasionally reach the Post Office. The following is an extract from a letter addressed to the Controller:—

"We are perfectly satisfied with the service of all the exchanges in London area and the extreme courtesy and promptness of service of your staff. Even during the very busy hours our calls have never been delayed or interrupted.

We also found that all the charges in your quarterly account were quite correct.

We are writing this, having in view the numerous complaints of the public in the daily press and the abuse of a highly efficient department.

The London Telephone Service is highly efficient, or at least more efficient than similar services on the continent and U.S.A., of which we have a great personal experience. We are perfectly sure that if the general public, and especially our business men, would remember that the operator is a human being and not a machine, that exchange operating is not such a simple thing as it seems to them; that Mr. So-and-So is not the only subscriber in London: and finally, that if a delay occurs it is mostly Mr. So-and-So's own fault, because he does not know how to handle a telephone, there would be less complaints and more endeavours to help the operator."

ONE of the American telephone companies (says the *Daily Sketch* of April 20), the Bell system, is advertising that last year it put in two million new instruments—"equal to the total number of telephones in Great Britain." This makes our Post Office look pretty small.

Now for the facts:—

The Bell system and connecting companies (that is, not "one American company" but nearly ten thousand) increased by 778,284 telephones during 1921.

The statement in the Companies' report is that "The Bell system is adding as many new telephones each year as there are in all France."

SOME ASPECTS OF PUBLICITY IN RELATION TO POST OFFICE WORK.*

BY JOHN LEE (*Controller, Central Telegraph Office*).

THERE once was a washerwoman who indulged in a daily illustrated newspaper before she began her day's work. As she laid it down one sunny morning and tucked up her sleeves to begin her work, she said "Now this would make a real picture for the papers." It may be that she was right. We are all washerwomen, We are all of the opinion that our work should appear in the illustrated papers. It may be that publicity is a little one-sided, that it deals too much with certain aspects of life and that other aspects of life go unnoticed, and that certain persons are overlooked. I confess I sympathise with the oldest inhabitant of Criccieth, a small town in North Wales, who said that he had planted three times as many potatoes as the Prime Minister, that the cinema men took no notice of him but gave all their attention to the Prime Minister, in spite of his meagre potato planting. It has been said that the newspapers take the place of parish gossip and that they are far more reliable. Yet parish gossip goes on gaily. You are told that regiments of Russians pass through the country, that everyone except yourself is in receipt of an unemployment dole, that this exalted person drinks heavily and that there are bishops who play cards. The war altered a good many things but it did not change the human passion for subterranean publicity. It revealed to us the possibility of calling a kettle black, until all that one could remember about a kettle was that it was black. It revealed the infection of what is called public opinion, the dear old theory of the scapegoat, which goes back to the Israelites in the wilderness, the object upon whose shoulders human disapprobation is laid. We in the public services have some experiences of being the scapegoat. The public must have material for disapprobation, and what better than an inarticulate body? Reputation was described by Shakespeare as a bubble, a bubble which was sought "in the cannon's mouth." To-day it is sought in less perilous ways; it is made and disseminated. The time may arise when a flashing sky-sign in Piccadilly Circus will be the true criterion of greatness. The Keats of the future will be honoured by this disturbing means; Chattertons who die in garrets will be heralded in blue and red lamps outside garrets. Our tastes and our opinions, our adulations and our estimates of value will be made for us.

This newer publicity calls for examination before we come to examine the work of our own service in regard to it. There seem to be five stages, and we can deal with them conveniently in the historic order. First there is the simple announcement. In a Cotswold village to this day there is a notice "John Smith mends boots." John is quite modest about it, he tells the plain indicative fact. He makes no comparisons. He says that he mends boots—he just improves them. He does not say that he makes them better than they were when they were new. He does not say that his repairs are better than those attempted by his rivals. He does not imitate the notice which I see daily in Cheapside "the best boots in London." How does this rival of John Smith know that his are the best boots in London? Why does not someone trouble to point out to him the exuberance of his claim? The answer is easy. No one believes it. When John Smith says that he mends boots, everyone in the village knows he is telling the truth. Even the vicar would certify. it. But if he said that his mended boots were the best in the Cotswolds, people would shrug their shoulders and say that they have heard that kind of thing before. In fact the simple announcement is not so simple as it looks. It may be very complex. It may be so complex that it defeats its own end. "No man," says an advertisement, "can be well-dressed unless he wears an Aristides collar." That is what is technically called an "effective" sentence. It may make us all sigh to wear an Aristides collar. It may make us feel antiquated in a collar which is not an Aristides collar. But even so we do not believe the statement that none can be well-dressed without it. We are quite sure that there are elegant young men in Bond Street who have never heard of the Aristides collar. Turn from this to the most modest of all advertisements, the public-house sign. It is the original sky-sign. It uses a picture to tell the story—a red dragon, or a black horse, or a hen and chickens. It is mere publicity, mere telling the world. Now this mere publicity is often regarded by those who purvey it as being a conferred favour. When Mr. Cochrane protested against what he called the prejudice of the newspapers against his productions, he was told that he "should not deny the value of publicity," or even of animated discussion, even if the animation verged on anger. Just so the boy with a fly on a pin might say, "I know it hurts, but look at the publicity I am giving you"! The public-house sign made no claim for the superiority of its comforts, that is, it trusted to the comforts themselves to make the claim. It said, in some cases, that it offered refreshment for man and beast, and there is little flattery in the terms "man and beast." The true method of publicity to-day would venture to offer concert-dinners to lords and ladies; the beast is fed with petrol from the Shell pump. Indeed, it is almost true that the day of simple announcement has passed by. Every newspaper is the best morning paper; every gramaphone has the sweetest note; every shaving-soap is the root-spring of America's clean-shaven prosperity; every typewriter is swifter and cleaner and more portable than every other typewriter; every breakfast food is so much better than every

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

other breakfast food that the only solution is to take them all and thus to prolong life beyond any power to enjoy it—if breakfast foods permit any enjoyment at all. So there is little room to-day for the simple announcement and we can pass on to the second category.

We come to the assertive announcement. The assertive announcement makes claims. It comes to the fringe of psychology. It impresses the unconscious mind by stamping it with the name of a certain condiment and then in the hour of need you remember that condiment. In time, for instance, you learn that it is an improper thing to say "good morning" unless you have used Pears' Soap. This method of assertive announcement has various grades, but a pretty strong claim for excellence is at the root of all the grades. It adorns the fields as you pass by in the railway train; it makes a dead wall into a living thing, almost a shrieking thing; it uses art and pyschology and the limitations of human nature to its own purpose: it covers the whole realm of human needs. It is not too modest, nor is it too assertive. It appeals to your sense of humour. The drowning man no longer clutches at a straw; he seeks to bestride a tin of meat juice. The beautiful scene in the country or at the sea-side is no longer the benison of heaven to a tired world; it is material for a striped young lady and her camera. The sea-side place which you love is thrice blessed in that a stoutish elderly gentleman (like yourself) who goes there leaps on the sand like (or unlike) a chamois. Poetry comes to its aid. An American railway company is said to have achieved success by inventing a Miss Phoebe Snow, who, clad in spotless white, was able to travel without blemish or tarnish, and the walls and the transparencies on the trams paid their tribute to "Miss Phoebe Snow, who loved to go, on the road to Buffalo: her dress stayed white, from morn to night, on the road of anthracite." It is amazing how much of our lives lies under the influence of the assertive announcement. In the Cotswold village, which I have mentioned, you did not approach John Smith until you really needed your boots mending, and you did not visit the Red Dragon aforesaid unless you had some need of refreshment for man or beast or bicycle. I travel home by the Brighton railway and I find it impossible to sleep at nights except in the striped red and white pyjamas to which my daily journey has accustomed me. We have lost much liberty of thought and action while this progress of assertive announcement has been in development. I am writing this paper with a very beautiful fountain pen, which was given to me by a dear friend, but if I examine my sub-conscious mind, I am even more proud of the fact that every Christian and civilised nation in the world knows it to be the Ideal pen. Your underclothing keeps you warmer if it is the fabric the name of which has soaked into your mind—and underclothing which reaches the mind is real underclothing. "Success in business," says an American advertiser, "can be assured by wearing the Bronx hat; it impresses; it carries weight; it adds dignity to your stature." I suppose one never takes off such a virtue-inspiring hat. There has been a shopping week at Richmond, accompanied by the usual psychological devices. I understand that a local trader offered house-pails and washing boards (I am not sure that I know what they are) at sixpence each. A queue lined up at six a.m. of people anxious to become possessed of a house-pail and a washing board. Either there was an astonishing lack, in Richmond, of house-pails and washing boards or the advertisements succeeded in infecting the people's minds with the idea that house-pails and washing boards were essentials to reasonable existence. So we are enslaved—heads and bodies and minds and souls. Sometimes there are perplexities. Sometimes the assertive announcements do not agree. There is a limit to the number of tooth-pastes which one can use, and to the number of positions at £5,000 per annum, which are available to those of us who take the correspondence courses at certain colleges. But that does not seem to affect the argument. We seem to be fashioned "hollow," as the American poet might have said, "o' purpose that we might advertisements swallow."

That leads me to the next category, the publicity which tells us not merely that our needs can be supplied, but what our needs ought to be. *Facile princeps* in this class is our dear old friend the patent medicine advertisement. It was the pioneer of psychological treatment of announcement. It gave the symptoms of the complaint so cunningly that it suggested all manner of things to our minds. M. Coué has made this into his theory of auto-suggestion. Do you awake with a tired feeling in the morning or have you some sense of fullness after meals, or have you a dislike for certain articles of food, or have you lost nerve and activity? Of course you have. So have we all. There is a multitude of pills and salves and ointments and concoctions for these very common ills of humanity. The law had to step in; *Truth* had to analyse the contents, yet this method of cunning suggestion is still in full fling, but it has gone far beyond the backache and the tired feeling It covers the whole of life and has put the human stomach into its normal insignificance. There is a certain type of shop to which I am invariably allured. It sells all sorts of clothes hooks, screws, popular music, soaps, and the like, various things which, I believe, are called utensils. I confess I cannot pass one without entering and purchasing things merely for the sake of purchasing them—purchasing at the stimulus of subconscious instinct which tells me that I don't want the things, that I hate the thought of carrying them home, but that they are cheap and that I must buy them. I am an economic toper in such a shop, and my family lead me past the doors much as other topers are led past other doors. There are other similar appeals which tell you what to read. They make the *Encyclopaedia Britannica* one's hourly need. They show you that certain cigarettes are essential to happy marriages, that household work (which *is* a necessity) may become merely a pleasant leisure hobby, that your feet were made for somebody's excellent polish, that the cares that irk us only come in the absence of chocolate, that rain descends from Heaven equally on the just and the unjust, merely to enable both to wear a certain mackintosh. In fact, the process is inverted. Instead of existing to supply our needs the advertiser shows us that we exist merely to consume his goods. We travel to fill his hotels; we walk to use his boots; we dress to wear the clothes which he provides; we can exist with ordinary food and ordinary raiment, but if we are to rise to the heights of really worthy life, he shows us what our essential needs should be. We are uncomfortable until we acquiesce. "Anything," we say, "for a peaceful life." And so our civilisation grows, our needs grow and the psychology of advertisement accelerates and expands the needs and directs them into the appropriate channels.

Then we pass to the fourth category. It is even more subtle. It is the psychology of the formation of a public sentiment. It begins with the use of opprobrious labels. It proceeds by the suggestion that the label—which is only a label after all—is the result of a careful and minute study. The public mind becomes infected. Just as it has learned not to be able to breakfast without Farmer's Golden Oats, so it has learned that in every walk in life there is the sum of efficiency except in the public service. People forget that trains are late. They will strap-hang in a crowded bus and comfort themselves by the suggestion that there is inefficiency in Whitehall. There are various aspects of this infection. It may suggest that certain things should be fashionable. Thus it may hint to us that we do not eat enough brown bread or peas. That may be quite true, but we would rather that the suggestion were made by persons not quite so definitely interested. It may send a wave of feeling over the country in favour of white waistcoats. It may and does attempt even bolder ventures, and there are reasons to believe that even high politics has not always scorned these psychological methods. It is a new aspect of publicity, and a disconcerting aspect, and I am not surprised to be told that the next General Election may be a psychological conflict. All the machinery of "atmospheres," "complexes," "suggestions," will be used. Voters are to be put under the influence at public meetings by means of cartoons, and the like. In fact, it is an odd irony, but the wide increase of the franchise in recent years seems to lend itself to this method, and all sorts of societies and propaganda are prepared to use it. Women are led to tremble at all sorts of impending dangers; men are led to suppose that in this or in that eventuality there will be something horrible. What it is may not be suggested, for the days have gone by for the careful study of detail. Sometimes it may seem that this method defeats its own ends. We become suspicious. We read between the lines and at the back of the lines. We grow to the belief that after all the moon must be made of some green cheese because the fact has been so strenuously denied. It cannot be for the public good that newspaper statements should thus succumb to the analysis of suspicion. Now in referring to these methods, we have need to be cautious in our criticism. There are equal dangers in protestation against them. The emphasis upon individual thought and independence may indeed suggest a sort of self-imagined superiority. It may be a wrong thing to have our ears to the ground ready for each movement of public opinion, but assuredly it is equally wrong to despise the value of herd-psychology, and to forget that in association or in community there is a useful restraint on the vagaries of the individual. In striving, therefore, for the balance, it is as well that we should attempt an analysis of latter-day attempts to influence the public mind by suggestion. It has been done unscrupulously. There are vast corporations in America which have succeeded in turning the edge of public suspicion by means of creating atmospheres. There have been instances where transit companies, in particular, have been able to divert public attention, by means of clever advertisements, from aspects of their work and enterprise which would hardly stand investigation. But apart from this, the unscrupulous use, there is an interesting study of other methods of indirect advertisement. I noticed an advertisement the other day in an American journal the purport of which was to sell a certain article. It described the factory, the thousands of machines, the whir and the hum of the machinery, the brightness of the operators, the methods of welfare, the rapid promotion of the geniuses in the employ of the company, the wonderful financial progress of the whole concern. Then at the bottom of the page there was a single line,—"If we can do this we can surely deliver the goods." It created an atmosphere in favour of the company. Much the same has been done by great commercial concerns in England, who have garden cities with special care for their staffs. They have a right, I think, to use the fact in their advertisements, for it indicates at least that they recognise that, in the public mind, there is the fundamental idea that a fine organisation means a worthy product. We cannot believe that it would be otherwise. The psychological infection may impress us in various ways It may give us a sense of confidence, and of trust, and of respect when we are not at all aware that we are gathering such impressions. There is a mysterious sensitiveness to agreement in the public mind. It was observed in Melanesia by Professor Rivers that the inhabitants would meet together and discuss questions quite fiercely and that very soon they would pass to other questions. Dr. Rivers was rather surprised and asked for an explanation. The reply was that they had reached agreement. There was no vote or any other method of deciding it openly: the men had become impressed by an instinct, which had been operative for hundreds of years, with the fact that they had now reached agreement. It did not need a vote or a show of hands, or even an articulated word. In some such way the use of psychological methods in the cultivation of public sentiments may awaken some old instinct and quite sub-consciously agreement may be reached. It is by this means that publicity on the bolder canvas has come to work in recent years.

Then there is the fifth category, which is rather different. It is the reasoned process. It may use a couplet or a tag to memory, but it is frank and fair in its statements, and wishes to argue point by point. One of the earliest was the well-known couplet, "They come as a boon and a blessing

to men, the Pickwick, the Owl, and the Waverley pen." In later days other couplets have been used, and they are more definitely whimsical, such as "The ghost of tabby, fed on skim, was all the war had left of him." It proceeds to tell you of another milk which is "full-cream to the brim." Then there are the admirable reasonings in the form of a column of good journalistic matter. Mr. Selfridge began this with his admirable writer "Callisthenes." The Underground Railway and Messrs. Lyons have followed. I think myself that these are a reaction from what I have called the psychological method. Certainly they pay mankind the tribute of cold reasoning; they call on the reader to follow the argument step by step. Other methods are known to you. There is what I might call the contra-positive method, which tells you quite boldly the demerits of the article, such as that most effective advertisement of Brooks' Monkey Brand,—"won't wash clothes." Mr. Ford, in a sense, has adopted this method in his later advertisements, which consist of funny stories showing the sad experience of some of his purchasers with their cars. It may seem to be an audacious method, but it has undoubted advantages. Not every manufacturer would tell this story of his product. A car owner insisted on seeing Mr. Ford personally. "Is it true that you build a car in ten minutes?" "It is," said Mr. Ford proudly. "I've got that car," said the visitor. Or the other story of the man who tried and tried to sell a Ford car, and in despair, advertised the fact that at a certain hour it would be put in the road for anyone to take away. He put it in the road accordingly, and peeped through the window to see what would happen, and saw ten other men bring their cars to the same spot. Again, this was a daring story. There is, however, a psychological explanation of this audacity. People's minds may become so deadened with the older methods of publicity, that the very audacity of the later method may be attractive.

Now, where does a public utility like the Post Office stand in respect of all these methods of publicity? At the first blush it might appear that a true public utility wants none of the devices. I am rather tickled at a paragraph in the *Westminster Gazette* this morning, in which it is suggested, after the manner of Plato's Republic that statues might be used for the purpose of showing the value of telephony. "In another place," he says, "I would have them erect a figure of a man of serene and benign countenance, beautiful to behold, engaged in holding communication through the telephone, in the manner of one tasting the nectar of the gods, that those perceiving it may reprove themselves and carry the image of that man in their mind's eye and model themselves upon him to the delight of the governors of the telephone." I am afraid that such a use of public statuary would hardly achieve its object. A public service has been established by public will to supply a public need, and it would not seem, therefore, to require any of the psychological methods which I have mentioned. To say that, however, is to overlook some factors in the case. The Post Office performs a large number of mixed services, and it is quite clear that the public has only a vague understanding of these services. I can speak for telegraphs in London, and I assure you that in recent months it has been simply amazing how ignorant are even firms of the highest repute of the value of some of the services, especially the foreign services, which we are giving. There is no doubt a great deal to be gained from some such method of enlightenment. One of the advantages of the Imperial Cable to us has been the greater intimacy which it has opened up with the commercial public, and the opportunities which it has afforded of frank discussion and of frank explanation of the ramifications of the service. Theoretically, the public ought to set out to know what these public utilities attempt, but the fact is that the duty is neglected. Accordingly, I am driven to the opinion that the Post Office must take some action from time to time to explain to the public the different services and especially the new services as they are introduced.

But there is another aspect of publicity in respect of public services. It is necessary at times that there should be defensive action. Misunderstandings do arise, and in some cases they have been actively fostered by interested persons. I have already referred to the infectious character of a general public sentiment, and an atmosphere of distrust can be more readily cultivated than an atmosphere of trust. For this reason I think it is a duty to be able to explain to the public any matter which calls for explanation. Unless this is done we are apt to be at the mercy of unscrupulous persons who have axes of their own to grind. If you hear day in day out of faults in the telephone service, you are apt to imagine that little difficulties which you may experience are part of the general inefficiency. You will let one swallow make the summer because someone else has already suggested to you that it is summer. Now it is for no one's good to have such misunderstandings spread abroad; it is not for the good of the staff, or of the administration, or of the public outside us. Sometimes indeed attacks can be forestalled but in any case I think it is of vital importance that there should be an expert, ready at all times to state coldly and faithfully the full truth to the public. It needs expertness. It needs the psychological skill which is able to put cold and passionless truth in the place of many mis-statements which already have influenced and poisoned the public mind. There is a wide distinction between this publicity and that, to which I have referred, which uses psychological methods to mask the truth. Formal publicity, in the way which I have mentioned, must of needs be just as skilful and as wide in its knowledge, but it will be direct and truthful as well as enlightened and skilful, for its rôle is to put the public in possession of the full facts before forming its opinion. It will not attempt, I think, any of the tricks of the propagandist. The public is quite ready to learn, but it does ask for a skilled and experienced teacher. It is of the utmost value to the service also that there should be a channel, an authoritative channel, of information to the public at large, for only by this means can it be assured that the information is given as it were from the point of view of explanation, and not of propaganda. It is for this reason that the public has been invited to telephone exchanges and to the Central Telegraph Office, and for this reason, too, that a most careful film was taken of the processes of modern telegraphy. Many millions will see that film. I hope they will be led by it to a more complete understanding of what goes no in the mysterious interiors of telegraph offices. It has been completed by Captain Calvert of the Gaumont Company with insight and intelligence, and I am sure as the pioneer of a series of industrial films it will have a profound influence in telling more than one-half of the world how the other half lives. Similarly I would refer to lectures on telegraphy which have been given by officers of the C.T.O. staff to various audiences and have been most warmly welcomed.

Beyond this I do not think that a public utility service should go. Some of you think, I know, that if we had a campaign of advertising we could expand the telegraph service. Personally, I doubt it. More than that I doubt if it would be right to make any appeal to the public to use any service, or if it would be wise to transfer the idea of public service to that idea of commercial service in which case gain and not necessarily service is the prime end. To make a necessary service remunerative is not quite the same thing as to aim at remunerativeness only. To suggest the value to the public of a particular service is a totally different matter. For example, I cannot imagine that anyone would doubt the usefulness and the efficiency of the service by which telegrams may be handed in or delivered by telephone. Yet one of my day-by-day puzzles is to understand how it is that so many telephone subscribers are unaware of the service. I see a distinction between making the service known and using methods of advertisement to cultivate a need for it. Similarly, there might be mutual advantages from showing the public in what ways they could co-operate with us in the various services. I read the other day that if the public improved its technique in respect of the telephone service, it would result in a saving of £17,000 per annum. I am pretty sure that that is an understatement. In any case, publicity which tends to the improvement in efficiency by educating the public in the use of the services is surely of the greatest advantage. Services which are very complex, like our own, which render various kinds of different service covering a wide area of public need, touching different sections of the public, commercial and social, at varied points and always expanding in their inclusiveness of range, do need some sort of periodical elucidation if the public is to understand all that is placed potentially within its reach. I can hardly imagine the Metropolitan Water Board putting out an advertisement to the effect that if you just turn the tap you will get a rich and abundant supply of water, or quoting statistics to show the advantage of a daily bath. Public utility of the uniform and simpler kind supplies a need which the public has realised and consequently the demand for it does not need encouragement, either psychological or otherwise. Gas and Electric Light companies do advertise, but it should be remembered that herein is a keen competition, and the method of publicity is as much defensive as it is an encouragement to the user. I know that it may be used against me that the American Telegraph and Telephone Company does advertise most extensively. To that I reply that it is not at all proved that advertising in such circumstances is done purely to attract more business. Rather, I think, it is part of the educational process and part of the defensive process. I daresay we might have lights in Piccadilly Circus which would induce in people's minds the necessity for having telegraph and telephone communication, but I am not at all sure of it. Certainly it is true that the wide public know of the existence of these services, and use them up to their need. But to show the public in what particular ways they can get the highest benefit out of the services is another matter. On the other hand, it may be seemlier in these days for a public utility to take rather a sober attitude in its relation to the consumer. Men and women were not sent into the world merely to send telegrams and to speak by telephone.

I very much question if we could adopt in this country the methods of advertisement which have been adopted by our friends the Western Union Company of America. The temperament and attitude of our people are against it. Such an advertisement as that which is directed to commercial travellers, telling them that mothers and wives and sweethearts are anxious to hear from them, is based on the essential sentimentalism which is so large a factor in life in America. Similarly the model telegrams for use on occasions of death or distress, with their variously-worded sympathy, would be resented on this side of the Atlantic. We might perhaps take a leaf out of the Scandinavian book and have beautifully printed forms for wedding congratulations with wreaths of orange blossoms festooned round them, but even so, I doubt if they would be acceptable. The English reserve is a strangely-deep characteristic, and though it does seem that the English individualism has given way to psychological handling in some respects, there is no evidence of any surrender of the intimacy of the personal life. Our business deals with the personal life and it is a factor which is of vital importance. Men may be persuaded to purchase a hat or a collar or a sideboard or a motor-car of a certain kind; women may be persuaded in other ways, though I doubt if they are as pliable. Neither men nor women in England are likely to respond to appeals which are necessarily based to a greater or less extent upon their deeper sentiments. We are apt to look at these matters from a purely professional point of view, just as the American fashionable tailor sighed when he saw Abraham Lincoln's coat, and like the scornful articles which appear in "The Tailor and Cutter," on the pictures in the Royal Academy. It is something to be a public servant ready and eager to help and to help with the utmost efficiency, paying the public the subtle tribute of believing that it knows when it wants our help and that in the end it will appreciate a service of uniformly high quality and will appreciate any advice or suggestion which we can make with a view to cultivating more intelligent co-operation in the use of the services. Perhaps it is given to us

in a humbler way to do something to restore the balance. It is no mean allotment of responsibility in days when advertisement has come to be an expert art and science. There is room for us to enlighten the public, to remove all sorts of misunderstandings as they arise, to deal with either organised or unorganised opposition, should it arrive. But beyond this, as a purely personal opinion, I venture to think that the Post Office should not go, and that in refusing to go it would be performing a public duty and paying a tribute to the intelligence of men and women of the day which will prove to be not the least important of its functions.

To sum up, a public service of its essence is both proud and humble. It is proud to be the servant of the servants of the people. It differs essentially from commercial adventure in that it must be less insistent upon its claims, less dominant in its attitude, less inclined to transpose the importance of consumer and producer. Yet if it is to be truly efficient it must not shrink I think from saying to its masters that in this or in that way are its services more available, that in this or in that way can it more efficiently fulfil public needs, and more definitely add to the welfare and corporateness of general life. No man is a hero to his valet, and similarly it may be claimed that no valet is a hero to his master. But it may be permitted to the humblest valet to suggest to his master what suit should be worn and in what way it might best be worn. From this rugged parallel one may see limits to publicity in respect of public utilities. They will serve, and not only stand and wait, but they may set out to explain and to enlighten and make their services intelligent and their loyalty and humility into a proud thing.

CORRESPONDENCE.

ECONOMY IN LINE TIME.

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

SIR,—Mr. Teare's article under the title of "Synchronism" in your December issue comes as a welcome reminder that your columns are open to all and sundry for the discussion of their particular theories.

The last two years or so has witnessed probably the greatest epoch in the annals of the British P.O. telegraph service, viz.: the linking up of the chief distributing centres by means of the Baudot Multiplex System.

Those who are keenly interested in machine telegraphy very naturally develop expertness in a special direction, and among the various topics which from time to time come up for debate, we find the question of "saving line time" occupying a very prominent position, Mr. Teare endeavours to dispose of this question by adopting the Western Electric System merely on the strength of the fact that the distributor has a greater range on account of the special segments for correcting purposes being dispensed with, yet a moment's reflection will show that if all Baudot installations were replaced by Western Electric installations, the present unavoidable loss of line time due to the Multiplex principle, would not be materially reduced.

In order to get the full advantage of the carrying capacities of a number of lines of different KR values, it would be necessary to vary the rates at which the moving systems rotate, consequently we should not have a common standard for operating, whether the system in use was a Baudot or Western Electric, and the inevitable result would be chaotic.

If we are to have a fixed standard for multiplex working, and it is difficult to imagine that such a condition is not essential, then it becomes impossible to work all lines on full load no matter whether the method of operating is by hand or by tap-fed apparatus. To achieve this object we must have recourse to an automatic system such as the Siemens-Halske and others, wherein the transmitter may be rotated at a speed determined by the retardation of the line, and the mechanical performance of the receiving apparatus. This advantage of the automatic principle over the multiplex is not generally touched upon.

Mr Teare successfully demonstrates the superiority of the Western Electric over the Baudot in an isolated case in which the electrical nature of the line permits him to do so. The question cannot, however, remain here without investigation, and I would beg your indulgence at some length in order that we may consider the subject on a wider basis.

A line which will permit 1,800 reversals, viz., 3,600 alternate positive and negative impulses per minute, obviously has a transit time of 1/60th of a second. A distributor is essentially a time divider (with due acknowledgment to Mr. H. H. Harrison), and in Mr. Teare's case if we build it up with 60 segments of equal size it is quite clear the moving system must not be rotated at a greater frequency than one revolution per second. If the frequency be increased to three revolutions per second, which is the normal rate for working, then the contact time will be reduced from 1/60th to 1/180th of a second and in order that the contact time may be restored to its proper value, viz., not less than the transit time of the line, the number of segments must be reduced from 60 to 20.

For this particular line a 20-segment distributor is satisfactory for "Western Electric" quadruple working, but is two segments short of the number required for quadruple Baudot, and the capacity of the distributor in the latter case is triple. The superiority of the "Western Electric" is then as four to three, not three to 2.7272 as claimed by Mr. Teare.

Assuming a standard speed of 180 r.p.m. the maximum number of segments permissible depends upon the transit time of the line, but as the number of segments will not always be a multiple of five, or a multiple of five plus two, it will frequently happen that we cannot avail ourselves of the full carrying capacity of a conductor. With equal conditions as to speed and voltages, the following table of a number of lines of different KR values shows the maximum carrying capacity of each line and its equivalent value in "Western Electric", "Baudot," and "Siemens-Halske" working:

	Transit Time—Seconds.	Maximum number of Segments.	Carrying Capacity of Line Reversals.	Carrying capacity number of words per minute.		
				Western Electric.	Baudot.	*Siemens-Halske.
a	.0196	17	1,530	90	90	102
b	.0185	18	1,620	90	90	108
c	.0175	19	1,710	90	90	114
d	.0166	20	1,800	120	90	120
e	.0158	21	1,890	120	90	126
f	.0150	22	1,980	120	120	132
g	.0144	23	2,070	120	120	138
h	.0138	24	2,160	120	120	144
i	.0133	25	2,250	150	120	150
j	.0128	26	2,340	150	120	156
k	.0123	27	2,430	150	150	162
	Aggregate			1,320	1,200	1,452
	Average words per minute			120	109	132

* Automatic.

In the above table it will be seen the Western Electric is slightly better able to make full use of the line time notably in *d*, *e*, *i* and *j*, than is the Baudot; it also enjoys an advantage over the latter varying from nothing to 33.3 per cent. in the matter of carrying capacity, but this is due to the principle (not the performance) of its correcting arrangements.

The last sentence of paragraph 9 of Mr. Teare's article is somewhat perplexing. The circumstances in which the correcting currents will fail when at the same time the working currents arrive intact are surely of an exceptional nature.

All impulses are distorted more or less as a normal consequence of the electrical nature of the conductor, and such distortion is the result of several factors which determine the working speed of the line.

If a correcting current be lost the cause is undoubtedly due to some extraneous interference and we must expect also the loss of working currents. Mr. Tyrrell's contribution in the December issue is very appropriate to this point. The effect of the "saw-teeth" distortions in the rise of the waves is not sufficient to disturb the working; they merely delay the rise of the currents. The tongue of the relay passes from one contact to the other at a definite point in the arrival curve of the current, and unless and until an impulse of opposite polarity reaches the same relative point in the wave, the tongue of the relay is not disturbed.

Furthermore in Baudot working we find that although the correcting impulse is due to arrive each revolution, it is only occasionally that we have a use for it; the frequency of utility is very low where the moving systems are driven by phonic motors, therefore, the possible loss of two or three correcting impulses would not detract very much from the merits of a quadruple duplex system, which has carried 26,096 telegrams in six consecutive days with a total loss of line time of 13 minutes and no failures in synchronism over the whole period.—Yours truly,

R. PRATLEY.

Liverpool, April 3.

THE EDINBURGH TELEGRAPH AND TELEPHONE SOCIETY.

A MEETING of the above Society was held on March 28, Major Jayne presiding, when a paper was read by Mr. E. H. Fisher on "The Zone System as it affects Edinburgh."

Mr. Fisher said the Zone System of telegraph circulation opens up a new era in telegraph management. Prior to this system the circulation of telegrams between areas was governed by arbitrary factors which varied

at different times. The Zone System promises to wipe out anomalies in circulation and to elevate circulation of telegrams to a science.

The system is built upon basic circuits along which traffic must circulate. From the small office to the group centre—from the group to the area centre—from the area to the Zone centre, the basic circulation follows the basic route.

If, however, there is sufficient traffic between one minor office and any other office, other than its group centre, a non-basic wire is allowed.

The anticipation is that the Zone centre inter-communication wires will carry better loads than obtains at present. The Baudot Quadruple Duplex is a unit sufficiently elastic to meet the demand of huge bursts of traffic and at quieter periods to contract to a small staff. The future of the Zone System is intimately bound up with machine telegraph working between Zones.

Mr. Phillips: If instead of having your work diffused over a great number of minor points you can concentrate upon a few major points you are on the way to fixity and stability, for you will legislate for the bulk and in the bulk you will have fixity.

Some of the experts of the Traffic Section will perhaps one day tackle the problem of transmissions and define exactly the extreme length of a reliable fast working wire and fix the point where greater speed and accuracy is obtained by transmission than by direct working. The absence of a standard is, I think, a weakness in our organisation. There is such a thing as specialisation in transmitted work. Every large office is not of necessity a first-class transmitting office. Transmission must be specialised, for it has its own particular requirements.

Messrs. Dodds, Dickson and Allan (Secretary's Office) also spoke.

Major Jayne and Messrs. Fisher and Moncrieff replied to the criticisms.

An extra meeting of the Society was held on March 31 when a paper written by Mr. J. Lee, Controller of Telegraphs, Central Telegraph Office, was read by Miss Moffat on "Some aspects of publicity in relation to Post Office Work."

A few points in the interesting discussion which followed are:—

Mr. Dickson: One of the things mentioned was the fact that the public had never heard of the Phonogram. He thought we were not doing our duty when such a state of things existed. He suggested that a booklet should be handed to subscribers when telephones were fitted, and some advertisement of the services should be made in the directories. It would make sure that the subscribers would know the use the telephone could be put to.

The only time telephones appear in the Press is when held up to odium: no doubt whatever that this is due to malice aforethought got up for certain reasons. The service is made a scapegoat and is unable to hit back. It seems to me that if Departmental legal experts put their heads together to find some way out it would be possible to alter the law of libel to make slander against a class or Department or a trade as punishable an offence as a slander is at present against an individual. The untruths published were appalling. Every little newspaper repeated the stories and it was little wonder the influence on the public was very wide. A certain paper stated that the local telephonists received £6 weekly. This campaign was organised to show not that the public control of the Telephone Service was bad, but rather to show that nationalisation of any kind was bad.

Mr. Lee is a great authority on psychology and on application of it to vocations. But anything we could do to have a counter campaign under a publicity officer would do no good so long as the law stands as it does. The penny-a-liner knows nothing about the matter and cares less. America is ruled by him. It would be fine if we could stand up for ourselves in open Court.

Mr. Watson said he was sorry he was not able to follow all the arguments of Mr. Lee or even of Mr. Dickson. In his opinion efficiency is at the bottom of it all. It was no use handing in a telegram if we cannot deliver it quicker than a postcard. Telephones have been widely advertised, yet the public are ceasing to use them. The standard of efficiency must be raised. We have heard of a no-delay telephone service. We never hear of a no-delay telegraph service. Efficiency is at the root of the business, and is the best advertisement.

Mr. Rankin: The only open competition in the Telegraph Service was the competition of the "Imperial" with the other Cable Companies. The "Imperial" Cable can only give the same rate as the other Companies. Yet other Companies have higher wage bills. If benefits are to be had from the service the public using the cable should get the benefit. The P.O. wages were 25 per cent. less than the Cable Companies.

Mr. Swan said as regards Mr. Rankin's remarks *re* "Imperial" charges, these charges were, he thought, governed by the International convention. He was not sure that Mr. Lee actually favoured advertising, but it has been said that advertisement is to business what steam is to machinery. The Imperial Cable is being widely advertised, and other services might with advantage also be advertised. It was no unusual thing to be asked by members of the public *if they can send telegrams and how to send them.*

Mr. Gow said the point which appealed to him was that of taking films showing the P.O. at work. There was no better way than by showing films of the work done by the P.O. if the public were to be made aware of the P.O. services. The Post Office should be the best known, whereas it is the least known.

Miss Moffat desired to supplement Mr. Gow's remarks—we must have publicity and real explanation of the services. How many people know about a telephone letter for instance? The P.O. is not necessarily a remunerative service, and we should popularise the services. The ideal of a public service is to supply public needs. The Federation of British Industries were responsible for financing the campaign of attack during the Telephone Ramp.

Major Jayne: Mr. Lee's paper very ably demonstrates the various effects of re-iteration. I am personally quite convinced that Pears' Soap is "matchless for the complexion," for that statement has been hurled at me thousands of times by advertisement.

There are many services in the Post Office that ought to be brought more prominently to the notice of the public—to give one instance, the Night Telegraph Letter Service.

In America I notice that the public are informed by advertisement that theirs is the finest Telephone Service in the world, with the result that it has become an accepted fact. In Britain it appears to be thought that ours is the worst—this is the result of re-iterated adverse criticism.

Many people in the Post Office do not like this adverse criticism. I am all in favour of it so long as it does not go too far. I believe criticism is the salvation of many services inside and outside the Government. It saves the Post Office from becoming smug; it leads to a tendency to become super-efficient, and if it makes us continually on the look-out for the improvement of our service it is all for good, both for ourselves and the public. All I ask is that we should get an occasional pat on the back.

Let us be known by our works in the Post Office.

Mr. Dickson moved a vote of thanks to the committee for their arrangements in connexion with the meetings.

Mr. Fisher acknowledged the vote on behalf of the committee and said the help he had received was invaluable.

Mr. Swan moved a vote of thanks to Major Jayne for his interest in the Society and his excellent Chairmanship of the meetings. The interest aroused had been very great.

TELEPHONE CALLS—RECORDING BY THE PUBLIC.

THE application of the new message rate tariff for telephone calls, as was anticipated, has made subscribers more careful in their use of the telephone, and many are endeavouring to keep records of their calls in order to check the Department's charges. The result has been that a considerable number of subscribers have challenged the amounts debited for local calls in their accounts, and some rather heated correspondence on the subject of over-charging, has been carried on in the public press. In order to test the subscribers' ability to keep an accurate record of their consumpt, 50 cases were selected from the disputants of their September quarterly account, and special records of their calls were taken during two or three days in each case. These records were compared with the subscribers' records and some useful information came to light which may be of interest to readers generally.

The subscribers had various methods of keeping their records, some showing a certain amount of care and others great laxity. The form of record mostly in evidence was in the nature of a small loose-leaf day book or note-book showing the time and the telephone number of the call. A number had some form of mechanical counter and others used small squares of papers which were filed on a wire file. One subscriber rather humorously stated that he had solved the problem of a simple method of recording his local calls, and that was a cardboard box with a small hole in the top into which a pea was dropped for each effective call. It was suggested that a butter bean might represent a trunk call. In the cases where mechanical recorders were used, the record could rarely be checked as the figures were continued from the beginning to the end of the quarter and daily readings were not kept. Some records were kept on loose pieces of paper and there appeared to be a danger of some of the slips being mislaid. There was also some dubiety as to the counting of $1\frac{1}{2}d. + 1\frac{1}{2}d.$ calls as two local calls.

The number of test cases made was 50 and the results worked out as follows :—

Percentage of under-recording on the part of subscriber.	Actual number of cases.	Percentage number of cases.
5 per cent. and under	5	10
10 ,, ,, ...	11	22
15 ,, ,, ...	19	38
20 ,, ,, ...	23	46
25 ,, ,, ...	26	52
30 ,, ,, ...	32	64
40 ,, ,, ...	35	70
Over 40 per cent.	2	4
Number of cases where subscribers' records were approximately correct ...	7	14
Number of cases where subscribers' record could not be checked owing to the absence of daily totals	5	10
Meter faulty	1	2

Taking the figures in bulk, the average percentage of under-recording on the part of the subscribers, was 15. The percentage of cases where the subscribers' record was wrong, was 84, and the percentage where the error was over 5 per cent., was 73. Where the subscribers' record was approximately correct it generally happened that the subscriber was a small user and had the telephone under his personal surveillance.

The recording on the part of the operators was very correct as a rule, and any cases of over-recording were attributable to the subscribers not keeping in touch with the operators in cases of difficulty, such as failure to advise the operator when a wrong number was obtained, and not advising the operators that no reply was being received.

Some rather remarkable cases of failure to record on the part of the subscribers transpired. One firm complained that they were charged 1,200 calls for the quarter while their record was slightly over 400. Thinking that some serious mistake on the part of the subscribers had been made, a visit was paid prior to taking a special record, but the firm maintained that no mistake on their part had taken place. A two days' record showed that the subscribers passed 30 effective local calls during this period, and on a comparison of the records being made, it was found that the subscribers had omitted 18 calls. A remarkable performance. One subscriber made 4 calls while the writer was in his office, and as he did not appear to make any note of the calls he was asked at what time he did so. He replied that he entered them periodically and that he always remembered his calls. Result—a third of his calls omitted.

The majority of the subscribers failed to take a sufficiently long view of their discrepancies. For instance, one subscriber was charged 200 local calls for the quarter, and he made a great noise because his record showed 24 calls less. On comparing his record with a special observation for two days, it was found that he had omitted 1 call out of 9. He admitted having the call, but stated that one call was neither here nor there. On an explanation that 1 call omitted out of 9 was 11 per cent., and 11 per cent. on 200 was 22, a figure very near his discrepancy, he was rather astonished, and then made a tirade against quarterly accounts. It was sometimes amusing to find a subscriber admitting that he might quite easily omit to record 2 or 3 calls per day, but he would never admit a discrepancy of 200 per quarter. The explanation that 2 calls omitted per working day amounted to nearly 160 per quarter rather staggered him.

The frivolous call has been largely cut out by the new rates, but it was found that in some cases the number of private calls to business calls was still very high. In one case of a large user it was found that a third of the calls were of a private nature. The principal was asked " if the staff were allowed to make private calls," and he replied in the affirmative, but that they were charged with the value of the calls. He was asked how much he got a week from this source, and it transpired that about 1*s.* was a good weekly figure. When he was told that he should be getting about 3*s.* per day, there was a storm in more than a tea-cup.

In interviewing the subscribers, the necessity for acting up to the printed instructions regarding the avoidance of overcharge was emphasised, and it was put to them that in ordinary business if they did not get the goods they let the suppliers know, therefore they should keep in touch with the telephone operator until they had obtained the call or let her know if there was difficulty. The investigations were received cordially as a rule by the subscribers, although in one or two cases there were many boisterous moments during the interviews. Others again were only too pleased to have the shortage pointed out, as it reassured them of the Department's methods. Some subscribers asked if it were worth while keeping a record, but they were told to please themselves ; only if they kept a record they should keep it intelligently and make allowance for possible omissions. The desirability of not slavishly considering that their records were correct and making an intelligent allowance for possible failure was impressed on the subscribers. It is thought that a certain amount of good has been accomplished by the investigation, but time will tell.

LONDON ENGINEERING DISTRICT NOTES.

New Telephone Exchange.

ON April 1 a new C.B. No. 1 type Exchange, known as Maryland, was opened at Jupp Road, Stratford, to replace the old Stratford Exchange which was opened in 1896 and the relief exchange, known as Broadway opened since the Armistice. The equipment is of the Western Electric Co.'s type and consists of 16 " A " and 11 " B " positions with subscribers' line capacity of 4,000. The nucleus of the exchange was formed by the transfer of 575 lines from Stratford ; 394 from Broadway ; 116 from East ; and 45 from Walthamstow. The exchanges from which the lines were transferred are of magneto, C.B. No. 9, C.B. No. 1, and C.B. No. 10 types respectively, and this fact increased the difficulties of the transfer.

Electrophone Service.

The number of electrophone subscribers is now approaching 2,000 This constitutes a record number of subscribers enjoying this facility.

Engineering Stores.

The following figures regarding the stores required to feed the London Engineering District for the progress and upkeep of the Telephone and Telegraph systems will be of general interest, and will give some idea of the magnitude of the engineering work dealt with by the Post Office in the Metropolis. The figures quoted are those for the year ended Dec. 31, 1921, and represent the value of stores used and recovered in connexion with the installation of new plant, alterations to, and improvements of existing plant and the maintenance of the two systems :—

Value of stores used	£1,044,229
Value of stores recovered	£395,014

The handling of these very large quantities of stores is a work of considerable magnitude and a few remarks as to how it is done, will, it is thought, not be out of place. A large proportion of the material is delivered direct to the scenes of operation by the Stores Department, and some of the recovered stores are returned direct to that Department, but a very substantial balance is dealt with through the medium of section stocks. For the information of the uninitiated it should be explained that section stocks are stocks of stores held at convenient points in each engineers' section for the ready distribution of stores required for the provision of new " subscribers' " circuits, and for " small works " incidental to the local installations. There are 39 section stocks in London, located mostly in telephone exchange buildings, which give employment to 106 men. The normal value of the stocks is approximately £60,000, which includes apparatus and tools for exchange and loan purposes to the amount of £15,000. During the year 1921 the turnover through section stock was £371,313 stores issued and £68,424 stores recovered, the handling of which involved the considerable total of 414,224 transactions.

Other units of work performed during the year by the storemen, but which cannot be expressed in money values, were in round numbers, 200,000 maintenance exchanges, 40,000 loans and 170,000 issues of small stores. The number of workmen catered for by these section stocks is 4,736.

WHERE TO STAY.

The attention of our Readers is directed to the following list of Boarding and Apartment Houses.

BOURNEMOUTH.—"Glen Cora" Boarding House, Hawkwood Road, Boscombe. Superior and Comfortable "home from home." Central and few minutes from sea. Liberal table. Highly recommended. Stamp for tariff. Mr. and Mrs. Halliday.

BRIGHTON.—Rusthall Boarding Establishment, 11-12, Cannon Place Central. One minute West Pier. From 2 guineas weekly.

DEAN FOREST.—Severn-Wye Valleys. Beautiful Holiday Home (600 ft. up). 60 rooms, extensive grounds, motors, golf. Boarders 47*s.* 6*d.* to 63*s.* Prospectus—Littledean House, Littledean, Glos.

JERSEY.—The Ritz Private Hotel, 83, Colomberie. Central, gardens, dancing, young society. From 45*s.* weekly. Tariff.

JERSEY.—The Sandringham, Colomberie. Near sea. Gardens. Young society. From 42*s.* weekly. Tariff.

SHANKLIN.—Glenavon Private Hotel. Comfortable, homely, Brd.-res. Electric light, billiards. Excellent cuisine, first-class reputation. New management. Mrs. Geere.

TORQUAY.—Homely board-residence, central for everything, 3 minutes Strand, Shops, Trams, Harbours, Piers, Promenade, Sea-front, Pavilion. Good cooking, recommended, no children,—Pridham, 2 St. John's Place.

BED-SITTING ROOM, single and double, lady's house, newly furn., gas-fire ring, bath, breakfast, use breakfast room. Nr. Tube and District. Gentlemen only.—Daniels, 7, Kildare Gardens, Westbourne Grove.

HOLIDAYS IN NORTH WALES.—Sea and mountains, mild climate, beautiful excursions. Golf course near. Comfortable, refined and magnificently situated Guest House, in extensive grounds. Produce from own gardens. 42*s.* 6*d.* per week, inclusive. For prospectus write Manageress, Bryn Corach, Conway.

In addition to section stocks, small stocks of items essential to the day-to-day maintenance of exchange plant and of that installed at subscribers' premises, also fire alarms and telegraph circuits, are held at various points by workmen. These small stocks are called "Normal Stocks" and there are 96 of them, with a total value of approximately £15,000, meeting the requirements of about 300 workmen.

One very important type of store necessary to telephone and telegraph construction, but which is not included in any of the figures quoted, is poles. To meet the districts' requirements of these items, 14 pole stacks exist; they are situated mostly in the outlying suburbs. On Dec. 31 last 697 poles were available for immediate use, in sizes varying from 26 feet light to 80 feet stout. This stock forms what is known as "District Depot Stock" and is held by the Superintending Engineer in trust for the Stores Department.

London Engineering District Clerical Staff.

The eleventh annual clerical dinner was held at Anderton's Hotel, Fleet Street, on Friday, Feb. 24. Mr. F. Freeman presided and was supported by Mr. J. R. Williams in the vice-chair. Mr. A. E. Cooke, the Principal Clerk, was the "Guest of the Evening." One hundred and thirty-four members of the clerical staff from the headquarters and sectional offices were present. The number included former colleagues who had gone to other Departments.

A very excellent musical programme, which was much appreciated, was provided by members of the staff. Mr. J. W. Kimber, the musical director, was assisted by Messrs. S. L. Bickerton, J. H. Chubbock, C. W. Cornwell, S. C. Edser, A. W. Edwards, C. A. Edwards, T. Flannery, H. W. Gardner, J. J. Gerke, E. F. Griffiths, J. W. Hamilton, Chas. Harris, W. J. A. Payne, H. G. Reeves, E. J. Ruffhead and G. H. Stanbridge. Mr. Chas. Forwood was engaged for the piano.

Mr. Freeman, in proposing the toast "The Guest of the Evening," stated that he had been associated with Mr. Cooke for 20 years and a very pleasant association indeed it had been. They would miss him very much—Denman Street would not be the same without him—and he was sure Mr. Cooke would miss Denman Street. He had been the personification of energy, as all knew, and they hoped that young as he really was, he would always keep young, and the setting sun of his official life would bring the dawn of a bright private life. Mr. Cooke had won their respect by force of character. All knew him as an upright and particularly well-intentioned man, traits which would continue to carry him far in his activities when he left the office, whether in connexion with Borough or wider political work. In conclusion, he wished Mr. Cooke the very best time, a better time than ever before. The toast was received with musical honours.

Mr. Cooke, on rising to reply, was greeted with prolonged cheers. He expressed his gratitude for all that had been said. He felt proud to have been associated with such a staunch body of colleagues and thanked the staff for all the kindnesses he had received during the many years he had served in the London District. He was retiring from the Service because he had reached the age limit, but he still felt young in spirit, and having been blessed with exceptionally good health he was hoping to find other activities to occupy his time and render good service to his country. It was his desire to take up political, municipal or charitable work. He was pleased to see his old friend and colleague, Mr. Heath, also many former colleagues who had passed to other Departments. Their presence was much appreciated. The staff had his best wishes and, if they thought fit, to allow him to join in future festivities, he would be delighted to be present.

At the conclusion of the evening, Mr. J. R. Williams proposed a cordial vote of thanks to the artists, and referred particularly to the items contributed by those who had recently been transferred from the Provinces.

Mr. W. J. A. Payne proposed "the Chairman and the Committee" who had organised a very successful and enjoyable function. Mr. S. Lees Bickerton seconded.

Inspectors' Annual Dinner.

The London Branch of the Inspectors' Society held their second annual dinner at Connaught Rooms, on Monday, April 3, 1922. There was a good attendance, an excellent innovation being the presence of ladies. The Chair was occupied by Mr. J. D. Boulton, Chairman of the Branch, and among the guests were Mr. and Mrs. R. McIlroy, Mr. and Mrs. W. A. Williams, Mr. and Mrs. T. Bagley and Mr. C. Bromley. The dinner was followed by a musical programme, which was thoroughly enjoyed by all present.

Mr. T. Bagley (General Secretary), in proposing the toast "The Society," expressed the opinion that the creditable report of the Geddes' Committee on the Engineering Department was due to some extent to the efficient staff organisations. Mr. W. A. Williams (President), responding, touched upon the success of the Society in obtaining representation on the Professional Officers, Group A Committee. "The Post Office Engineering Department" was proposed by the Chairman, whose statement that he looked forward to the day when the Department would be controlled by an engineer, was received with loud applause. Mr. R. McIlroy (Superintending Engineer, London), responding, contrasted the conditions 30 years ago with those of to-day, and his statement that promotion in the future will be decided upon efficiency met with general approval. Mr. C. W. Messenger proposed the toast "The Ladies," which was responded to by Mrs. Maddocks in an excellent and well-delivered speech. Mr. A. H. Veale proposed "The Visitors," to which Mr. A. C. Greening responded with some extremely appropriate quotations from Mark Twain.

The musical programme was so consistently good throughout that it is difficult to select any particular item, but mention should be made of a string quartette of members of the staff, which played delightfully during the reception and interval. The greatest credit is due to Mr. E. W. B. Howe (Hon. Secretary), and the Dinner Committee for the immense amount of trouble they must have taken to have ensured such a complete success.

A New Type of Storage Battery.

An interesting article appeared in the *Electrical Review* of March 29 in which a new form of lead accumulator is described. It is a lead hydrate battery and is unique in many respects, and was invented by an Englishman. The following are some of the claims made for the new battery:—

(1) It has 300-800 per cent. greater capacity than any other battery has hitherto attained.

(2) It is indestructible as a battery.

(3) It is rechargeable in 15 minutes.

(4) It cannot sulphate.

(5) It has a much longer life than any other battery.

(6) No deterioration takes place if the battery is left for an indefinite period at any stage of charge or discharge.

(7) It is capable of being discharged at rates very considerably in excess of the normal without deterioration.

Although the inventor had in view primarily a traction battery, yet if all that is claimed for it is correct, there is a useful field for it in the telephone industry.

Messages over Trolley Wires.

Some satisfactory tests were recently made in the U.S.A. in the use of carrier currents to enable conversation to be carried on between a moving car and a sub-station, and also between the front and rear of a long-freight train, the carrier currents being superimposed on the trolley wires. There can be no doubt as to the utility of such an arrangement, but it is questionable whether intercommunication on a moving train would not be more easily and cheaply provided by older methods. Although the solution of the problem of communication between a moving electrical train and the power station has now been found in the use of carrier waves, other methods were under consideration in this country some 15 years ago by a telephone engineer, who is at present a member of the Post Office Research Section.

Vitamines.

Speculation is rife in the scientific world as to the probability of being able to extend the span of human life considerably beyond its present limit when more exact knowledge of the action of vitamines on the human system has been obtained. If it becomes possible to ensure continuity of corporeal existence say for 200 years, will the age for retiring be extended or will it be possible to enjoy one's pension for the extended period. It may become necessary for all Civil Servants before becoming established to take an oath to abstain from the consumption of vitamines. No doubt the National Whitley Council will bear the matter in mind.

LONDON TELEPHONE SERVICE NOTES.

After Hours.

To those who read Mr. E. J. Lansbury's paper on night service in a recent issue, and visualised an ever-ready night force anxious to render instant service no matter what the hour, it comes as a surprise to learn through the medium of the recently published Report on the Telephone Service, that in some parts of Norway only "the larger Trunk exchanges are open continuously.* In the smaller exchanges there is no obligation for attendance at night, but any subscriber who succeeds in gaining attention is charged 6.7*d.* extra." In other parts of the country the service is available at night, but extra fees are charged for each night call, varying according to time and place, and these fees are paid to the operators concerned. One wonders in the first instance, whether the staff are encouraged to drop in if they happen to be near to the exchange on the off-chance that somebody may be calling.

Critics in the past have been rather fond of comparing the London Service with that which they claimed to have had experience of in Scandinavian countries, but here at least we need not fear comparison. Not a telephone in London remains inoperative because of non-attendance at the exchanges. Except for three or four exchanges in the care of resident-telephonists, London exchanges are staffed regularly at night. This is not the only advantage the London subscriber has. He does not pay more for night facilities, but if he calls a distant town he gets the advantage of reduced fees.

The advantages of being able to telephone at all hours of the night are not confined to subscribers in London. At many exchanges there are all-night public call office facilities for the general public, and there can be no doubt

(* This is the rule all over the Continent.—EDITOR, *T. & T.J.*)

that they have proved most valuable in cases of emergency, especially as telegrams may be dictated from them.

London subscribers also have the distinction of keeping traffic officers from their beds at night, and in certain urgent cases repairs are carried out, so that London should be thankful, though we say it.

* * * *

Pre-Payment Coin Box.

It may be of general interest to remark on an experiment now proceeding with a new type of coin box, the special feature of which is that three pennies have to be inserted by the caller before the exchange can be signalled. The caller, once in communication with the exchange, can deposit the coins in the separate cash box or get them returned as he wills, but an ingenious device prevents him speaking to the required party until he has let the coins go into the cash box, although he can hear all that is going on. If the experiment is successful there will be considerable advantages over the type of coin box now in use, chiefly on account of the saving in time by not having to collect the coins individually during the progress of the call.

* * * *

Langham Choral Society.

The Society held its third and last concert of the season at Queen's Hall on March 28, when an excellent performance of Coleridge-Taylor's increasingly popular "Hiawatha" was given. The hall was filled to its capacity; only two seats remained unsold. It is gratifying to note that the Society has wound up the season with a substantial balance, and the fears that its activities might have to be curtailed for lack of funds are happily dispelled. One of the difficulties in connexion with an organisation depending chiefly on a youthful staff for its support, is the choice of works to be performed. It is hoped that the selection of "A Tale of Old Japan" for the first concert next season will meet the popular taste. It is with regret we note that Miss W. Nurse has resigned through ill-health the Secretaryship, a post she has ably filled from the commencement of the Society. Mr. W. R. Child of the Contracts Branch has taken over the duties.

* * * *

Inter-Branch Football Match.

In a spirit of friendly rivalry the Contract Branch recently accepted the challenge of the Accounts Branch to play a football match, which was decided on the evening of March 30, and resulted in a victory for "Contracts" by 2 goals to 0. A cold driving rain, which at times changed to sleet, failed to damp the enthusiasm, and a very enjoyable game resulted, despite the elements. The winners were perhaps fortunate in recording a victory by two clear goals, but they held just that advantage which entitled them to carry off the spoils. Cowdrey was responsible for both goals.

* * * *

Macbeth on the Bonus.

Is this a bonus which I see before me
Its back toward my hand? Come, let me clutch thee:
I have thee not, and yet I see thee still.
Art thou not, longed-for bonus, sensible
To feeling as to sight? or art thou but
A bonus of the mind, a false creation
Proceeding from the work-oppressed brain?
I see thee yet, in form as palpable,
As that which once I drew.
Thou softenest the way that I was going.

There's no such thing.
It is the (Shakespeare) business which informs
Thus to mine eyes.

J. McM.

* * * *

Culled from the Exchanges.

East Exchange.

The East Exchange staff held their annual social at the Limehouse Town Hall on Feb. 22, 1922, where a very enjoyable evening was spent. The programme consisted of music, dancing and games. The songs rendered by Misses Tyler, Godfrey and Mr. Moulds were greatly appreciated, as was the humourous recitation given by Miss Orme. A pleasant feature of this social was the reunion of many members of the staff who have now left the district. Mr. Arrowsmith kindly carried out the duties of M.C. Reference was made to the forthcoming bazaar which is being held in aid of Shadwell Children's Hospital at East Exchange on Monday, April 3, 1922.

* * * *

Regent Exchange.

Regent's last dance of the season was held on March 31 at the Shaftesbury Hotel. The knowledge that it was the last dance seemed to make everybody the more determined to get the utmost enjoyment from it. Mr. Buckeridge was M.C. and that fact, together with the floor and music, made the evening a proper success to finish a very enjoyable season.

The monthly whist drive at Gifford House was held on March 25. As most of the players are in invalid chairs and some even unable to move from their beds, these occasions demand much care and forethought in their arrangement. As M.C. Mr. Buckeridge overcame these difficulties, and with the help of the girls, a very enjoyable afternoon passed happily for all who took part in it.

* * * *

The Point of View.

I *hate* those horrid "B" girls,
The "A" girl made complaint:
The way they take an order wire
Would aggravate a saint.

They laugh and talk incessantly,
And calmly disregard
Our plaintive calls for junctions,
Yes, it's really very hard.

Their tones are pert and insolent,
They answer when they choose;
They give wrong numbers constantly,
Mistaking "fours" for "twos."

They always try to thwart us
With their "No lines," "Don't break in,"
And if we want a junction changed,
It's deemed a deadly sin.

We're "cut off" on an average
Ten calls in seventeen:
Yes, I *do* detest those "B" girls—
They ought never to have been!

O, time went on—as time will do,
The "A" girl changed her state:
For she must go to junctions too
Like other "A" girls, tried and true.
And straightway changed her point of view
And subject of debate.

I *can't stand* those horrid "A" girls,
This "B" girl then made plaint:
The way they use the order wire
Would aggravate a saint.

They "break in" on each other
And upset the order wire,
And pick up any junction
They may happen to desire.

Of course I'm blamed for it, although
They cause their own delay;
How *can* my service perfect be
When they behave this way?

They should be made to try their skill
At junctions for a space:
They'd soon begin to realise
It's scarce a "cushy" place!

But never mind, their time will come,
Then I shall think with glee:
Now they will know the trials of
The girls whose work is "B."

DOROTHY TURNER.

PERSONALIA.

LONDON TRAFFIC STAFF.

Resignations on account of marriage :—

Miss L. EDLESTON, Assistant Supervisor, Class II, of the Trunk Exchange.
Miss E. CRANEY, Telephonist, of the Trunk Exchange.
Miss N. M. LAMBERT, Telephonist, of the Purley Exchange.
Miss G. M. NEWTON, Telephonist, of the Mayfair Exchange.
Miss V. L. R. TAYLOR, Telephonist, of the Mayfair Exchange.
Miss M. G. FISHER, Telephonist, of the Mayfair Exchange.
Miss D. E. STREATER, Telephonist, of the Mayfair Exchange.
Miss F. A. M. E. SILLENCE, Telephonist, of the Victoria Exchange.
Miss E. FURTWANGLER, Telephonist, of the Paddington Exchange.
Miss A. L. RAYNER, Telephonist, of the Putney Exchange.
Miss R. JESSUP, Telephonist, of the Woolwich Exchange.
Miss E. K. HUMPHREY, Telephonist, of the Avenue Exchange.

THE

Telegraph and Telephone Journal.

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MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.SC., M.I.E.E., FELLOW I.R.E.

(*Continued from page* 120.)

Interrupted Continuous Waves.

IT has already been mentioned (page 131, Vol. VII) that if a C.W. station wishes to communicate with one equipped only with apparatus for spark reception, the continuous trains of waves corresponding to the dots and dashes must be broken up into detached portions, so as to resemble the radiation from a spark station. The type of signalling so produced is known as "Interrupted Continuous Waves," or "I.C.W."

With commercial valve transmitters, the high tension supply is obtained from an alternator, the current pulses being rectified and afterwards made continuous by a smoothing condenser, as already explained. With such an installation, I.C.W. can be obtained by disconnecting the smoothing condenser. The voltage applied to the anode of the transmitting valve then pulsates, rising to a maximum once for each half-cycle of the alternating current supply. The amplitude of the radiated oscillations therefore varies in a similar manner, and consequently at the receiving station a note is heard, the pitch of which corresponds to twice the frequency of the alternating current supply. (The frequency of the supply is the number of *complete* alternations per second.)

Wireless Telephony.

With I.C.W. we are moulding the radiated waves to the comparatively simple form of the alternating supply and a simple musical note results. If we can mould the radiated waves to the complex form corresponding to speech, the corresponding sounds will be held at the receiving station, and thus the speech will be transmitted—(see page 132, Vol. VII).

There are several methods by which this can be done, but only one will be described here. The arrangement is shown in Fig. 33.

The connexions as far as the oscillating circuit is concerned are nearly the same as those of the valve transmitter already dealt with. In this case, however, a closed oscillating circuit, instead of the aerial circuit, is excited from the oscillating valve, and the oscillations in this closed circuit are made to excite the aerial through an oscillation transformer.

A valve, known as the "absorption valve," is joined across the secondary coil of the oscillation transformer, as shown in the diagram, and it is by means of this valve that the speech modulation is impressed on the radiated waves. The space between the anode and filament of the absorption valve provides a path by which some of the energy in the secondary coil is shunted away from the aerial. The amount of energy so shunted away evidently depends on the resistance offered by the valve, and this resistance depends on the grid potential. Thus, by causing the grid potential of the absorption valve to vary in accordance with the speech waves, the resistance of the valve is caused to vary in the same manner, the amplitude

of the oscillations in the aerial are modulated similarly, and so the speech is transmitted.

The speech modulations are impressed on the grid of the absorption valve by means of a microphone acting through two amplifying valves. The variations in the microphone current produced by the speech are impressed as voltage variations on the grid of the first amplifying valve through a step-up transformer. The variations so produced in the anode current of this valve are impressed through another step-up transformer on the grid of the second amplifying valve. Finally, the variations of the anode current of this valve are impressed through a third step-up transformer on the grid of the absorption valve, and the modulation of the radiated waves is brought about as already described.

The modulated oscillations set up in the distant aerial are amplified and then rectified in the usual manner.

It will be evident that for the clear reproduction of speech no distortion must be produced by the amplifier, that is, the amplified oscillations must be an exact copy of the received oscillations.

In order that this may be the case, the amplifying valves must be so arranged that the fluctuations in anode currents are exactly proportional to the changes in the grid volts, as mentioned on page 184, Vol. VII.

Land-line to Wireless Telephone.

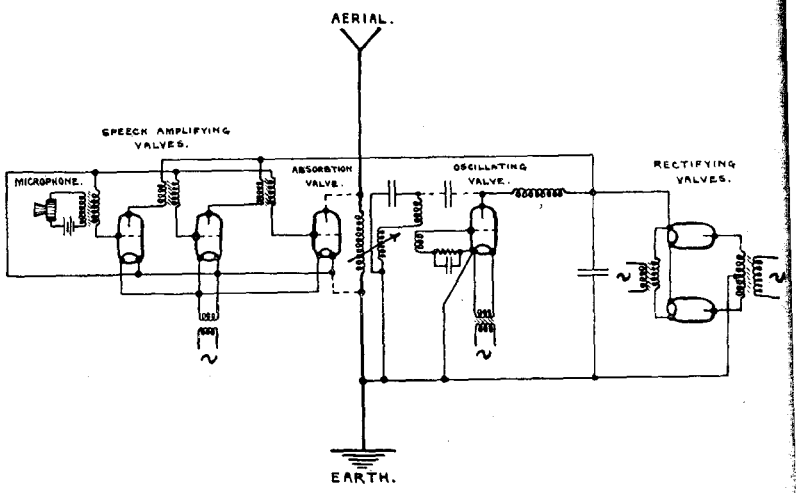
The exchange of speech between two wireless stations is, of course, a very notable achievement. For commercial purposes, however, this is not enough. It should be possible for two telephone subscribers to be joined through their exchanges to the wireless stations, and for their conversation to be carried on as though they were connected by an ordinary line. A subscriber in London should be able to hold a conversation with a person on board a ship or an aeroplane.

It has not yet been found possible with wireless telephony to speak and listen simultaneously, as is done on an ordinary telephone circuit, when using a single wave-length for the wireless portion of the connexion.

When the wireless link is between two land stations, as when communication is effected between the mainland and an island, it is possible, by using separate transmitting and receiving stations at each end, and a separate wave-length for each direction, to reproduce the conditions of an ordinary telephone circuit, as far as the subscribers are concerned, and one can then if necessary, interrupt the other in the course of a conversation, but such an arrangement necessitates a certain spacing of the wireless transmitting and receiving stations at each end, and this prevents it from being used on an aeroplane or on shipboard, because in these circumstances the necessary space cannot be obtained. For these a switching device has to be installed at each wireless station, and an operator there has to listen to the conversation and switch over from "send" to "receive," or *vice versa*, at the appropriate instant. This, of course, is not so convenient as the system which permits one subscriber to break in while the other is speaking, and efforts are being made to produce a practicable system which will give these breaking-in facilities between any two wireless stations whatever, whether on land or sea, or in the air. So far, however, such a system has not been produced.

The manner in which the switching system is carried out is shown in Fig. 34. For the sake of clearness only the essential pieces of apparatus have been inserted on this diagram. The full connexions of the transmitting gear are shown in Fig. 33, and those of the receiving gear in various diagrams in the section devoted specially to that portion of a wireless station. The reader should have no difficulty in filling in the omissions for himself.

The three switches 1, 2 and 3, which are moved simultaneously, effect the change from "receive" (R) to "send" (S). When the switches are to "receive," as shown in the diagram, the aerial is joined through switch 1 to the receiver, and the received signals, magnified if necessary, are passed through the transformer R, switch 3 and transformer L to the telephone line.



FIG, 33.

A telephone, joined across the secondary coil of the transformer R, enables the operator at the wireless station to keep in touch with the conversation so as to switch over at the proper moment. When the switches are to "send," and the receiver therefore disconnected from the aerial, the receiver is still affected sufficiently strongly by the waves sent out by the near-by transmitter for the speech to be reproduced in the operator's telephones. He can, therefore, follow the conversation in both directions.

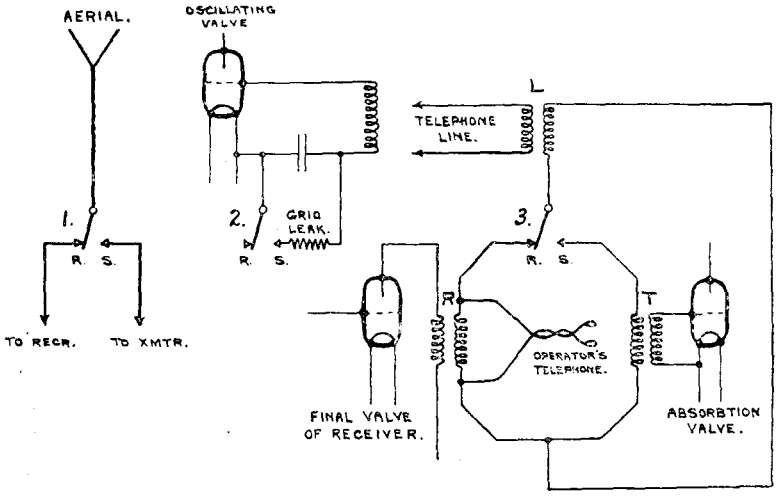


FIG. 34.

The switch 2 in its "receive" position, disconnects the leak round the grid condenser of the oscillating valve of the transmitting set, and therefore, as already explained in connexion with the valve transmitter, prevents oscillations being set up.

When the switches are moved over to "send," switch 1 joins the aerial to the transmitter, switch 2 closes the grid leak and so starts the oscillations, while switch 3 joins the line transformer L to the primary coil of the transformer T. The secondary coil of this transformer is joined to the grid of the absorption valve, if necessary, through a number of speech amplifying valves, as in Fig. 33. Currents coming in over the telephone line can thus vary the potential of the grid of the absorption valve, and so modulate the emitted waves to the correct form to reproduce the speech.

(To be continued.)

PRINCIPLES OF THE FIVE-UNIT SYSTEM.

(NOTES OF THE FIRST LECTURE OF A SERIES TO SUPERVISING OFFICERS IN THE C.T.O. GIVEN BY W. T. COUSINS.)

THE object to be achieved in substituting multiplex systems for Morse working is to fill the line. The output of the Morse is limited to the speed of the slowest operator at either end. The length of the signals and the time taken between them leaves the line idle for a longer period than when in use. Multiplex working makes it possible to fill the line without unduly pressing the operators.

WHEATSTONE.

10 reversals	...	=	1 inch
∴ 1,200 reversals	...	=	10 feet.
But 50 words ...	...	=	10 feet.
∴ 50 words ...	...	=	1,200 reversals.
1 word ...	...	=	24 reversals

BAUDOT.

11 reversals	...	=	1 revolution*
180 revolutions	...	=	1 minute.
∴ 1,980 reversals	...	=	1 minute.
Taking 5 letters + 1 space		=	1 word.
Words for 1 arm	...	=	$\frac{180}{6}=30$ words per minute.
Words on 4 arms ...	...	=	120 per minute.
∴ 120 words ...	...	=	1 minute.
But 1,980 reversals	...	=	1 minute.
∴ 120 words ...	...	=	1,980 reversals.
1 word ...	...	=	16.5 reversals.

1 Wheatstone word : 1 Baudot word : : 24 : 16.5.

Baudot words per minute ... ... = 120

$$\therefore \text{ Wheatstone words per minute } \ldots = 120\times\frac{16.5}{24} = 82.5$$

N.B.—Then a line which will work at approximately 85 words per minute Wheatstone duplex, should work 120 words per minute (normal speed) on Baudot quadruple duplex.

On long lines with a repeater in circuit it is the practice to try reversals and old slip before working commences.

If alternate keyboard tappers are depressed on the Baudot, reversals will be sent to line similar to those sent from a Wheatstone transmitter. In the place of running old slip, Morse characters are formed by making certain combinations with the keyboard tappers by means of small rectangular metal blocks. The combination generally used is made by the letters "BL" run together, *e.g.*, — - - - — - - — - - - - — - -

REVERSALS. Correction

T. G. T. G. current.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

COMBINATIONS.

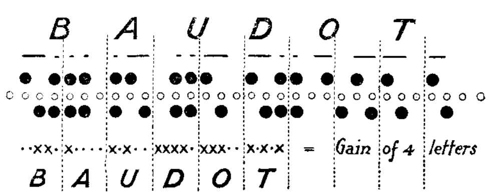
V. E. V. G.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22=BL.

V. H. M. U.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22=PR.

The Baudot code is a five-unit one, each letter being the same in length (the Western Electric, Murray and Teletype also have a five-unit code).



COMPARISON.

The Morse alphabet contains only three letters equivalent in length to the Baudot alphabet.

Viz. A. N. S.

three letters shorter

Viz. E. I. T.

and twenty longer; also all figures and secondaries.

"CRITICS CONVERTED TO PAYING COMPLIMENTS."

THE following extract (under the above headline) from the *Bradford Daily Argus* furnishes yet another proof, if any be needed, of the great advantage of giving subscribers a practical demonstration of the working of a telephone exchange:

About twenty members of the Bradford and District Chamber of Trade, representing most of the distributive trades, visited the telephone exchange at Nelson Street, Bradford, yesterday, at the busiest time of the day. The visit was the result of some hostile criticism made at the last Council meeting.

Mr. Fred Pickering, J.P., hon. secretary of the Chamber, and Mr. J. J. Booth, the president, introduced the members, who were courteously received by Mr. Lefevre (the Postmaster), Mr. Bates (district manager), Mr. Tinsley (engineer), Mr. Rogers (traffic manager), and Mr. Lawrence (superintendent). All the main departments were visited, and the party was intensely interested in all they saw, and they came away with very much altered opinions of the efficiency of the system so far as Bradford is concerned.

Mr. Booth gave his heartiest thanks to the officials, on behalf of his colleagues; and Mr. Pickering, in supporting, said that only by tradesmen subscribers seeing for themselves could they realise the difficulties and the intricacies of the telephone department.

Messrs. Bates and Tinsley, in reply, said, that if the public subscribers only knew more of inner workings of the exchange, much of the adverse criticism which had recently appeared in the Press would be proved to be based on erroneous conceptions.

Concerning the complaints of overcharging, it was pointed out that many subscribers on investigating would discover that a great many calls were made by members of their staffs which had no connexion at all with business. The girls were so busily employed that it was an impossibility for them to neglect their work, as there were supervisors always moving behind them.

It was also mentioned that the demand for new telephones had been met and reduced by about 90 per cent., and those still waiting were held up for certain equipment not being to hand. The officials anticipated that within two months all demands would be promptly met as they occurred.

The *Bradford Chamber of Trade Journal* makes the following comment:

Whatever may have been the opinions of the members of the deputation prior to this visit of inspection, it is most assuredly safe to state that they came away with much altered views of the wonderful system as seen in operation at a time when the peak load of calls was highest. So far as could be judged the system was being worked with the greatest efficiency, and whatever subscribers may say in complaint of over-charges it seemed next to impossible for such to be made. One must not forget, however, that many calls are made by members of staffs of various business houses in the Bradford area who have no authority to use the instruments for their own personal assignations or purposes, and thereby "hangs a tale" probably of a great many calls which business men are being called upon to pay which have no connexion whatever with their businesses. Everyone came away feeling that the afternoon had been most profitably spent.

TELEGRAPHIC MEMORABILIA.

THE closing meeting of the 1921-22 Session of the T. and T. Society, held at the I.E.E., was marked by a deeply interesting paper by Mr. A. B. Hart, and read to a deeply interested audience. The presence of Mr. F. J. Brown, Chairman for the session, was particularly welcome, especially in view of his unavoidable absences across the Atlantic on important national business. Sir Andrew Ogilvie was amongst the comparatively few speakers who were able to contribute to our knowledge of so technical a subject of "Carrier Currents." More than one complimentary remark was heard as the audience dispersed on the sustained interest of Sir Andrew in affairs electrical despite his retirement from public service.

The Annual Report and Balance Sheet for the closing session and the election of the various officers and Committee for the session 1922-23, preceded Mr. Hart's successful contribution to our general knowledge. It is highly satisfactory to place on record an increased membership, an increased balance to be carried forward, and last but not least, the acceptance of the chairmanship for the coming session by Sir Henry Bunbury, who, one can readily believe, is keen to know more intimately something of telegraph and telephone activities other than the cold figures with which his daily task is closely associated.

The annual report of the Post Office Sanatorium Society and Statement of Accounts for the fifteenth year of its existence, which terminated on Dec. 31, 1921, is to hand, and shows a very considerable net increase in its membership and a satisfactory balance sheet for the year under review. No

less than 8,112 new members joined during that period, against which must be set 2,912 withdrawals due to deaths, pensions, marriages, &c. Appreciation of certain investments and certain economies have permitted the Treasurer to announce that no less a sum that £14,386 now stands to the credit of the reserve fund. Doubtless, the most satisfactory item is that under "General Results," which states that the Society's efforts have resulted in arresting or materially improving 87.91 per cent. of the tubercular cases treated. Membership is open to all classes of the Post Office services, and the subscription is represented by the lowest valued coin of the realm *per week* !

The Swiss Marconi wireless station was opened near Berne at the end of the month of April, but it is understood that the Swiss Government have no intention of closing down any of the international *wire* telegraph services in consequence.

The *Westminster Gazette* was apparently the first to announce that the Irish Post Office had made arrangements with the Commercial Cable Company, Waterville, and the Marconi Wireless Co., Clifden, to handle Irish traffic for America at Irish stations.

The Imperial Wireless Service (Anglo-Egyptian section) inaugurated on April 24, appears to be working very smoothly, promising well for future developments.

The information comes to hand from a very reliable source that direct telegraphic communication has been established between Russia and Germany, *via* Dvinsk. The *Daily Telegraph* also announces that, "The Council of People's Commissaries has granted a concession for telegraphic communication between India and Europe. Communication will be through Russian territory, and there will be connexion with Turkey, Egypt, Persia, and the Mediterranean countries."

The *Pravda*, Riga, also stated early last month that the Soviet Government had authorised the project of "granting the Indo-European Cable Company a concession of the cable running through the territory of the Soviet Republic linking up with the cables of the above company in other countries.

The Black Sea cable belongs to this company, joining up Odessa and Constantinople, and besides the company has the use of the land cables run from the present Russo-Polish frontier through Odessa, Kertch, and Tiflis to the Russo-Persian frontier."

The report of the Indo Company's Chairman at their 55th Ordinary General Meeting, held a few weeks ago, may therefore be quoted with added interest, although its appearance in the London daily Press appears to have passed without notice. A few extracts from that report will doubtless prove especially informative :—

"The Polish concession was signed some time back. Within the last few days we have been advised by the Russian Department of Posts and Telegraphs that our concession from the Moscow Government was signed. This is, of course, a very important fact, as the concession covers the whole territory traversed by our line, from the Polish frontier on the west to the Persian frontier on the east, transiting various Federated States, who have also approved the concession.

Our concession from Persia is already in existence, and that from the German Government, although not actually signed, owing to international politics, has for a long time been agreed in principle and should offer no difficulty.

The condition of the Company's line is more satisfactory than could perhaps, have been expected.

It is workable for a stretch of over 200 miles north-west of Odessa, whilst east of Odessa a similar state of affairs exists for 300 miles into the Crimea. Beyond the Straits of Kertch the line is in working order between Ekaterinodar and Tiflis. Between Tiflis and Erivan there is a short stretch where the repairs have not yet been completed. The section Erivan-Djoulfa, on the Russo-Persian frontier, has undergone repair and is now in working order, as is also the Company's Persian section, Djoulfa to Teheran.

Further, the Black Sea cable, Odessa-Constantinople, is again in working order, and has already been officially opened by the Soviet Government representatives at Odessa. This cable will, therefore, shortly be able again to carry the classes of traffic formerly dealt with by it, and will, it is hoped, help to re-establish business relations generally with Southern Russia and the Black Sea ports.

The Indo-European Telegraph Department states that their Persian lines are in good order and are available at any moment.

During the last three years we have been straining every nerve to be ready for the reconstruction when the moment arrived. Great quantities of material of every description have been accumulated at suitable bases. The fact that Central Europe has been devastated and laid bare from every point of view has rendered it necessary to provide for our staff and workmen even the ordinary necessaries of life, such as food, clothes, and medical supplies, the latter item in particular being very scarce in parts of Russia.

The most arduous part of our work is, undoubtedly, the section from the German and Polish frontier on the west to the Polish-Russian frontier on the east.

Much of our line on that territory has absolutely disappeared as a separate international line, and where three or four wires were suspended there are now 10 to 20 of all sorts, including telephone wires ; we, therefore, in accord with the Polish Government, arrived at the conclusion that it must be rebuilt in a new location—namely, along the great *chaussees*, or high roads.

Our engineering staff is on the spot, as also the material required, but the work of building a fresh line of some 400 miles will occupy some months.

The constructional work has been elaborated here, in London, and the variety of material and appliances that have been provided is legion ; such things as specially constructed six-wheel lorries for transport of oak poles and other material, a motor-caravan to enable the engineers to live on the spot, cars for travelling from one erecting gang to another, all tools and line tackle—in fact, a hundred and one items."

The Company is evidently now in full possession of 'the political rights-of-way,' and should ere long recover much of the lost ground of the last eight years."

European affairs may thus be said to be gradually disentangling themselves now that 'communications' have begun to re-organise, and as was to have been expected after the great upheaval, to re-orientate.

For example, take the following from a Danish financial source :—

"The Danish Store Nordiske Telegraf Selskab has applied to the Swedish Government for a renewal of the agreement between the two parties, which will expire in about three years from the present time, having been prolonged in 1910 for a period of 15 years. An agreement also exists between the Government of Finland and the Great Northern Telegraph Co. with regard to the telegraphic traffic to the west, and if Sweden were to terminate the contract with the Danish company this would influence the relations between the latter and Finland, because the company would no longer be able to fulfil its contract obligations. Finland and Sweden would then have to arrange their own mutual telegraphic connexions. As a consequence the attitude of the Swedish Government is also of exceptional interest for Finland. Sweden receives a considerable amount in transit taxes, which will be increased when the company's services to Russia and the Far East are resumed. In some circles in Sweden it is desired to become independent of a Danish company, and in this respect there is the example of Norway. But the position of Sweden and Norway in relation to the company is quite different. In Norway the company only owns the cables between Norway and England, but no transit traffic proceeds through Norway."

The fact too that the Great Northern Telegraph Coy. of Denmark, which has considerable interests in Eastern as well as Western Europe, will announce a dividend of 22 per cent. at their General Meeting to be held at Copenhagen, on the 30th of the present month, is proof positive that there is likely to be some liveliness in matters telegraphic during the next year or two. With the Eastern Telegraph Company improving its cable service, the Indo, the Northern and the Imperial services all alive to the possibilities of Eastern and Far Eastern traffic there should be some strenuous work for telegraph canvassers !

From Vienna we learn that an Austrian Wireless company has been founded, capitalised by the Vienna Bankverein and the Siemens-Schuckert Telefunken companies, for enlarging all the existing Austrian stations and thus permitting direct wireless services with all Europe and America. Such is the ambitious scheme !

The amalgamation of the three chief German cable companies, the *Deutsche Atlantische*, the *Deutsche Sud Amerikanische* and the *Ost Europaische* is now a *fait accompli*, while the *Ueberseeverkehr* corporation of Berlin reports an increase in the traffic from the Wireless stations at Nauen and Eilvese in 1921, particularly with the United States and European countries. This corporation it will be recalled, has a certain community of interests with the Radio Corporation, as also with Transradio Argentina.

Consider the following items, telegraphic and telephonic, wire and wireless, land and cable, and say readers all if in telegraphic and telephonic history there was ever before so much movement in the province of our craft :

That there is a scheme on foot for controlling all wireless stations built or to be built on Mexican territory for the next fifty years ;

That a wireless telephonic service has been opened between Pekin and Tientsin ;

That a long-distance telephone circuit will shortly be installed between Shanghai and Nanking ;

That the lonely island of Tristan da Cunha is to be rendered less lonely by the installation of a wireless installation ;

That the preparations for the extension of the Bergen wireless telephone service will be completed by June ;

That it is understood that an agreement has been reached between the Finnish and Swedish telephone administrations, under which a nine circuit cable is to be laid between Helsingfors and Stockholm for service between the two countries ;

That the Cuba Submarine Telegraph Co. has laid a new cable section between Cape Cruz, and Santiago, and completely repaired the Cienfuegos-Santiago 1905 cable, and *inter alia* has also declared a dividend of 10 per cent ; and,

That the French telegraph authorities recently established a temporary direct telegraph circuit from Paris to Biskra Algeria, a distance of 1,562 miles.

Mr. W. L. Griffith has been appointed by the Canadian Government to succeed Sir George Perley as the Dominions representative on the Pacific Cable Board.

On the 2nd of last month there passed away in the person of Mr. H. Sissons a personality which simply by daily acts of helpfulness, and a constant spirit of courtesy endeared himself to all with whom he came in contact, officially or unofficially. Originally on the staff of the Submarine Telegraph Company, he was transferred to the Government service in 1889, remaining in the Cable

Room, C.T.O., for several years. Eventually transferred to the Engineer-in-Chief's department he retired upon reaching the age-limit in April of last year, apparently with every prospect of a lengthy period of retirement. The respectful sympathy of all his old colleagues is tendered to his bereaved wife and family, together with the sincerest expression of appreciation of a fine character.

An interesting item of the tour of the King and Queen in Belgium was the establishment of direct telegraphic communication between Zeebrugge Quai and London C.T.O., during the time their majesties visited the celebrated Mole and its heroic associations.

The visit of the Duke of York to the C.T.O., London, though an official one, largely partook of that homeliness and freedom with which we have become accustomed to associate the royal family. The young duke was unfeignedly interested in all that he saw, and witnessed the receipt of several telegraphic messages specially addressed to his highness, from countries as far apart as Australia, Canada, France, and Belgium, the Director of the Czecho-Slovakian Telegraphs forwarding a cordial note from Praha, the capital, with which city the C.T.O. is in daily direct communication by wire *via* Germany.

Transition Periods.—"In an age of transition it is the direction of the thoughts and aims of men which constitutes the radical difference or agreement between them rather than the exact distance that each may have travelled on the same road."—*Seebohn* on *Thomas More.*

J.J.T.

CORRESPONDENCE.

ECONOMY IN LINE TIME AND MY TIME.

THE KR LAW AND THE TR LAW.

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

SIR,—It would save my time and your readers' time, as well as line time, if some people would stop writing nonsense about the Multiplex. In your December issue, Mr. Teare trumpeted the alleged advantages of the Western Electric Multiplex, and now Mr. Pratley urges the alleged advantages of the Siemens' automatic system. I pointed out in reply to Mr. Teare that the Western Electric had merely adopted the Picard method of correction from the message signals, which Picard had applied to the Baudot Multiplex working across the Mediterranean years before the Western Electric Company had ever thought of Multiplex, and that this Picard method was available for any multiplex system. To attribute special merit to the Western Electric Multiplex for economy of line time through the adoption of the Picard-Baudot device is obviously absurd. Actually I was the first to propose correction from the message signals for the Multiplex as far back as 1903, and when the conditions require it, I provide this economy of 20 segments instead of 22 on the distributor in a much simpler way than the Western Electric or Picard method.

Turning now to the claims of Mr. Pratley, in favour of the Siemens' automatic system, he contends that in order to gain full advantage of the saving of line time by the adoption of correction from the message signals, it would be necessary to have various speeds for various lines depending on the "KR values," that is to say, on the varying length of the lines. Mr. Pratley asserts that varying speeds of operation on the Multiplex would be "chaotic." The facts are against Mr. Pratley. The Western Union has extended the Multiplex with tape transmission all over the United States, and has a variety of speeds ranging from 30 to 60 words a minute per channel, not only without "chaos," but with very considerable economy. With keyboard perforators and tape transmission there is no difficulty whatever in suiting the speed of operation of the Multiplex to the line and the traffic. Actually in Great Britain the lines are so short and their carrying capacity in most cases so much beyond traffic requirements that there is no pressing need to vary the speed, and it is only a question of time for the standard rate of transmission on all Multiplex trunk lines in Great Britain to be raised to 60 words a minute per channel. The Western Union has found this speed profitable. Profit is all-powerful. It is like the grey cloud of necessity to which even the gods must bow, and sooner or later profit will compel the adoption of the 60-word rate (two messages a minute per channel), on the Multiplex lines in Great Britain. Mr. Pratley forgets also that on the Multiplex not only can the speed per channel be varied, but also the number of channels. It is a fact proved beyond question by Western Union experience that the speed of the Multiplex can be adapted as closely as desired to the length of line and the load of traffic. It is tape transmission that gives flexibility of speed both to the Multiplex and the Automatic. In this respect the tape transmission Multiplex is equal to any automatic system, and has the advantage over any automatic system of far higher traffic-carrying capacity. On the Murray Multiplex installation on the *Scotsman* private wire from London to Edinburgh (400 miles), 60 words a minute per channel on four channels from London to Edinburgh presents no difficulty. That is 240 words a minute directly and instantly printed from the line signals in page form. No automatic system can do that or ever hope to do it. Physical and commercial limitations make it impossible. Even six channels at 60 words a minute are not the limit for the Multiplex, and in coming years, when traffic presses, a speed of 360 words a minute in each direction on busy Multiplex trunk circuits in Great Britain will be one of the commonplaces of telegraph practice, and it will not be any automatic system, German or otherwise, that will do it.

In view of the facts that I have given in this letter, how absurd is Mr. Pratley's statement that it is necessary "to have recourse to an automatic system such as the Siemens-Halske and others, wherein the transmitter may be rotated at a speed determined by the retardation of the line, and the mechanical performance of the receiving apparatus." The modern tape transmitting Multiplex has all the facility of automatic systems for speed variation, and "the mechanical performance of the receiving apparatus" on the Multiplex is, and always will be, far beyond the capacity of any automatic system. Mr. Pratley says: "This advantage of the automatic principle over the Multiplex is not generally touched upon." Naturally it is not touched upon, because it is not true

Mr. Pratley's calculations are very interesting, but they are based on the assumption of a fixed speed for the Multiplex of 180 revolutions per minute (30 words a minute per channel) which is ridiculous. Mr. Pratley should take a trip to America and see what the Western Union is doing in a country where, on account of the great distances, "the KR values" have real importance. The Western Union is working the Multiplex quadruple duplex between New York and San Francisco, 3,300 miles, or eight times the distance from London to Edinburgh. In Great Britain the distances are so small that in most cases the KR values are negligible when the traffic, load is considered. If the limiting speed of the line is 200 words a minute and the traffic only requires 100 words a minute, we need not worry about the KR. In fact KR. in Great Britain is mostly TR—that is to say, Tommy Rot—and it is on the TR law, and not the KR law that Mr. Pratley's elaborate calculations are based.

One word more. Mr. Pratley credits Mr. H. H. Harrison with the observation that a distributor is a time divider. It was I who pointed out in my pre-war advertisements in the TELEGRAPH AND TELEPHONE JOURNAL that distributors are "clocks or time dividers," running about 15,000 times faster than ordinary clocks. I shall have to apply to the TELEGRAPH AND TELEPHONE JOURNAL for a reduction of my advertising rates on the ground that Mr. Pratley does not read my advertisements.—Yours truly,

DONALD MURRAY.

THE TYRANNY OF TELESCOPES.

THE British Chaplain and Vice-Consul at Gothenburg told a Manchester audience (according to the *Manchester Evening News*) that owing principally to its water-power the entire country of Sweden was electrified from end to end. He did not say, continues that journal, whether or not the tyranny of telescopes was as great and as terrifying as it is here.

What is this tyranny of telescopes to which our contemporary darkly alludes?

O ye, in happy innocency lulled,
What reck ye of the tyranny which stalks
About us, and the easy Briton's dulled
Perception baulks?

Draw near, and learn that, unsuspect, exists
A fearsome Tyranny of Telescopes,
More dread than that of Prohibitionists,
Kaisers or Popes.

Who wields this tyranny? To what dark end?
I cannot say, but seem to understand
Some Hidden Eye, replacing our old friend,
The Hidden Hand.

Say that you bury some respected aunt
(And bury her at Lord's or Kempton Park),
The Telescope may tell—and you may want
A berth as clerk.

Or, say you are a servant of the State,
The Telescope, it may be, day and night
Watches for your Dead Hand, which soon or late
'Twill drag to light.

Or, if your bonus dwindle till it cease,
The Telescope may serve to magnify
Your salary—but not, alas, increase
Its power to buy.

Perchance its terrors for small game it saves,
As when plump maidens on some sunlit strand,
Hiding but half their charms beneath the waves,
It spies upon—and then an edict craves
"Mixed bathing banned."

W. H. G.

THE BAUDOT—XXXIII.

By J. J. T.

The Moderator.—As we know, the moderator is a speed governor of a rough and ready type compared with that of the regulator of the Baudot distributor. The care of this portion of the apparatus and its adjustment are very simple. It is liable to collect an abnormal amount of dust, and of this it should be regularly freed. The brake with which it is provided and which controls the moderator by damping down its speed by contact with the friction plate, should be periodically examined and kept well supplied with tow. Definite speed values are obtained by bringing more or less spring spirals into play for lower or higher speeds respectively. It is generally arranged that the moderator should rotate at about 1 per cent. faster than the distributor, and in this country is so adjusted that the *electro*-brake is pulled up to the speed of the distributor once every revolution.

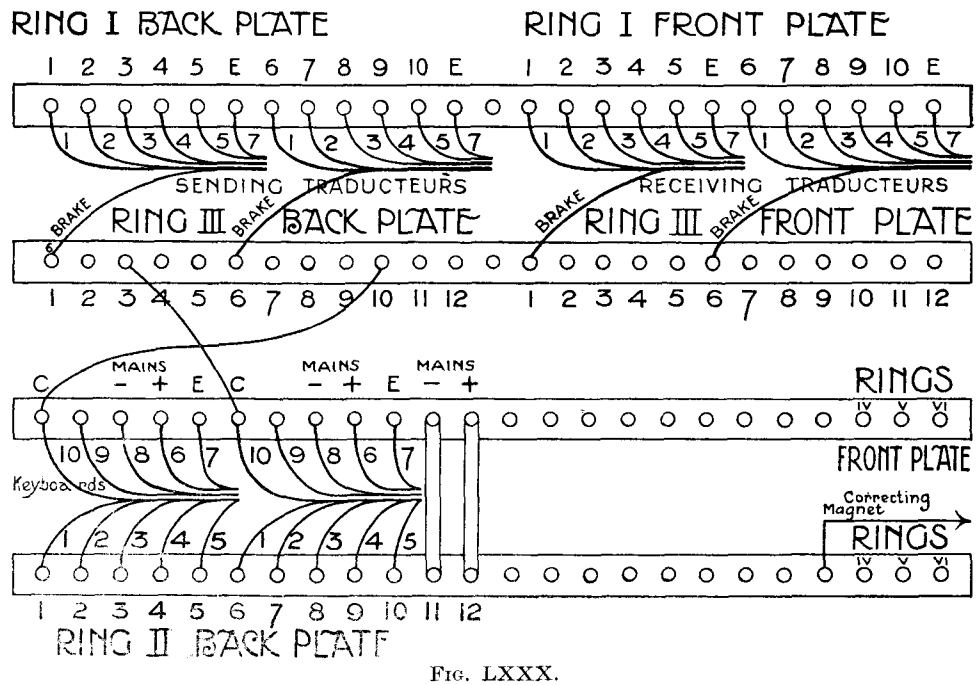


FIG. LXXX.

In turning to what may be said to be the more modern developments of Baudot, no difficulty should be found in following the means by which the Duplex system is applied to Baudot Multiplex telegraphy. In doing this, no simpler method is known to the writer than that diagrammatised by Lt.-Col. A. C. Booth, who, as is well known, was responsible for adapting the system in the British Isles.

Fig. LXXIX gives this very clearly. The distributor is of the double-plate type, a common axle running through each plate and carrying the respective brush carriers, the back plate A being devoted to transmission, and the front plate B to reception. In this plan the brake and cadence rings are not shown, only the essential receiving rings 4 and 1, and the transmitting rings 2 and 5, together with the local record or control rings 1 and 4, being represented.

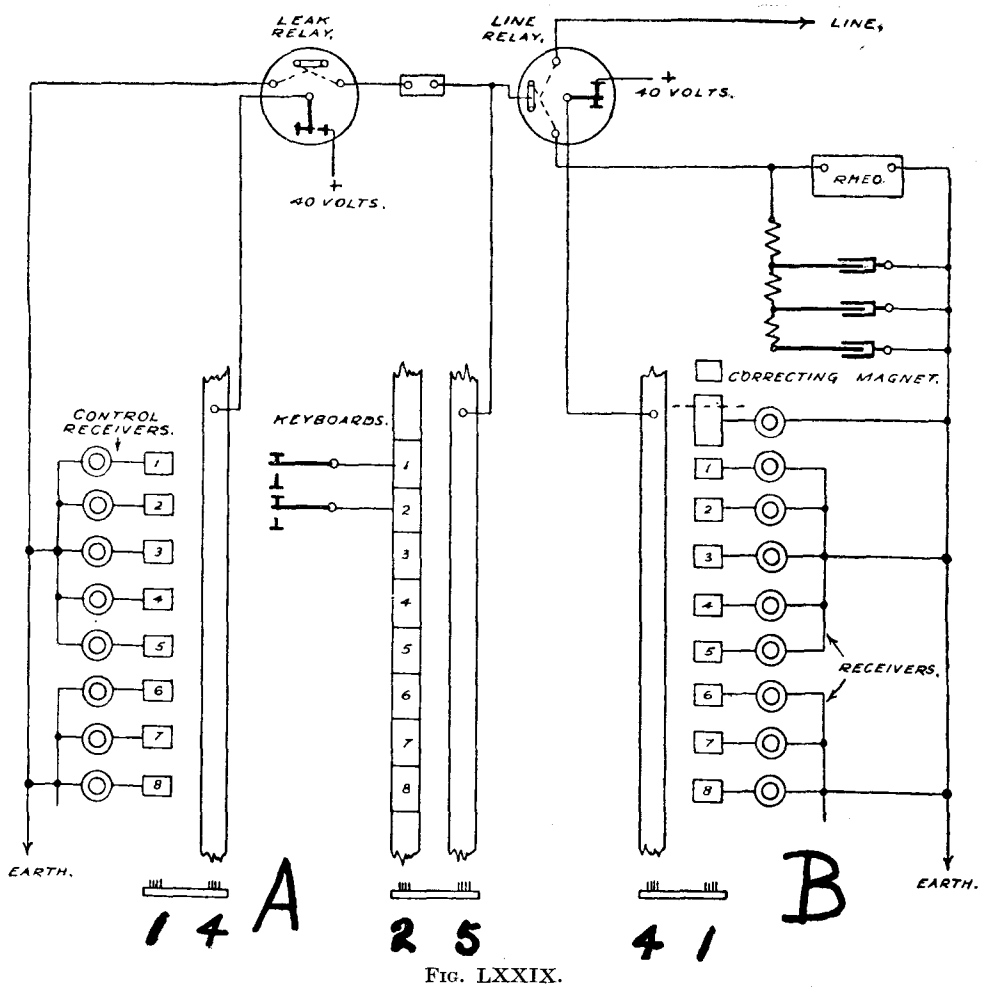


FIG. LXXIX.

The simplicity of the arrangement is striking. The Duplex system here chosen is the Differential, although Bridge is, of course, not excluded. Ring 5 Back Plate is joined direct to the split of the relay instead of to Line as in Simplex.

Taking the simplest form of Baudot Duplex, the Double, only 12 segments are required, 10 for the keys of two keyboards, and two for the correcting currents, as there is not need for making any allowance for propagation or retardation.

Similarly, a Triple Duplex Distributor would have 17 segments, a Quadruple Duplex 22 segments, and so on.

Fig. LXXX represents the connexion box, to which as in all Baudots, the various parts of the apparatus are joined. It consists of four wooden strips suitably enclosed. The connexions from the distributor plates, batteries, &c., are brought to the back of the respective strips and attached to metal plugs or screws, which pass through to the front of the strips. Here the relative connexions in their various cables are brought from the keyboard keys, cadences, brakes, &c., and are strapped on as desired. The connexion box here shown is that fitted for a *Double* Duplex Baudot. Rings 2 and 5 of the Front Plate are not in use.

(To be continued.)

RETIREMENT OF SIR WILLIAM NOBLE, ENGINEER-IN-CHIEF OF THE POST OFFICE.

ON the last day of May Sir William Noble retires from the chair of the Engineer-in-Chief at the G.P.O., and carries with him the best wishes of the whole engineering staff.

Beginning his official career in 1877 as a telegraphist in Aberdeen, he was not content to be a manipulator all his life. He acquired a proficient knowledge of Pitman's shorthand in a phenomenally short time, an art which has stood him in good stead. He also devoted his spare time to studying English, mathematics, the principles of electricity and magnetism and other kindred sciences. He won medals in both the ordinary and honours grades in the City and Guilds examinations in telegraphy and telephony, and was appointed lecturer in those subjects at Gordon's College, Aberdeen.

SIR WILLIAM NOBLE.

His success attracted attention throughout the service, and in 1893, after a short training in routine procedure in the Engineering Department in Edinburgh, he was appointed Engineer in charge of the Aberdeen section. Four years later he was promoted to a First-Class Engineership at Headquarters, and in 1900 he was appointed Second-Class Technical Officer. The Post Office had just about that time undertaken the task of installing a telephone system in London, and in 1901, Mr. Noble was selected to act as Assistant Superintending Engineer in the newly-created Central Metropolitan District. He had a large share in the work of the "telephoning of London," a big engineering undertaking, of the magnitude of which the general public has no real conception, and of which even the technical press had but vague notions at the time.

In 1905 he was recalled to Headquarters as First-Class Staff Engineer and placed in charge of the telegraph section, which included wireless telegraphs in those days, the operations of radio work having not then reached the magnitude and importance now attained. The comparative seclusion of a section at Headquarters did not act as a sedative to his energy. It was during this period that central battery working was introduced, an improvement which resulted in large savings in apparatus and battery materials. He also vigorously promoted the development of machine sending and printing telegraphy. In 1907 he returned to the London district as Superintending Engineer of the Central Area. After improving and consolidating the organisation of that district he recommended the amalgamation of the three London districts into one, in order to reduce the overhead charges and to simplify the transfer of the National Telephone Company's system and staff to State control. The recommendation was not accepted at the time, but after the transfer two districts were formed out of three, and eventually his original proposals were adopted and a single London Engineering District covering the entire area came into being.

During the years in which he held the post of Superintending Engineer, Sir William was called upon to serve on many departmental committees. For five years he was Chairman of the Factory Works Committee. He, in conjunction with Mr. Sinnott, was responsible for the present system of joint examination, which deals with the examination and repair of all apparatus used by the Department and which saves annually many thousand pounds worth of valuable plant and puts the recovered apparatus into sound revenue-earning condition on the most economical cost basis. He was a member of the Superintending Engineers' Committee, the Underground Railway Committee, and the Main Factories Committee, the last named having as its Chairman the then Assistant Postmaster-General, Captain Norton, now Lord Rathcreedan. Sir William was also one of the three members of an advisory board entrusted with the task of selecting men for promotion to engineering executive rank, and a member of the Selecting Committee for higher posts on the clerical side. Prior to the transfer of the National Telephone Company, he was appointed engineering representative on the Staff Transfer Committee, set up for the purpose of grading into existing Post Office classes the members of the Company's staff. All these special duties on staff work gave Sir William an excellent opportunity of becoming acquainted with a great number of the officers of all ranks, and the information was valuable in handling the staff and in the making of promotions.

In 1912 Sir William was appointed Assistant Engineer-in-Chief. The engineering staff by the transfer of the Company had increased threefold, and the new Assistant immediately set himself to organise the combined staffs into a homogeneous whole. His knowledge of the Company's men acquired during his close association with them in the London District and in his work on the Staff Transfer Committee was invaluable in this connexion, and the amalgamation of the two staffs was accomplished with the minimum of complaint on both sides. Owing to the financial position of the Company and their terms of tenure, the development of the country from a telephone point of view had fallen behind and there was a tremendous leeway to make up. The engineering department fully realised its responsibilities, and the next two years were years of great activity. New exchanges were installed everywhere, underground schemes were provided in almost every industrial centre, obsolete lines and plant had to be recovered, and a vast network of main underground trunks was planned and commenced. In spite of the complaints in the Press about a deterioration in the service, owing, it was said, to the dead hand of the State having been laid on a flourishing industry, the efficiency of the service improved steadily; the time of answering calls was gradually reduced, the number of false and interrupted connexions was diminished and the delay in trunk calls was being effectively eliminated. It is not too much to say that but for the war the telephone service in this country would by this time have been equal to the best in the world.

For his services in connexion with the Signals, R.E., during the War, the King of the Belgians recognised and honoured the subject of our sketch by creating him a Chevalier de l'Ordre de la Couronne for "constant and generous help" during the war.

In 1919 Sir William Slingo retired and was succeeded by Mr. Noble. The appointment was a popular one with the staff, who recognised in their new Chief a man, who, while he had the reputation of being a hard worker himself and looked for the same standard in others, was extremely fair. His services were recognised by the King in 1920 by the conferment of knighthood, an honour which came to him earlier than to any of his predecessors in office. The staff on that occasion acknowledged the honour by presenting Sir William with an illuminated address, signed personally by about 2,000 members from all over the country.

REVIEWS

"Marine Wireless Pocket Book." By W. H. Marchant. Published by Sir Isaac Pitman & Sons, Ltd. pp. vii.+180. Price 6s. net.

This is a book small enough to go easily into the pocket, but which contains in tabloid form practically everything which the ship's wireless operator ought to know. Primary and secondary batteries, generating plant, the various types of transmitting and receiving gear, manufactured by the Marconi Co., Radio Communication Co., and Telefunken, three-electrode valves, and the adjustment and testing of apparatus are all dealt with briefly, but in sufficient detail for the notes to be of great assistance as *aides memoires* to a man who has previously studied the subject, but who, perhaps is beginning to get somewhat rusty on certain points.

In addition, an explanation of the use of logarithms, tables of logarithms and trigonometrical functions, and notes on electrical units and symbols used in diagrams of connexion are given. The book concludes with the licensing regulations for W/T stations, and a collection of miscellaneous information useful to the wireless telegraphist.

It is well printed on good paper and strongly bound, and should prove useful as a handy book of reference for men who are compelled by the nature of their work to keep down to the absolute minimum the amount of baggage which they are able to take about with them.

"Model Questions and Answers on the Thermionic Valve." By Clifford Jones. Published by James Munro & Co., Glasgow. pp. 44.

The thermionic valve is the foundation stone on which all modern wireless telegraphy is based, and a knowledge of the principles of its action and of the various arrangements in which it is employed is essential for anyone connected in any way with practical wireless matters.

The small book under review is designed to provide elementary students, especially those working for the Postmaster-General's certificate, with the means of testing themselves, and of making sure that they really *know* their subject, instead of merely having a hazy idea that they have read a lot about it.

There are 160 questions covering the whole field in a simple and non-mathematical manner, and any student who conscientiously worked through them, and made sure that he understood the answers could be quite certain that he had a thorough grip of the principles of the subject and need not fear any questions with which he might be faced in his examination.

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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 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. VIII. JUNE, 1922. No. 87.

SIR WILLIAM NOBLE.

THERE is one characteristic of Scotsmen which is a source of unfailing delight to other nationalities. It is the delight which Scotsmen take in telling stories against themselves. Sir William Noble had this amiable weakness (or amiable strength) in an extreme degree. It is put in the first place here largely because it is significant of something more than the mere recounting of Scotch stories. The value of Scotch stories to civilisation is enormous, but in Sir William's case it indicated the value of a perspective which could see everything sympathetically, which could look from varying points of view, which was never bound by tradition or convention or habit of mind. He is a humanist in the strictest sense of the word, in that to him the worth of life is after all a human worth. Day by day he dealt with affairs which are mysteries to most of us, more mysterious than ever when put in the form of mathematical formulæ, perplexing even in the more or less plain language of scientific terms, but he never forgot for one moment the human values of all those whom he directed and led. He is gifted with an insight into character, with a measurement of particular capacities, which is a rare gift.

There is poetic romance in the idea of a man who has gone right through the service from the bottom to the top. Later ideas of the science of management have led to some controversy on this subject, and there are those who would say that a manager should be trained for management, for administration, from his youth up. This burning controversy need not be touched in this case, but it is wise for all that to protest against the false dichotomy which can only see the two cases, those who reach the top from below and those who are, so to speak, born into the purple. There are reasons to think that a third class does exist —those who have risen from below and possess qualities of leadership, of thought and of insight, which have been quickened and sharpened and broadened in the university of actual affairs. At least Sir William Noble's colleagues can say this of him that it is not merely because he has gone through the mill and reached the top that they have the highest respect for him, but because he has gone through the mill and reached the top and evinced the capacities and qualities which everyone regard as essential for him who holds the foremost place. He was proud of his department; he fought strenuously throughout on its behalf, and if in so doing he ran the risk of a few blows and some little opposition, these did not come from men who respected him the less. He gained the respect and gratitude of the staff for the defence which he put up from time to time of the telephone system, and he did this through a period of heavy pressure and constant occupation with various committees and conferences, in addition to his ordinary day-by-day work. To some of us having frames less virile and nerves more ready to tension, his physical capacities were a constant amazement; it was a part of a general adaptability which is given to but few of us.

In another place the fuller story of his life is given. This is an appreciation at the moment of his retirement. He drops out of the Service, let us say, at a fortunate moment. The winds of criticism are quieted and the storms of opposition have been stilled. He sees the Services, which have been so much to him in his long official career, becoming almost popular in the public eye. It may not be supposed that the sunshine and calm in which he leaves our vast enterprise will continue always. There are alternations of storm and calm in official life as difficult to explain as the changes of weather are to the meteorologist or the trade cycles to the economist. For him who lays down the office of Engineer-in-Chief we do not wish a calm and a quiet and a restful leisure. Sir William Noble could hardly tolerate anything but activity, anything but zest and, indeed, we might almost say, anything but conflict. Rumour has suggested that he chooses a career of angry controversy, of posters on the wall, of heckling, of violent recriminations. We who wait in the calm, the comparative calm, in which he has left us, wish him, in whatever new career he takes upon himself, the joy of human fellowship, the gladness of mutual helpfulness and a continuance of the sense of achievement which are his to-day. He has left a mark on our Service, and that is a proud thing. He has left a standard of fair dealing and a tradition of loyalty, which are precious things for all of us, and not the least to those of us who, though we have differed from him at times in the past, have always differed from him with the ready recognition of his unselfishness of motive and of his loftiness of aim.

WIRELESS BROADCASTING.

MANY references have appeared recently in the public press as regards the extent to which wireless facilities are used in the United States for broadcasting music and information of general interest to the community, and our readers are doubtless aware from the same sources that the number of amateur receiving sets in the United States is between 500,000 and 600,000 (some say a million) as compared with between 8,000 and 9,000 in this country. There is no doubt that America with its larger distances offers special scope for wireless distribution of information which would otherwise not be available in scattered districts; and there is also an opening in this country for a somewhat similar service, though possibly to a lesser extent.

Some of the American experts who have had experience of the results of broadcasting are of opinion that the future of the wireless services lies entirely in that direction, and that wireless as a means of individual communication between fixed points is in general a back number and is never likely to be a serious rival to the cable and land-line telegraphs and telephones. Without accepting this extreme view in its entirety, it seems to us that the wireless service is even now unrivalled as a means of simultaneously distributing matter to an unlimited number of stations. Those of us whose activities have been confined to line telegraphy or telephony can hardly realise at first that a wireless station, like that at Leafield, near Oxford, can send out a message on high power which can be and is picked up by any number of receiving stations near and far, and is characteristically addressed to C.Q. (all stations).

It is therefore of considerable interest to us to learn that after consulting the Imperial Communications Committee, the Government have accepted the view that a scheme of "broadcasting" by wireless should be adopted, and have agreed as an experiment to permit the firms manufacturing wireless equipments to broadcast musical instruction and entertaining matter for reception by the public by wireless telephony with a power of 1½ K.W. (valve input) from 5 p.m. until 11 p.m. on week-days (British legal time) and all day on Sundays at various centres throughout the country.

The manufacturing companies have received the news of this concession with enthusiasm, and small wonder, for they will no doubt glean additional kudos from the sale of additional receiving apparatus and the increased sales will lend a useful fillip to the trade. But by far the greater advantage will be reaped by those who, residing far from the madding crowd, have yet a lingering desire for music and the other light and harmless amusements of civilisation, a desire which they have not hitherto been able to satisfy. Just fancy! Any time and anywhere to be able to tune in on 400 metres and to hear Clara Butt or Harry Lauder, or to learn what weather we may expect to-morrow, or why yesterday's forecast was falsified! And it does not matter whether the snow is inches deep outside or whether it is blowing "great guns," the service functions just the same while each member of the audience enjoys the comfort of his own fireside.

HIC ET UBIQUE.

Mr. F. ADDEY, Assistant Inspector of Wireless Telegraphy at Headquarters, leaves at the beginning of this month to take charge of the high-power Post Office Wireless Station at Abu Zabal, Cairo. Our best wishes go with him. Mr. Addey is well known to our readers as the contributor of the series of articles on "Modern Wireless Telegraphy and Telephony," which is still running, and has acted in the capacity of reviewer for the *Journal* of works on radiotelegraphic and other technical subjects.

IMPORTANT telephone developments are projected during the current financial year. £9,500,000 is to be expended on these works, £2,230,000 on trunk lines, £3,500,000 on subscribers' and junction lines, and £2,250,000 on new exchanges and extensions to existing exchanges. The main underground London-Edinburgh trunk route will be completed by an extension from Leeds to Edinburgh *via* Darlington and Jedburgh, and that from Birmingham to Bristol by the Worcester-Bristol section. Amongst other important underground routes to be put in hand are the London-Southend, Manchester-Preston, Preston-Lancaster, Colchester-Ipswich, and Edinburgh-Kirkcaldy lines. Automatic exchanges are to be installed at Southampton, Gloucester, Swansea, Sheffield, Shrewsbury, Fleetwood, Dundee and Kirkcaldy. The developments of the London area include the establishment of new exchanges at Tottenham, Kilburn, Nunhead, Barnet, Eltham, Southall, Hounslow, Woodford, Wallington, Addiscombe and Thornton Heath, while a new exchange called Monument will be opened in Central London.

THE summary of written complaints for the month of March shows some results which would astonish the telephone-using public if they grasped their full import. The number of such complaints per 1,000 originating calls was: for the provinces 0.073 local, 0.069 trunk calls; for London 0.050 local, 0.084 trunk; Great Britain and Northern Ireland 0.063 local, 0.071 trunk. That is to say that in London one local call in 20,000 was the subject of a written complaint.

THE following is an extract from an article by Mr. Dudley Ward in the *Manchester Guardian* on "The Foreign Exchange Market in London," referring to the enormously increased use of the telephone and its influence on the market:—

It is perhaps this almost exclusive use of the telephone which is the chief characteristic of the London market in its present form, distinguishing it not only from pre-war practice, but also from most foreign centres, where exchange business is still carried out to a large, but perhaps decreasing extent, on the Bourse. Since the final abolition, at the end of 1920, of the meetings in the Royal Exchange the London market has no central meeting place, and dealers, in the course of business, never see each other in the flesh. The market is nothing more than a close network of telephones connecting up dealers and brokers, and spreading out further by telephone to the provinces and to the nearer Continental centres and by cable to all the rest of the world. The acceleration of business by this means is enormous. At any one moment London may be connected up with Paris and Brussels by 'phone, Paris with Zurich and Spain, Zurich again with Vienna, and Brussels with Amsterdam, Cologne and even with Berlin, so that the levelling up of rates with the whole Continent need be the work only of a few minutes. Cable business, particularly through London, has been accelerated to an almost equal extent, so that a wire may be sent out and an answer received from New York within eight minutes, an advantage which makes London the clearing-house for America's exchange business with the Continent.

Telephone Talk, published at Vancouver, B.C., states that the telephonic development of British Columbia is now 14.8 per 100 inhabitants. Canada as a whole is 10.4 per 100, and the United States 11.4. Unfortunately in quoting disparaging figures for Europe, some very stale statistics are apparently used. Great Britain is shown as having a development of 1.9 instead of 2.2., Holland as 1.8 instead of 2.4, Germany 2.3 instead of 3, Switzerland 3 instead of 4, Sweden 6.4 instead of 7, and Denmark 7.3 instead of 8.7.

"To what base uses, &c." The Queen of Sheba is synonymous with "the William Fox Love Spectacle," in the *Baltimore Sun*. The bill for the telephoning alone of the film, we are told, was 18,000 dollars. Fifty captains were stationed to direct the various squads of "mob," and soldiers under orders from headquarters. Twenty-five "trouble" men were patching and laying wires and instruments for two months, and eight operators worked at the exchange on the field. Perhaps not even the supernatural hosts which Solomon, according to the Koran, arrayed against her could have astonished the Queen more than the wonders of cinematography and telephony, and certainly nothing so much as an American film producer's ideas of oriental manners and morals.

A DISCUSSION with a "high postal official" on wireless developments gave a provincial journalist to understand "that there is a good prospect of the regulations being relaxed in favour of amateur senders, but their efforts will be restricted to a small power of wave-length. A length of 24 watts is suggested as being adequate, but it was pointed out to me that a power of this dimension has been known to reach Australia from this country, while on other occasions a wave-length of half-a-million watts has failed."

Such a champion mixer is lost in journalism; his sphere of activity is surely cocktails.

WOMEN IN THE CIVIL SERVICE*.

BY MISS L. M. HERRING (*Central Telegraph Office*).

IT is customary in these days to find that a considerable amount of time is spent on discussions concerning women—as they were—as they are—and (to the invariable confusion of all disputants)—as they should be. Therefore the title of this paper does not now excite comment. It appeals to all rational thinkers as a perfectly natural subject for discussion. This fact of itself must call for satisfaction from our feminists, because, while unquestionably many factors have contributed towards the building up of the present position, it is at least certain, that interest in the psychology and aspirations of women has achieved sufficient dimensions to ensure that the historians of the future will devote a measure of their time to a comprehensive survey of women's progress.

Students desirous of obtaining a true and complete picture of the women of past centuries have found very meagre mention in the old records upon which to base their conclusions. Extravagant, and even ludicrous appraisements have emanated from the poets and songsters of all ages, but while their art was to be admired, and often exquisite in its beauty, rarely can it be said that their pourtrayal of women has been convincing as a record of her in actuality.

The question under discussion—Women as Civil Servants—whilst seemingly very simple, and to outsiders perhaps, scarcely controversial—being to them a record merely of a *fait accompli*, is to those intimately concerned one that they regard—maybe hopefully—possibly despairingly, but of necessity, with a continually increasing interest.

In a book of to-day, one of those novels written with the aid of an unusually powerful imagination, and telling of altogether improbable feats in an utterly impossible world, the author gives his hero power to see into other men's minds, to know as though they were written all their thoughts. As a matter of interest, the hero could be expected to find such an occupation more exciting than the destiny ordinarily accorded him in a book of this type. Could this most useful power be extended to ordinary people like ourselves, the result would be amusing, astonishing and distinctly instructive.

Civil Servants are, in the main, a reserved class of people, preserving an outward calm and geniality, which a peep at their thoughts would show to be merely an exterior polish or covering assumed as a protection.

It is within the memory of many women, how elderly gentlemen and, curiously enough, even some elderly ladies, held up their hands in horror at the thought of the Woman Member of Parliament. Some possibly are still living who believe that the prestige of the House of Commons has suffered a blow from which it will never recover. But modern men and women find such ideas simply amusing. Yet it is probable that an exercise of that mind-reading power would show still surviving among certain heads of Departments a feeling of sadness and vague alarm at the sight of well-dressed and alert looking women preparing to assist in the work of their Departments. Such minds are very easy to read, and, such is often the inconsistency and waywardness of the male mind, that thoughts subtly change and maybe they are entirely forgotten and the once irreconcilables become sturdy supporters of the extended employment of women.

It would be still more interesting to look into the mind of the young male Civil Servant. His views would probably be contradictory. As a good brother he would like to see his sister in as comfortable and secure a job as his own, yet he would want to shut her out from competition with himself or his friends. One can almost see him in silent consternation at the thought of her possibly beating him in a competitive examination ! He would find too, that all sorts of little prejudices—legacies left him by by-gone generations—would prompt him to desire to choose what work women should do, and what should be reserved for him alone—he would be tempted to speak disparagingly of the work performed by women, and again, being on the whole an honest fair-minded boy, he would be vaguely discontented with such an attitude, and would probably conclude by putting the blame on women for "pushing in where they were not wanted," marrying one of them, and being very thankful that his female relatives were able to command positions which enabled them to be dependent only on themselves.

To women, the point of view is different ; years ago she had a more limited choice ; for her there was marriage, with its attendant advantages and disadvantages, celibacy without independence, and celibacy with an unenviable position as governess or domestic servant. Slowly she was forced by economic necessity, to press her way into other occupations, and to-day we find that women, having reached a permanent footing in the world of labour, are now of their own vigour and proud courage fighting their way to obtain recognition of the right to enter any occupation (with equal status) that exists or will exist in the future. The modern mother strives to equip her girls to battle through life for themselves, and this new spirit of independence in women is one of the most convincing proofs of the stamina, vitality and limitless possibilities of the human race.

To present an adequate account of the services already performed by women in the Civil Service is no easy task. The difficulties centre round the variety of work—necessitating a discrimination and explanation which perforce must be given at some length, and which involve the consideration of problems inseparable from the employment of women, not only in the Service but in all professions and industries. Methods of recruitment, rates of pay, and conditions of service, in so far as they differ from those applicable to men, can be considered in conjunction with the Departments concerned. It is manifestly impossible to describe in detail the work performed by all classes of women. A general survey, however, which shall be sufficiently comprehensive to convey a mind-picture indicative of the position women occupy to-day in the home Civil Service must be attempted.

Survey of Work Performed.

The names of leading women of to-day spring readily to mind. Miss M. Laurence, Established Officer at the Treasury, needs no introduction. Easily the chief woman officer in the Service she is known to many women through her activities on the National Whitley Council, where with Miss Buchanan, Lady Superintendent of the Savings Bank, she assists in its deliberations from the official standpoint. Miss Dixon, Assistant Secretary at the Board of Education, Miss Constance Smith, Deputy Chief Inspector (Home Office), Miss Durham, Chief Woman Officer in the Ministry of Labour, and Dr. Janet Campbell, Principal Woman Doctor in the Ministry of Health (not forgetting Dame Adelaide Anderson, Principal Lady Inspector of Factories, who retired last year), all have given a contribution of which women can well be proud. Almost all Government Departments now employ women ; investigation of their work presents some interesting features.

In the *Board of Education* the Pensions Sections is entirely staffed by women. The work is varied, responsible and complicated ; calculations of pensions for school teachers under the Superannuation Act of 1918, settlement of questions of Service and the keeping of records, all form part of the ordinary day's work.

The *Ministry of Health* employs about 80 women, whose work is of an executive nature, dealing with cases of unpaid contributions for Unemployment Insurance, regulations governing compliance with Health Insurance laws and any difficulties regarding benefits. There are also 17 women inspectors with salaries up to £400 per year, who perform, in taking their own cases in court, work approximating to that of a solicitor. There is one woman Insurance Commissioner in receipt of a salary of £1,000 per year—she is one of the few women in receipt of equal pay with the men of her class.

Prior to the Re-organisation Report of the National Whitley Council, women officers in the Ministry of Health were receiving the same pay as the male insurance officers, but in future the findings of the Report regarding pay as between the two sexes will be applied, with the result that new entrants will receive £20 less in yearly salary than was previously paid.

Reference must be made to the *Scottish Board of Health*. The Department, as it now exists, was formed by the amalgamation of the National Health Insurance and the Local Government Board. The latter was the much older and more conservative Department, and had been entirely staffed by men, any encroachment by the women on this domain being much resented. Now, however, women are working side by side with men in almost all branches. The policy of the Scottish Board is that the men and women should be interchangeable—women inspectors do exactly the same work as men—go down coal mines, visit public houses, &c., and the Woman Inspector for a District is in charge of men and women inspectors.

The *Ministry of Labour* employs a very large female staff. A visit to the offices situated at Kew would be of real interest to anyone keen on studying women's work. Acting Accountants, Assistant Accountants, Acting Examiners, Higher and Lower Clerical Officers, and Writing Assistants are occupied in work, ranging, for the higher ranks, from Certification of Claims to benefit and the keeping of the Insured Contributions accounts (with all of the necessary correspondence involved), to the compiling of statistics, &c., for those in the lower grade.

In the *Employment Exchange Service* of the Ministry, the work allotted to women is in connexion with women applicants for work and unemployment benefit. The salaries range from that for First Class Officers of £450 by £15 increments to £550, to that of Employment Clerks who receive a maximum salary of only £150. The work would be described as clerical and would include interviewing, registering and placing of applicants for work, interviewing employers and paying out benefit. A large temporary staff is at present employed, the duties of the established women being general supervision, investigation of fraud cases and the placating of irritable and dissatisfied applicants. There appears to be dissatisfaction amongst the established staff regarding their status. With one exception, that of the Great Marlboro Street Exchange, the exchange managership are allocated to men and the women feel that they are not getting their correct proportion of higher posts.

Work performed in the *Public Trustee* office has a special interest. The Public Trustee acts in numerous capacities—as Executor and Trustee of Wills, Administrator of Intestate Estates, Trustee and Co-trustee of old and new Settlements, Custodian Trustee, &c.,—much of the work is connected with legal and accountancy questions. Women clerical officers are employed in all departments.

Until recently, professional posts in the Legal and Accountants' section have been reserved almost entirely for qualified Solicitors and Accountants. It has been decided that men and women employed on accounting shall be given opportunities to qualify for the posts. One woman has already been given the rank of Second Grade Accountant.

Another *Departmental Class* which possesses particular claims on our attention is the *Home Office*. Women Inspectors were first employed in

* A paper read before the Post Office Telephone and Telegraph Society of London, on Feb. 27

1893, numbering about 30. The inspection of factories where women were employed was their chief business, but in August 1921, it was thought desirable that the Home Office staff should be interchangeable. The higher ranks comprise one Chief Inspector, two men Deputy Chief Inspectors, one woman Deputy Chief Inspector, and men and women Superintending Inspectors, also one woman Medical Inspector. The maximum salary of the woman Deputy Chief is £850 per year. A woman Superintending Inspector would be in charge of a division and in control of about twelve men and four women inspectors, with a clerical staff of both men and women. The work is very important, often highly technical and includes: the fencing of machinery, general inspection of factories and workshops, the administration of regulations dealing with dangerous trades and the administration of Truck and Factory Acts. Legal cases are, of course, frequent, and the women inspectors conduct their own prosecutions in court. They place a very high value on their work which, I am sure, could not by anyone be disputed.

Mention must also be made of the *Department of Scientific and Industrial* research, which will shortly become established. All the science women, who have been employed for some time temporarily, are to be retained and they are in receipt of the same pay as their male colleagues.

The *Foreign Office* has recently decided to employ women on account of the excellence of their work during the war period, and women in the service are keenly appreciative of the recent action of the *Colonial Office* in selecting two women to do research work in Africa.

It would be impossible to conclude a survey of women's work in the Service without allotting some space to the volume and importance of work performed by the *Post-Offices* classes, both clerical and manipulative.

In the Savings Bank Department the staff of women has, since the entry in 1875, under the control of Miss Constance Smith, first lady superintendant of a staff numbering only 65, increased by leaps and bounds. To-day there are over 2,000 clerical women, 380 sorting assistants, some writing assistants, and 21 typists. At one time the ledger branch was divided almost equally between men and women. In 1909 the women took the whole of the ledger work, handing over to the men certain other sections. Women have had complete charge of the warrant branch since 1916.

It is worthy of note that in all the Press criticisms against Government Departments, neither the Savings Bank or Money Order Department appear to have received particular attention, and a visit to either would possibly provide a partial explanation. The organisation of staff and work is extraordinarily efficient, and the administration can reasonably be proud of these two important Post Office sections.

The Money Order Department employs 2,000 women and about 70 men At one time a male department, it was handed over to women in 1898, the chief control being reserved to men. Postal Order, National Savings and Money Order business are dealt with the work is of a stereotyped kind, but needs care and accuracy. Much has been said in praise of the services rendered by the clerical staff—it would be unfair to omit some comment on the writing assistants' duties and those of the somewhat despised sorting assistant. It is undeniable that the simple clerical duties performed by writing assistants, for which they are paid a very inadequate wage, require neatness and exactitude, and in the case of sorting assistants, rapidity and accuracy are absolutely essential, otherwise the work of the whole department will suffer.

It remains to deal with the telegraph and telephone services. No one will deny their tremendous value and far-reaching importance. An account of the work performed by the telegraphist and telephonist will fittingly conclude a section devoted to a record of the work of women Civil Servants.

The Woman Telegraphist.

As with the male staff, the title "*telegraphist*" is only given to those working in the Central Telegraph Office in London. In the provinces they are called sorting clerks and telegraphists and in London district offices counter clerks and telegraphists.

The single title for the C.T.O. staff is used advisedly, because, with the exception of non-manipulative work relating to the office circulation of telegrams, only instrument duties are performed, and also, as the premier office of the country, greater concentration is accorded to the production of the telegraphist par excellence. Being the centre of the very intricate telegraph system of the whole of the United Kingdom, it is in the C.T.O. that the biggest variety of telegraph instruments is to be found, and where high-speed telegraphy has achieved its highest point of development. At one time the staff employed was mainly women; now the men largely outnumber them—a point which could well be borne in mind by those who are prone to criticise adversely the claim of the women for a more extended share of the work.

Prior to the war, women were employed principally on the Metropolitan work, circulation day work, and in one large provincial section. They were given the same training as men, with the addition of sorting and tracing practice for rapid distribution and location of telegrams, and, while a number of sections were staffed solely by men, the women were liable for duty in any part of the office, when placed on the spare and reserved lists.

During the war, the position became similar to that prevailing in outside industry—where formerly a few girls here and there were to be seen, there were now hundreds; even the cable room was invaded, for so long sacred to men only; and at one time over 80 women were giving excellent service on the lines to France, Italy and Holland, at a period, it should be remembered, when the more stable lines to the Continent were not available for other than military use. Since the war women have been retained on all instrument work, with the exception of that performed in the news and racing sections. The present arrangement appears satisfactory both from an administrative point of view and also to the women whom it enables to keep in touch with the whole of the operating that they can be called upon at any time to perform. The introduction of high-speed telegraphy has found the women easily adaptable and quick to learn new methods of signalling.

Technically, women in the C.T.O. have done well. Since 1906—on three separate occasions—the medal awarded by the City and Guilds of London for telegraphy, and competed for on equal terms by men and women throughout the country, has been won by a C.T.O. woman. There are several women in possession of honours certificates in telegraphy, magnetism, and electricity, and a fair number are in possession of First Class Technical Certificates. In 1912, women possessing the necessary technical qualifications were studying the intricacies of the Baudot installations, and in 1918 there were five women in charge of Continental Baudot sets; at the present time, there are six women on the list of Dirigeurs for inland working, and their example has been followed by women in Manchester, Edinburgh, Sheffield, and Norwich. It is probable that there are women in training in other offices, but it must be remembered that the facilities in provincial towns for acquiring the necessary knowledge are smaller and less easily accessible than for those resident in London. Testing of lines and the removal of instrument faults are also performed by women.

Counter Clerk and Telegraphist, Sorting Clerk and Telegraphist.

The provincial women and the London counter clerks would probably, and rightly, resent any suggestion that their work was less valuable than that of their colleagues in the C.T.O., and they would seek to state their case on the lines, that in addition to a knowledge of telegraph manipulation, they are required to familiarise themselves with duties performed in the sorting room and at the counter.

A counter clerk at a small Post Office arriving on duty at 8 a.m., would proceed to unlock the safe containing cash, postal orders, postage stamps, &c., and allocate them to various counter drawers. She would then finish off the previous day's accounts ready for the Postmaster, prepare daily requisitions for fresh supplies of postal orders and stamps, and the forms required for the day's use and she would also check the time at which messengers sign on duty. Her duty at the counter then commences, and when not engaged in serving the public, she will time and send out all telegrams, inspect the messenger's pouch each time he returns and make a note of the time on a sheet specially headed for that purpose. She will also assist when possible in the instrument room and sorting office. Concerning counter work, whether it be in a large or small office, she must be ready at any time to deal with any branch of Post Office business—necessitating at least a nodding acquaintance with practically every Post Office rule in existence. There are separate books of rules for Savings Bank, Money Orders, Parcels Post, Foreign Parcels Post, Telegrams, Foreign Telegrams, Express Post, Cash on Delivery System, &c., not forgetting the Post Office Guide. While it is impossible to know every rule, she must know where to find it, and possess enough general knowledge to be able to apply it. For instance, should a customer desire to send a letter by express post to St. Malo, the counter clerk would need to calculate quickly the business charges, which would include a 6*d.* fee for sending the letter to the local station, and 3*d.* stamp for postage, a 6*d.* stamp for the local express fee in St. Malo, 4*d.* in coppers for railway fee, 1*s.* for a telegram (addressed to Postmaster, Southampton, asking him to send a messenger to convey the letter to the St. Malo boat) and last of all, a charge of 6*d.* on the letter for the messenger's journey to the boat.

In addition to the sale of postage stamps, and stamped stationery, there are inland revenue stamps, which include those used for Marriage Licences, Bankruptcy, Judicature, Civil Service Examinations, Bills, together with papers and parchment stamped with different amounts used for drawing up legal documents. There will also be Life Insurance, and Annuity Business, work connected with the Savings Bank, Government Stock, Money Orders, Postal Orders, Pensions, National Savings Certificates, together with the sale of Licences for Dogs, Guns, Armorial Bearings, Motor Vehicles, Brewers and Male Servants. All licences must be prepared in duplicate, and a copy has to be sent weekly to the Customs and Excise Authorities. In connexion with all types of counter work, there are daily and regular returns to be furnished monthly, quarterly or yearly, and the sorting clerk and telegraphist at a small office has to prepare these in spare moments! Rule books must be kept corrected up-to-date. At the close of the day a daily balance has to be made.

Criticisms levelled against the woman counter clerk do not trouble her unduly; she takes a pride in the accurate and wholly efficient performance of her work, and would tell you that in spite of its exacting nature, and the sometime ungraciousness of members of the public, she occasionally finds compensation in an appreciation of humorous situations inseparable from her calling. She is expected to know everything about everything, the exact hour a letter posted now will be delivered in the Outer Hebrides—why a telegram handed in in Australia is delivered an hour before it started; and what will be the safest way to send £2 16*s.* 2½*d.* to my sister in Rhodesia!!! There is an interesting story of a well-to-do lady who received a telegram—the delivery copy of which was delivered from a Post Office in the West End. The receiving telegraphist possessed a somewhat unusual style of handwriting—hardly the orthodox Civil Service style, but good and perfectly legible. The lady complained that the writing was disgraceful and wound up her tirade by saying: "*why, it might have been one lady writing to another.*"

There are also customers who need special treatment, such as the Old Age Pensioner, the Child Depositor, and also the illiterate person, who, though shrewd enough in money matters is terrified at the thought of filling up any kind of document. Reference to the need for a working knowledge of the sortation of letters, and the preparation of mails must not be omitted from this almost too lengthy account of the duties of the counter clerk and sorting clerk and telegraphist. A good memory and a general knowledge of geography are required to deal with a circulation which varies at different hours of the day, and the rules governing surcharges as to what will or will not pass as printed matter. These regulations are very complicated, and it has been said that there are only two people in the Service who known exactly what they mean—and even these two cannot agree !!!

Telephone Operators.

Last, but not least, it must be borne in mind that telephone operating forms part of the daily round of duties allocated to the man or woman for whom the public show too little patience, and against whom has been levelled much unjustifiable criticism. But they are not alone as recipients of attacks from the Press and the public. Probably no section of the Post Office administration has been so severely censured as the telephone service, and a defence of the telephone girl could not be omitted from a paper purporting to deal with the work of women as Civil Servants.

Early in the agitation against the telephone service (as administered by the Post Office), a head-line of considerable interest to telephonists appeared in the daily papers. It stated that they were in receipt of wages amounting to £6 per week and commented on the generosity of a public department that spent the tax-payers' money in grossly over-paying a staff of girls who failed to give the said tax-payers the services considered to be their due. The amount quoted was, of course, incorrect—the highest paid telephone operator, even in the days before the 1921 drop in the War Bonus, received little more than £4 per week, and it is certain that not one of those responsible for the attack and the inaccuracy, would have been prepared to perform the exacting duties of a telephonist for that amount of money. It is fashionable to commiserate the public when discussing the telephone service, but those who have watched the work of an operator on a busy section are in no doubt on whom their sympathies fall.

To work directly with the public must always call for unlimited patience, concentration and tact—to perform such a service at the end of a telephone line, gives to some members of the public unlimited license for all kinds of wilful and unwitting misunderstandings. The telephonist in a large exchange usually occupies the same position along the exchange board from day to day, so that in time she is familiar with the normal requirements of her subscribers. She must enter the exchange with her instrument already adjusted and she is not allowed to move from her position until released by another operator. Many subscribers are quite ignorant of the fact that with others they form a group of persons all demanding at the same moment attention from the exchange operator, and they ascribe a few seconds delay—due to a period of pressure—to deliberate neglect. Tact and courtesy are constantly employed to keep them in good humour, and it may be that the regulation restricting the operator's powers of soothing to a few standard phrases is responsible for the irritability shown by many subscribers.

A group of eight positions is usually in the charge of an Assistant Supervisor—whose duty consists of rendering assistance in every way possible of supervising the general work of her girls, taking note of delinquencies and checking errors where necessary. Fortunately for the woman telephonist, there are certain clerical duties which she can occasionally perform.

Promotion prospects for the telegraphists and telephonists are to be found within their own class. Women telegraphists can proceed through Assistant Superintendents and Supervisors appointments to the position of Chief Supervisor carrying (in London) a maximum salary of £300 per year. Telephone operators, at the expiration of about 12 years' service, can become Supervisors, Class II, and eventually Supervisors in charge of exchanges at a salary of from £170 to £220 per year.

Women in the two grades can compete under the findings of a recent Post Office Departmental Whitley Report, for a limited percentage of vacancies in the clerical grade.

It is not possible to discuss the position of women in the Civil Service without touching upon some of the general problems affecting women wheresoever they may be employed.

Equal Opportunities.

For some years past women have been asking for equal opportunities with men, which without doubt, includes a claim for opportunity of service on the highest work the Civil Service has to offer—whether it be of a manipulative, clerical, executive or administrative character. They say, in effect—give us the human right to *choice* of occupation equally with men ; in doing so they do not ask for preferential treatment—the demand is for a common examination and they desire acceptance on merit alone.

Most women and men are anxious in this matter as in others, to arrive at a judgment both on the general and particular cases which will be fair to both sexes, and their difficulty or facility in reaching a conclusion must of necessity be coloured by their views on the whole position and status of women in the world's affairs.

The problem would seem to revolve itself into three pertinent considerations, which are : the interests of the community ; the woman ; the man. If these can be answered then you have the solution, but, even so, while the correct theoretical answer may be thus obtained, it must be admitted that its practical application may not be so simple.

It is not possible to state in detail the whole case ; such an attempt would not be proper to a paper written regarding one class of women worker only. Perhaps it is sufficient to state that, if the interests of the commnuity are of importance, the claim made by women regarding the value of their services in those departments where they are at present employed, must be given its due weight.

As long as 1881, Mr. Fawcett, then Postmaster-General, signified his confidence in the ability of women Civil Service clerks by staffing the new postal order branch entirely by women, and they still retain the whole of this work.

Sir Alex. King, in 1906, in his evidence before the Select Committee, on Post Office Servants, stated that the work handed over from the Second Division Clerks to the women clerks was performed equally well by the women as by the men.

In 1909, Mr. Sydney Buxton paid a tribute to the women's work in connexion with the Quarterly Returns of Licences sold by Postmasters, which had previously been done by the Inland Revenue—the work was carried out under great pressure of time, and personal messages of congratulation on the manner in which the work had been despatched were sent to the staff. One more pre-war quotation—Mr. Herbert Samuel in 1911, stated that at a meeting of County Council representatives a high compliment was paid to the efficient work done by the Accountant General's Department in connexion with local taxation licences, and he was pleased to discover that the work referred to had been carried out by the women clerks.

As we all know, during the war the praises of women were sung almost *ad nauseam*, and we find no evidence, even in these days of unpopularity of the Civil Service of any attack directed particularly against the *woman* Civil Servant. She suffers at the present time equally with her male colleague under a grossly unfair and unfounded charge of inefficiency.

Women are not seeking to obtain for themselves an *unfair* proportion of Civil Service appointments—they prefer the comradeship of men to a futile and inevitably harmful sex antagonism and rivalry, and in claiming freedom to give of their best they are only urging a human right which should be beneficial to all.

It is argued that as most men have dependents to support they should therefore by right be given the work which will give the highest monetary return. Against such an argument, the claim for economic independence now being urged by and on behalf of married women must be borne in mind. It would seem that the ultimate solution of the problem will be along the lines of such a principle, which is one which will probably also finally solve another vexed problem, that of equal pay for women doing equal work with men.

Equal Pay.

For many years an agitation for equal pay has been carried on. Groups of men and women, Associations and Trade Unions have, with few exceptions, recognised the claim, and pressure has been brought to bear upon the Government and upon employers in general. Up to date the progress has not been rapid. The non-acceptance of the findings of the War Cabinet Committee on women in industry aroused considerable indignation. Evidence was tendered for Civil Service women and special mention was made of their work in the Committee's Report.

Equal pay was recommended and Civil Service Officials could have, had they chosen, upheld the decision of this Government committee, when the question came before the National Whitley Council in 1919 and 1920. The opportunity arose on the setting up of a sub-committee to revise methods of recruitment and scales of pay for the clerical classes in the Civil Service. A good case was put up by the staff side, but the final report signed by every member of the committee, contained only a partial concession. Equal pay was conceded to girls up to the age of 22 years. The arguments on the official side centred round the marrying age for men ; the claim for senior women, a number of whom also have dependents, was ignored. But it must be admitted that the question is by no means easy of solution. All would agree that equal value in work should receive equal remuneration in return, and that no employer is entitled to benefit by the economic necessities of those employed.

At the same time it must not be forgotten that the wages of men have been laboriously built up through many generations, and undoubtedly, a determining factor in the rates paid at every stage in industrial history has been the function of men as bread-winners. For this reason, the way of solution seems to point inevitably towards a drastic change in the economic position of those women who are engaged on the important work of home-making and child-rearing.

Such a change does not, however, appear to be within the range of immediate application, and in the meantime women in the Civil Service and elsewhere are subtly reproached for accepting lower rates of pay, a stigma which a study of the early history of women's entry into the labour market and a consideration of the many points involved is not altogether a fair one. It is even suggested that women ought to refuse to perform the highest duties of their class, and should not endeavour to prove their ability to perform any work but the lowest of the grade concerned, until the equal pay claim is conceded to the full. The effect of such a sacrifice on the part of women would be to *lower* even their present status, the harmful effects of which would be felt not only by themselves but by the Service as a whole, and in any case would not solve the question at issue or appreciably help towards that end.

Status.

When women speak of their status it will be found that they are concerned rather with the position occupied by their sex than with that of individuals, and in this sense it is important to bear in mind, in determining its quality, the important relation which to most people's minds, salary bears towards it. Apart from the ethical side of the equal pay question, there

are women who attach more value to status than to an increase of salary, badly though that may be needed and, in so far as such an attitude is the outcome of sex-pride, a desire that women should prove themselves able it is utterly praiseworthy. But, however that may be, the fact remains that Government Departments are not free from the tendency to judge the status of men and women in similar proportions to their differing rates of pay, with a consequent variation in the degree of authority relegated to them.

In this connexion, it is desirable to study the committees of enquiry and wage settlements that have made recommendations during recent times; to incorporate in my paper an investigation of such magnitude is not possible. It must suffice to discuss briefly the Report issued by the Civil Service National Whitley Council on the re-organisation of the clerical classes. Important though the findings of previous committees have been, it is probable that this Report transcends them all in so far as it affects the recruitment, pay and conditions of service for women.

Re-organisation Report. National Whitley Council.

That parliamentary activities were immediately set up by the women's societies in order to press the claims that were only partially met in the report speaks eloquently of the disappointment felt by many Civil Service women. These women were not alone in their apprehensions—other sections of women workers—notably teachers and head-mistresses viewed its recommendations with grave concern, believing that not only were they themselves indirectly affected, but that the future careers of the girls of whose educations they had charge would also suffer.

Section III of the Report is entitled "The Recruitment and Status of Women in the Civil Service." It declares that "The status and authority of women shall be identical with that accorded to men in parallel classes," that the "minimum of the basic scale of pay in each class should be the same for women as for men," and that it is the Committee's earnest desire "to ensure that the opportunities afforded to women of proving their fitness to discharge the highest administrative duties of the Civil Service shall be full and liberal."

The reading of this section would at first sight appear to contain matter for encouragement and hope, but its application has given rise to much bitterness and disappointment.

That the members of the Committee made a strong and honest attempt to solve the problems which faced them is not disputed, neither is it contended that no progress has been made towards meeting the aspirations of the women—maybe the opposition encountered and the difficulties confronting the Committee have not been sufficiently appreciated.

The acceptance of the principle of equal pay up to the age of 22 years, while being admittedly a step towards its final achievement, cannot but give rise to discontent. It introduced a differentiation on the grounds of responsibilities, yet it is not prepared to treat the bachelor woman on a level with a bachelor man; neither does the report recommend equality as regards the married man with dependents and the single woman with dependents. It is also the opinion of many women that the restriction of equality of pay to the earlier increments, almost nullifies the agreement laid down in the initial part of the report that the status and authority of men and women shall be equal.

This report reduced the number of administrative and clerical classes in the Civil Service to four, to be called administrative, executive, clerical and writing assistant classes, and the injury to the position of women in the re-arrangement of work lies in the extension of the class of writing assistants, and in the methods of recruitment for the higher class. Whereas, for men, the recruitment for administrative posts will be by open competition and promotion from the lower grade, the women will be recruited by a selective process. There are many general objections to the latter method, but the real insult to women consists in the implied lack of suitable candidates through the ordinary channels, with the additional objection that a loop-hole is thus left to the department at the end of the experimental period authorised in the report to assert that equality of work has not been fully proven because the methods of recruitment for the two sexes were not identical.

In discussions on the report since its publication little comment is made regarding the fourth class to which is designated all work of a simple and routine character, and it is here that women have cause for ascribing much of Section III quoted above as being mere lip service to principles which, to women, mean so much.

Writing assistants' positions are to be recruited locally, are not open to men, and carry a maximum rate of pay of 36*s.* per week. It constitutes an attempt to saddle the women with *all* routine work required in the Service, with the obvious consequence that the future fight on their part for a just share of the *higher* posts and more interesting work will be badly handicapped. Local recruitment ensures that the service shall be cheap. Girls are to be discouraged from the exercise of a proper spirit of independence, being expected to live with their parents and to pay for their board and lodging a far smaller amount than they would be called upon to pay elsewhere.

It has been alleged that some sections represented on the staff side of the Whitley Council were little inclined to fight the proposition for the perpetuation and extension of this class because they were anxious to increase the importance of their work by eliminating all which was of a purely mechanical character. If this be true, it is a matter for regret that so little regard for the future position of women was shown.

Supervising Positions for Women.

As has already been indicated there is in evidence a reluctance to place women in positions of authority. In sections where women are in the main new entrants, the monopoly by men of the positions of control calls for little comment—the necessary adjustments to meet the claims of the women will, it is anticipated, be made in due course, but where, as in the case of the London Telephone Service, the bulk of the staff are women, it appears unjust that the higher controlling positions shall be reserved for men.

It may be interesting in this connexion to give some thought to a comparison of the qualifications of men and women for work of a supervisory character, but it is necessary, if a true criticism is to be made, that there shall be eliminated any prejudice against women as women, and any antagonism against men as men.

To possess a thorough knowledge of the work—to understand the staff—to be alert and tactful and able to apply rules and regulations without undue rigidity—these are a few of the qualifications required for successful supervision. Women, when given an opportunity, show considerable powers of organising and they have a highly-developed sense of the effectiveness of order and method in the general arrangements of work. Responsibility usually finds them keen to understand thoroughly the work placed under their control, and concentration on the smallest details amounts with them almost to a fault. Then there is the quality of tact in general management and in questions of discipline. Women have been accused of petty rigidity and narrowness of vision; if the condemnation were ever true it is necessary to discover the cause, and therefore to look back into history for evidence of training which would produce such faults.

In entering new spheres of action, women brought with them the traditions of centuries of repression, with the obvious tendency to cling tenaciously for safety to literal interpretations of instructions given merely for guidance, and to be timid of stepping outside well-defined paths. Domestic traditions also taught them to be painfully conscientious and often intense devotion to a high code of conduct led them to try to exact rigidly from those under their control an attention to the ordinary tasks of the day which were beyond the power of common-place human nature to reach. And so, unconsciously, the woman controlling officials may have made for themselves a reputation which, while being excellent from the point of view of output, was of such a nature as temporarily to hide a genuine kindliness which without doubt most of them possessed.

But women learn very quickly, and the faults of which their predecessors were accused have been found capable of modification in such a way as to make their present value in the capacities of supervising officials of a quite high order, and it can, with truth, be claimed that women of to-day reflect the greater freedom accorded to them, notably in their attitude towards their work and their staff.

Supervision of Men by Women.

Women are in many departments pleading for an extension of their powers. They claim the right to compete for more and higher appointments, involving if necessary the supervision of both sexes, always providing that they prove their fitness. One of their handicaps is the traditional opposition of men to supervision by women. A hopeful sign, however, is the fact that its strongest expression is to be found amongst the lower ranks of the Service. There are instances of men in higher positions who find no indignity in having for their chief a woman of proved ability, who has won her position fairly by merit. An interesting story appeared in the February issue of *Opportunity*, the organ of the Federation of Women Civil Servants, is worth recording:

"In a certain department, it was desired to employ temporary men clerks on work which was in charge of a permanent woman, but the authorities were so imbued with the tradition that men will not work under women that they established a Grade 1, temporary clerk in charge of the other temporary men as an intermediary. One day, when he was giving instructions to one of his subordinates, the latter said 'Look here, you jolly well clear off. What do you think you are, anyway? Miss G—— is in charge of this room, and I'll take my instructions from her, and from no one else!"

While in this question, as in others, there are difficulties in the way of practical application, and in the absence of a common establishment list, perhaps legitimate grievances for senior men, the generally accepted principles incorporated in the Sex Disqualification (removal) Act, should preclude the necessity for an exposition of the women's claim.

(To be continued,)

TELEPHONE CHARGES.

THE principal revisions of telephone charges which will become operative on July 1 next are—

(1) Reduction of 7*s.* 6*d.* per quarter or (£1 10*s.*) per annum in the rental for residence connexions for the first line, and 5*s.* per quarter for auxiliary lines to private houses.

(2) Reduction of 7*s.* 6*d.* per quarter in the rental of two-party line residence connexions.

(3) Reduction of the charge per mile for extra mileage of exchange lines from £10 to £8.

(4) Reduction of the charge for local calls from 1½*d.* to 1¼*d.* and for calls from 5 to 7½ miles from 3*d.* to 2½*d.*

Trunk line charges for distances above 35 miles will be reduced by 1½*d.* a call between 7 a.m. and 2 p.m., and between 7 p.m. and 7 a.m. Reduced charges for calls between 2 p.m. and 7 p.m. will come into force. For example, 3 minutes' calls for a distance of 35 miles can be obtained for 10*d.*; 50 miles for 1*s.* 1*d.*, 100 for 2*s.*, 200 miles for 3*s.* 6*d.*, 300 miles for 5*s.*, and 400 miles for 6*s.* 6*d.*

LONDON ENGINEERING DISTRICT NOTES.

Institution of Post Office Engineers.

THE Annual General Meeting of the above Institution was held on Tuesday, May 9. The Annual Meeting is always an event, as the Council under the Chairmanship of the Engineer-in-Chief reports progress. On this occasion the Secretary was able to announce that the financial difficulties brought about by the War are rapidly disappearing and that the future is a bright one. London members were pleased to be informed that the Chairman and Vice-Chairman of the London centre for the next session are to be Mr. McIlroy and Mr. H. Wilson, respectively.

After the business of the evening had been completed, Mr. P. T. Wood was called upon to read his paper on "A Year's Work in a London Engineering Section." The majority of papers read before the Institution are of a highly technical character, but it is recognised that the Institution has a two-fold duty to its members. Firstly, to keep them informed of the latest development of the art, and secondly, to give due meed of attention to the executive side of the business. The rapidity with which one speaker followed another during the very interesting discussion that followed was a very clear indication of the interest taken by the audience in the subject chosen by Mr. Wood for his paper. It is possible that in some quarters the opinion is held that work in a section is merely a matter of conforming to regulations, and that there is no scope for the exercise of technical ability or power of organisation. This is very far from the truth as was made abundantly clear by Mr. Wood. The gradual process of devolution that is going on makes the powers and responsibilities of Sectional Engineers progressively greater. Mr. Wood, who dealt with the work in the whole of the Centre Section, both internal and external, was able to report that the development work is so forward that there is not a single demand for service that cannot be met at short notice. To Mr. J. Brown, the External Engineer, and his staff must be awarded much of the credit for this satisfactory state of affairs. It is impossible in these notes to mention all the interesting points dwelt on by Mr. Wood, but it was noticed that one subject referred to evidently touched a responsive note in the minds of his audience. This was the little value which is apparently attached by the authorities to titles in the Engineering Department.

Youths who have reached the age of 21 are graded as Labourers, or when a vacancy occurs as a Skilled Workman. In Mr. Wood's own words—"to an ambitious youth who has possibly had a secondary education, the title is not one that can carry self-respect with it, and on this account is to be deprecated. I would suggest that a new title be found for these young men awaiting promotion. A young aspirant to the post of Traffic Superintendent by the time he is 21 can be pretty sure of possessing the proud title of Traffic Superintendent, Class III, and though I should not call an Assistant Fitter an Engineer, Class 7, I would do what I could to raise his self-respect by a title other than labourer. It is also a matter of interest to note that Traffic officers responsible for an area equal to a section sign their letters as District Superintendent, whereas the lesser title of Sectional Engineer is allotted to a post of greater importance and with wider responsibilities."

After the meeting the writer of these notes crossed the Embankment to catch a tram and noticed a man whose duty it is to pull a lever at intervals to divert certain trams on to a branch line. Remembering Mr. Wood's words it occurred to him that this man, who is probably graded as an L.C.C. labourer, would be much prouder of his job and would perform it with much greater vim if he were given the title of "Traffic Controller," even if for staff record purposes, it were followed by the words "Class X."

Exchange Works.

The new temporary exchange in the Kilburn area, which is known as "Maida Vale," and which will give relief to Paddington, is progressing rapidly. The internal and external staffs are vieing with each other to complete their portion of the work first. There is a very good prospect of the exchange being opened during August. The premises were formerly used as a Fire Brigade station, and required only minor structural alterations for the purpose of temporary exchange premises. The permanent exchange will be erected on the same site and at the rear of the existing building, which will ultimately be used as operators' quarters and offices.

Telegraph and Telephone Society's End of Session Meeting.

It is not often one is so fortunate as to listen to such an interesting and instructive lecture as that given by Mr. A. B. Hart, Assistant Staff Engineer, Engineer-in-Chief's Office, on Monday, April 24. The subject was "High Frequency Carrier Current Transmission in Telegraphy and Telephony."

There is so much misconception regarding how a lecture should be given that special reference must be made to the fact that Mr. Hart is a lecturer par excellence, and others who aspire to impart information to either a technical or non-technical audience might study his methods with advantage. Unfortunately the time available for Mr. Hart's lecture was limited by the fact that the business of the Annual General Meeting had to be conducted first. The first portion of the lecture was devoted to the historical aspect of the subject both within and without the Post Office. In this connexion, the valuable work performed by General O'Squier of America was mentioned. The lecturer then went on to describe the underlying principles and fundamental circuits of the system in its present day form. The impetus given to research in this field by the invention of the three electrode thermionic valve was made clear, and a very lucid explanation of how a valve acts as a high-frequency generator was given. The method of modulating the carrier course was explained, but the reverse process of demodulation was not reached, owing to the time limit.

Mr. Hart explained the uses so far made of the system in this country, and made some guarded prophecies as to its possible development. The rival merits of various names for the system were touched on during the discussion. The lecturer claimed that such expressions as "wired wireless" and "line radio" were unsuitable because they convey a wrong conception of what actually takes place. He claimed that the system is correctly described by the title under which the lecture was advertised and as given above. The meeting was graced by the presence of Colonel Sir A. Ogilvie, who opened the discussion.

Thrust Boring.

Readers of these notes will remember reference being made to the method adopted for laying cables beneath the Channelsea River at Stratford for feeding the new Maryland Exchange. A deep pit was sunk on each side of the river and 9 holes to take iron pipes were made by the Mangnall Irving Thrust-Borer System. Cables were subsequently drawn through the pipes. The arrangements have proved quite satisfactory despite the fact that the cables are partly submerged in water. Those desirous of knowing more about this interesting process are referred to a descriptive article in the *Electrical Review* for April 21. The process is being used in connexion with cable laying under roads without having to disturb the surface, which is generally an expensive operation, especially when one of the modern methods of road making such as the use of reinforced concrete has been adopted.

The process possesses great possibilities and will be watched by telephone engineers with interest.

Telephone Construction in the Wild West.

No one disputes that benefit is derived through transferring one's body from its usual environment to some pleasant strand where *dolce far niente* can be indulged in. It is equally beneficial at times to let one's mind wander to fields afar, even though there may be a link between the subject under consideration and one's daily work. In the tight little island on which we live our operations are perforce apt to be condensed and concentrated, and it is refreshing to read of the entirely different conditions which are encountered in providing telephone lines a distance of 5,600 miles across every conceivable class of territory, including blazing deserts, flooded valleys, and snow-capped mountains. In an interesting article headed "Conquest of No Man's Land," in the October number of *Telephone Engineer*, the romance of the work involved in linking up New York with the island of Catalina in the Pacific Ocean is described in glowing colours. The most interesting portion of the story deals with construction work in the "Lean" Region, between the Pacific Coast and the Western States, comprising an area of more than one-fifth of that of the entire United States. In parts neither horse nor mule is of any use, as only the Mexican donkey and the native Mexican can find sustenance on the wastes. The difficulties of transporting line stores under such conditions can be imagined. In one part the thermometer frequently registers 120° in the shade. Special precautions are necessary in crossing sun-baked stretches, which, at intervals, of some years possibly, are converted into raging torrents.

A lineman's "length" for maintenance averages 2,000 miles, and the average fault duration is 7 hours. Those who saw the Western Electric Co 's films dealing with the thermionic valve and its applications, will remember seeing a call put through between New York and San Francisco, and the line creep across the map. After reading the article referred to above, one gets a better understanding of what is involved in constructing and maintaining such a 'ine and its extension across No Man's Land.

Municipal Engineering has been taking architects to task for not making adequate provision in buildings for the accommodation of electrical services. This has been a sore point with P.O. engineers for a long time, but there has been a distinct improvement during the last few years. Telephone services and electric light services are required in practically every room in the larger buildings erected for business purposes, and it goes without saying that it is cheaper and more satisfactory to provide the necessary channels for them while constructing the fabric rather than to have to cut away afterwards. Any new building in course of erection is soon spotted either by the contract staff or the local engineer, and immediate steps are taken to get in touch with the architect or builder so that any omission may be rectified before things have gone too far.

Benevolent Society.

The fourteenth Annual General Meeting of the London Engineering District Benevolent Society was held on Tuesday, May 2, when the Superintending Engineer presided and expressed his pleasure at having been elected President of a Society, which had for its object the rendering of assistance to comrades who had been subjected to misfortune through no fault of their own.

Mr. E. Slattery, the Hon. Secretary and Treasurer, presented the Annual Report and Balance Sheet. The total membership is now 1,820, and, notwithstanding the fact that the subscription has been reduced to one penny per week, the total grants to necessitous cases amounted to £213 in sums varying from £1 to £10. A donation of £60 was made to the Hospital Saturday Fund, and the balance in hand was further increased.

During the year no less than 184 hospital letters were obtained for subscribers to the fund, and it is difficult to estimate the benefit which the members have received from the special treatment in hospitals and convalescent homes as well as from the supply of surgical appliances.

Although the membership is large, it is hoped that there will be a further accession of strength during the year. Subscribers have the double satisfaction of knowing that if they fall upon evil days they can accept assistance without any loss of self-respect and on the other hand if they are fortunate enough to escape the need of help, they know that they are providing a veritable life-buoy to colleagues who would otherwise be in imminent danger of being drowned in the sea of debt owing to heavy and unexpected expense due to prolonged sickness or other similar calamity.

LONDON TELEPHONE SERVICE NOTES.

After Hours.—Another Aspect.

IN last month's notes the service aspect of "after hours" was briefly remarked upon, but readers of these columns have been made abundantly aware of the social side of the staff's activities when the day's task is over. With so many exchanges and offices spread over the face of Greater London, large numbers of the staff must of necessity remain strangers to each other except perhaps in name. In view of the number of young people engaged in assisting London to telephone, it is inevitable that recreations of the collective variety are arranged in various centres and it is on these occasions that we have the opportunity of sharing the company of our colleagues.

These are the occasions when we see each other in a new light. The shackles of discipline are thrown aside for a while and everyone meets on equal terms.

The season for indoor recreations has just closed and the Committees responsible for organising choral and orchestral societies, dances, whist drives, bazaars and the like have, with one exception mentioned below, earned a well-deserved rest. Their places have been filled for the summer months by enthusiasts in sport, and lunch time chatter now savours of cricket, tennis, launch trips, swimming galas and so on. The compilers of these notes will be glad to have particulars of interesting sporting and social events, and, if there is room, for visitors from other exchanges and offices, a preliminary announcement in these notes may be worth while.

Apart from the activities enumerated above, mention should be made of those who either by inclination, age or unfitness for violent exercise devote their spare time to civic activities or on behalf of benevolent institutions. Their colleagues do not come into such close touch with their efforts as with others, but since their "after hours" are given up to serving a larger constituency, great credit must reflect upon the staff generally from having them in their midst.

L.C.C. Lecture Courses.

Consideration has been given recently in the London Telephone Service to the adoption of the City Literary Evening scheme of lecture courses, and it has been taken up enthusiastically by the staff. Lectures in six subjects have been arranged commencing on April 24, 1922, and continuing until July 14, 1922.

The number of students enrolled in the L.T.S. totals 208, and the various subjects selected showing the number of students attending each subject are detailed below :—

Economics	34
Art Appreciation	51
Elocution	65
English Literature	69
Psychology	58
French Literature	27
	304

Post Office Sanatorium Society. L.T.S. Committee.

Following on the recent appeal for funds for recreation purposes at Benenden Sanatorium, several members of the staff have suggested sending used magazines or books to Sanatoria for the use of patients.

It has been ascertained that these would be appreciated and the L.T.C. Committee would be grateful if anyone who has magazines or books in good condition, and can spare time for this purpose, would forward them to the Registry, L.T.S., 144a, Queen Victoria Street, from where their distribution would be arranged. It is possible that exchange libraries may have books, which could be spared periodically, and such contributions would be very welcome.

Culled from the Exchanges.

Central Exchange.

The Eldorado Swimming Club are holding their second Annual Gala at the Pitfield Street Baths, Hoxton, on Friday, July 28, at 7 p.m., when many interesting events will be decided. There will be a Ladies' Invitation Team Race, which promises to provide an exciting contest, and also a L.T.S. Open Handicap. The Honorary Secretary, Miss C. C. Curtis, will be glad to receive entries for the latter event not later than June 28.

City Exchange.

It will be remembered that when the City traffic district held their annual dance last season, many of the staff and their friends were disappointed owing to the demand for tickets exceeding the accommodation. Taking time by the forelock the Committee are glad to announce that they have been able to secure the Royal Horticultural Hall for Saturday, Nov. 4. An energetic Committee have sworn to make the affair the event of the season, and advise all who have been left out in the cold on previous occasions to make a note of the date now. Tickets will be obtainable from any member of the Trunks, Central, City and Toll Exchanges.

Regent Exchange.

Have you ever experienced the extreme pleasure of watching people thoroughly enjoy themselves, knowing that you have helped them to their happiness? If so, you will realise some of the delight of Regent when they gave their Gifford House protéges a very special treat on April 29. It happened this way. At the end of last season, the Committee of the Social Club found that they had £8 11*s.* 0*d.* in hand, so the Chairman—who, by-the-way, is Mr. Buckeridge—handed it over to the Gifford House Committee with the idea of so swelling the finances of the latter that they should be able to give the men a real gala day. It was a project very much after the benevolent hearts of Regentites, and everybody entered into it with a will. Extra donations were given by the girls. Pantries were raided to provide good things and mothers were persuaded to devote some of their valuable time to making cakes, tarts, &c. Meanwhile, the Committee had been busy with the actual plans for the day. Chars-a-banc were hired to carry the men from and back to Gifford House, Roehampton (Queen Alexandra's Hospital). Seats were booked for "Rockets" at the Palladium, and a real sumptuous spread was provided for the men after the show in the dining room of the exchange. Forty-seven guests arrived from Roehampton, and the girls divided themselves into two parties. One contingent awaited the boys at the Palladium and the others—real martyrs—stayed at the exchange and transformed the dining room into a banqueting hall ready for the arrival of the guests.

Judging by the ecstatic laughter of the men, "Rockets" must be a Revue of Revues. Also, judging by the fast disappearing dainties, the tea was hugely appreciated. There was much laughter round the flower-decked tables, and it was a difficult matter to recognise the sober old dining room, where daily, bands of business-like girls, hastily take their meals. One of the men gave a speech of thanks and then—long after they should have done so—the chars-a-banc departed with crowds of merry invalids, whose pockets were bulging with cakes which the girls had insisted the men should take for supper. Now the Committee have in their possession a delightful letter from a charming lady—the Matron at Gifford House. The wording generously testifies to the success of the day, and the sincere thanks and immense appreciation of the men for the unfailing generosity and the thoughtful attentions of their Regent friends.

"The Sinner."

I met a maiden wandering all sadly and alone,
It seemed as if a deep despair had claimed her for its own;
Perplexed, I asked "What do you here? Why so disconsolate?"
She answered me in cryptic words, all sorrowing her tone,—
"I have been late."

"Dear goodness," in amaze I cried, "Why make you all this fuss?
"'Tis surely not a matter that should set you grieving thus;
Now stay your tears, and smile again; the crime is not so great.
"You do not understand," she said, "Grim laws are made for us,—
And I've been late."

I knew her for a maiden who behaved in all things well,
In tact and discipline she soared, in wit she did excel;
She'd no excessive sick leave—right well did operate,
Why, therefore, should she murmur like the sounding of a knell,—
"I have been late."

"Oh pay back all the time you owe," I soothing, counselled her,
And let it rest." She wanly smiled and answered me, "Kind Sir,
I've paid it back, yet it shall not suffice to expiate,
My punishment for ever stays, 'tis useless to demur,—
I have been late."

"Then promise that for evermore, you'll early be," I urged,
"I've promised, and I always am," her tones indignant surged.
"But the past is not allowed to rest. Go, leave me to my fate,
For though my soul in penitence from every sin be purged,—
I *have been* late."

DOROTHY TURNER.

MR. G. NOBLE PARTRIDGE.

THE news of Mr. G. N. Partridge's death on May 5 last will be regretfully received by his many friends. After only a week's illness he died from an attack of pneumonia, but there is no doubt that his constitution had been undermined by sand-fly fever and malaria contracted during his army service out East.

Born on May 11, 1872, Mr. Partridge was educated at The High School, Nottingham, and entered the Post Office Service as a telegraphist in 1889, transferring as Junior Clerk to the Engineering Department at Nottingham in 1891. He was promoted to Second Class Engineer in the Scotland East District in 1898, and was transferred as First Class Engineer to the Metropolitan Central District in 1902, to assist in the telephoning of London. After the completion of this work he was transferred to Cardiff in 1904, and was re-classified as Executive Engineer in ordinary course.

George Partridge was not the man to stay at home when the call was sent out for men in the Great War, and he entered the Royal Engineers with a commission as Second Lieutenant in January, 1916. With the exception of about six months, he served in Egypt and Palestine in charge of lines of communication, and in the building of long stretches of important military routes, until January, 1919, when he was invalided home.

Mr. Partridge was held in very high esteem by his staff, and there were many flowers. Nearly 200 of the staff attended the funeral as a last tribute to his memory.

AN APPRECIATION.

"A primrose by the river's brim.
A simple primrose was to him
And it was nothing more."

This was a favourite quotation used on apt occasions by George Noble Partridge, and I feel that I am sadly mistaken if it does not serve to revive living memories of him to his intimate friends. They will appreciate under what circumstances he would use it, without venom and without harshness, for both were foreign to his nature, but with that whimsical good-humour which won him his hosts of friends. I never knew another man who, considering his gentlemanly reserve, made such a host of appreciative friends as quickly as he did. Not every specimen of male humanity can lay claim to be counted as a full unit amongst men, but with the passing of George Noble has disappeared a character—a man.

Mr. G. N. PARTRIDGE.

He had faults—but what man possessed of full vigour and instincts has not? Those who knew him thought most of his good qualities, and appreciated his abilities. He was a man of wide reading, and only the best literature and poetry made any appeal to him, and quotations from the poets often came forth aptly fitted to official matters under review. His sense of the ludicrous saved many a situation, and his resourcefulness and tact were proverbial.

His knowledge of human nature seldom led him astray, and his benevolent idealism in his dealings with others, and especially with his staff, endeared him to them more than I have ever before experienced. His subordinates could rely on him for all deserving support, and trusted him before all others.

His self-reliance was justified by his intellectuality, and had Fortune been less fickle, he would have gone far in the Service, as his was a mind for great things with a quick recognition of essentials, a comprehension of possibilities, and an appreciation of relative values.

It was with the deepest regret that all who knew him heard of his death, and there are few men who have been so mourned or have left such a deep feeling of bereavement amongst his staff and his friends.

E. O.

GOLF.

The season was inaugurated on April 25 when a team of 8 players of the Engineer-in-Chief's Golfing Society and of the Central Telegraph Office met at the Chipstead Golf Course The teams were led by Sir William Noble and Mr. A. W. Edwards, the Deputy Controller, respectively, and a most enjoyable day was spent in delightful surroundings.

Singles were played in the morning and foursomes in the afternoon, the Engineer-in-Chief's team proving successful in both sessions. The meeting was thoroughly enjoyed by all, and the pleasure was considerably enhanced by the geniality of the leaders.

The following are the results of the games:—

SINGLES.

Engineer-in-Chief.		*C.T.O.*	
Sir W. Noble (3 and 2)	1	Mr. A. W. Edwards	0
Mr. H. J. Ost (1 up)	1	„ B. Savage	0
„ J. M. Shackleton (3 and 2)	1	„ E. Woods	0
„ A. B. Hart (1 up)	1	„ Reeves	0
„ R. A. Weaver	0	„ N. West (2 and 1)	1
„ T. H. Newlands	0	„ C. W. Whitehurst (7 and 5)	1
„ D. Reid (2 up)	1	„ R. Hain	0
„ M. F. G. Boddington (5 and 4)	1	„ J. P. Leckenby	0
	6		2

FOURSOMES.

Sir W. Noble and Mr. Hart (3 and 2)	1	Messrs. Edwards and Reeves	0
Messrs. Ost and Shackleton (4 and 3)	1	„ Woods and Savage	0
„ Reid and Newlands	0	„ Whitehurst and Hain (2 and 1)	1
„ Boddington and Weaver (7 and 6)	1	„ West and Leckenby	0
	3		1

"CENTELS" *V.* ST. BARTHOLOMEW'S HOSPITAL CHARITY FOOTBALL MATCH.

A SPIRIT of revelry prevailed in the vicinity of the C.T.O. round about 3 p.m. on Thursday, April 27, enlivening the usual drab scenes of city hustle. Business men stopped to see what it all meant as the revellers in gay costumes, some pretty, some grotesque, and many undoubtedly original, flitted about. It was the occasion of a charity match which had been arranged to be played at Herne Hill between the "Centels" and St. Bartholomew's Hospital, to augment the funds for the Bazaar to be held later in the year to provide hospital beds, and many a stray copper found its way into the collecting boxes in response to the alluring charms of the collectors.

Six chars-a-banc left Angel Street shortly after 3 p.m., the leading car containing the now famous Jazz Band discoursing sweet music to enliven the journey. The greater number, however, took advantage of the special train which the S.E. & C.R. had placed at our disposal, and which was well patronised. As we reached Herne Hill Station, the cars were just passing, the fun and high spirits still well maintained. Unfortunately, as we entered the football ground a storm burst, the rain continuing to fall heavily for nearly an hour, which somewhat damped the spirits for a time, but the natural exuberance of the C.T.O. boys and girls soon asserted itself and dominated the proceedings for the whole in spite of wet, and cold feet. The ground was now in a very bad condition in places, being almost under water, necessitating a postponement of the start until 4.30 p.m. The Rt. Hon. H. Pike Pease, M.P., H.M. Assistant Postmaster-General, kicked off. Misfortune befell the Centels soon after the commencement, their captain, W. Holden, sustaining an injury to his hip occasioning his withdrawal from any further participation in the game. A good and evenly contested struggle, with Bart's slightly the stronger side, proceeded until half time, when the score stood: Bart's 1, Centels 0, the effective shot being a fast one by Stewart Lowe, which went just inside the far-off post.

During the play amusing diversions were indulged in, the Jazz Band, which has undoubtedly come to stay, parading the front of the stands and ground, picking up gold and silver. The Bart's followers were not strong in numbers, but what they lacked numerically they made up for in initiative and pluck, at one time they made a concerted action and "won" our drum, parading the ground to signalise their victory, making the "victim" speak for itself. This naturally roused our band and by a well-conceived counter-attack they recovered the lost trophy, but only after a prolonged battle, during which Ju-Jitsu and every other method of attack and defence were tried, with an utter disregard to their nether garments and wearing apparel in general.

Before commencing the second half, the sporting spirit of the Bart's men was exemplified by their captain insisting upon our injured captain being replaced. Mr. Hichen then took the field. Enthusiasm was now worked up to a high pitch by the "Centels" pressing hard, several shots at goal only being miraculously saved by the skill of the "Bart's" goalkeeper. At last, however, Head tricked the defence and Ward saw his goal pierced for the first and only time. Bart's scored again a few minutes from "time," the final reading Bart's 3, Centels 1. The hospital men were the stronger side and well deserved their win, whilst the Centels thoroughly enjoyed the game and achieved their object, the Bazaar Fund benefiting by something over £60. We understand the Bart's boys quite enjoyed the "rag," and appreciated the fact that they themselves did not, for once, have to provide all the fun, also that several more trophies now hang in their smoke-room. It is hoped that this will become an annual affair.

The Rt. Hon. Pike Pease, M.P., H.M. Assistant Postmaster-General, Mr. J. Lee, Controller, Central Telegraph Office, Mr. A. W. Edwards, Deputy Controller, Mr. W. Ferneyhough, Assistant Controller, and several other prominent officials were present and stayed until the end, all apparently thoroughly enjoying the fun and sport provided.

A. M. M.

PERSONALIA.

CENTRAL TELEGRAPH OFFICE.

Promotions.

Miss M. M. BURROWS to be Assistant Supervisor.
Miss E. A. M. WHEELER to be Assistant Supervisor.
Miss A. G. T. HILDERSLEY to be Assistant Supervisor.
Miss E. S. BENTLEY to be Assistant Supervisor.
Miss A. C. E. BROOM to be Assistant Supervisor.
Mr. C. SANDERSON to be Superintendent.
Mr. G. T. BENNETT to be Assistant Superintendent.
Mr. S. T. SHAPCOTT to be Assistant Superintendent.
Mr. H. GRAY to be Overseer.
Mr. E. J. SAMUEL to be Overseer.
Mr. G. H. BAKER, senior, to be Overseer.
Mr. H. W. DUNNE to be Overseer.
Mr. T. H. WRIGHT to be Overseer.

THE

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THE TELEPHONE COMPANIES OF GREAT BRITAIN AND IRELAND.

BY ARTHUR E. COTTERELL.

WHEN turning over a file of old newspaper cuttings recently, I came across the following advertisement, which appeared in the *Globe*, on Tuesday, Sept. 16, 1879:—

Sole Proprietors of Bell's Patent,
THE TELEPHONE COMPANY, LIMITED.
36, COLEMAN STREET, LONDON, E.C.
JAMES BRAND, ESQ., *Chairman.*

LONDON TELEPHONIC EXCHANGE.
This Exchange is already in successful operation and a considerable number of the leading Bankers, Companies and Merchants in the City are now connected through its agency.

For terms apply to—
MR. ORMISTON, *Manager,*
THE TELEPHONE COMPANY, LIMITED,
36, COLEMAN STREET, E.C.
where the system can be seen in full operation.

This old notice is of general interest, as it relates to the opening of the first telephone exchange on this side of the Atlantic, which occurred during the previous month of August, whilst to me it served to recall those early days. I well remember Mr. Fred Ormiston. When I joined the Midland Telephone Exchange in Birmingham, in November, 1879, he was Consulting Electrician to that Syndicate, and to several other electrical concerns, having relinquished after a short tenure his position as Manager for the Telephone Company in London. It is many years since he passed away. He was a man of wide experience in electrical matters so far as they had progressed in those days. Behind a somewhat brusque manner there was kindheartedness, and a willingness to impart what he knew to others.

To many readers of this JOURNAL, whose association with the service has been limited to the period since the transfer to the State or only dates back to the closing years of the National Telephone Company, it may be interesting if a brief account is given of a few of the main evolutions through which that Company came into being and attained its full strength.

The Telephone Company, Limited, was registered in June, 1878, with offices in London; having secured the sole rights of Prof. Bell's invention for the whole of the British Isles. The aim of the Company was to establish an exchange system in London, to supply private wires, and to license local companies throughout the Kingdom to carry on similar businesses, supplying them with the necessary instruments on royalty terms, viz., £1 per annum for each receiver or transmitter, and reserving some measure of control.

The question of adopting the telephone had been considered by the Post Office with the idea of using it on private lines, and a proposal that it should be allowed to hire sets for this purpose was sanctioned by the Treasury in August, 1878.

In the early experiments Bell's telephone was used both as transmitter and receiver, and I believe this was the case with some of the original private wires, but the invention of the carbon button transmitter by Dr. Clarence Blake was immediately taken advantage of and used from the first in the British telephone exchanges.

Prior to Blake's invention, Mr. Edison had patented his telephone with carbon transmitter and revolving chalk receiver, and a dispute arose as to the Blake transmitter being an infringement of Edison's instrument.

The Edison Telephone Company of London was formed and registered in August, 1879, and within a few months established an exchange in London.

The possibilities of competition between these two companies involved some vexed questions.

The Telephone Company was threatened with litigation for infringement with regard to the Blake transmitter, without which or its equivalent its service would have been greatly impaired, whilst on the other hand, it had an immense advantage in its possession of the Bell receiver, which was far and away better than the Edison chalk receiver, which not only needed frequent adjustment but that the listener should keep turning a handle. Moreover, as the Edison instrument was a loud speaker, it was in many instances an inconvenience for the messages to be heard by everyone in the room, instead of being confined to the actual user; also the articulation was not so perfect as with Bell's instrument.

The opposing companies, being possessed with common sense, ultimately took the wise course of joining hands, thus combining under the title of The United Telephone Company, which was registered in June, 1880. As a result competition and litigation were avoided, and what was of more consequence, the new company was in possession of the master patents and thus able to command the field for the next ten or eleven years, seeing that Bell's patent was not due to expire until Dec. 9, 1890, and Edison's patent on July 30, 1891.

These happy auspices were marred, however, by reason of the Post Office having intervened with the announcement that the use of telephones for exchange purposes, or communication between the premises of other than one person or firm, was an infringement of the Postmaster-General's monopoly under the Telegraph Act of 1869.

The two companies, which had not then fused, contended that the telephone was not a telegraph, and its invention had not been contemplated at the time of the Telegraph Act. Accordingly, they refused offers from the Post Office to grant them licences subject to payment of royalty, and restriction of areas of communication. A law suit followed with the result that judgment was given in favour of the Post Office on Dec. 20, 1880, confirming that the telephone was a telegraph within the meaning of the Act. In these circumstances the United Company had no option but to accept a licence on the terms offered, the royalty to the Post Office being fixed at 10 per cent. of the gross receipts of the Company on its exchange business; licences on similar terms being granted to such other companies as had been formed in the meanwhile or were formed thereafter.

Several local Syndicates had been established in different parts of the country towards the close of 1879, viz., The Lancashire & Cheshire Telephonic Exchange, The Midland Telephone Exchange, The Scottish Telephonic Exchange, whilst the firm of Messrs. D. & G. Graham started the business in Glasgow. The Syndicates were shortly afterwards turned into limited Companies.

In February, 1881, the Provincial Telephone Company, Limited, was registered with the idea of assisting in the promotion of local companies throughout the country, but resulted in the formation of the National Telephone Company in March of that year, which acquired the licences and such businesses as existed of the Midland and Scottish Companies and of Messrs. D. & G. Graham.

Eventually the British Isles was divided for telephonic exchange purposes between the following limited companies.

The National Telephone Company with the largest territory comprising the Midlands, Yorkshire, the extreme north-western part of England, nearly the whole of Scotland, and the northern part of Ireland.

The Lancashire & Cheshire Telephone Co., registered May, 1881.

The Northern District Telephone Co., registered December, 1881.

The Telephone Company of Ireland, registered May, 1882.

The Western Counties & South Wales Telephone Co., registered December, 1884.

The South of England Telephone Co., registered January, 1885.

The Sheffield Telephone Exchange & Electric Light Co. had a local business.

The Post Office opened several exchanges in opposition, the principal ones being Cardiff in August, 1881, and Newcastle-on-Tyne in October 1882, but apart from these two the Companies did not regard the rivalry as very serious. The Newcastle Exchange, like others at Hull, Bradford, and Middlesbrough, had been telegraph exchanges which were converted from A.B.C. instruments to telephones.

Seeing that the United Telephone Company owned the master patents it may be wondered why the Post Office were able to use telephones in opposition. What happened was this, that the Company had entered into an agreement with Messrs. Scott & Wollaston enabling them to manufacture and supply telephones for *private* use but not for exchange purposes. This agreement was later on assigned to the Gower Bell Telephone Company. Curiously enough, there seems to have been a weak spot in the agreement, as although neither Scott and Wollaston, nor their assignees could use the instruments for exchange purposes, there was nothing to prohibit any purchasers from doing so. The Post Office entered into a contract to be supplied with 20,000 of these instruments, very many of which were used on their various exchanges.

Several attempts were made by different firms to produce modified types of telephones in the hope of evading the patents, and the United Company was put to much trouble and expense in upholding its rights. The most important instance was the action against Messrs. Harrison, Cox, Walker & Co. in 1882, which finally established the validity of the master patents. In establishing its case, the United Company had to disclaim certain portions of the Edison patent in consequence of which transmitters manufactured prior to July 29, 1882, were exonerated and were afterwards used by the London & Globe Telephone & Maintenance Company, Limited, which opened an exchange in London at about half the tariff rate charged by the United Company. The London & Globe Company resorted to various doubtful tactics, which created wayleave difficulties and even actual interference with the United Company's wires, as a result of which legal proceedings were commenced. Eventually, however, the United Company bought out the other for £25,000.

It became evident soon after the telephone companies had established exchanges in certain towns that something more was required than communication within the limited areas to which they were restricted by their licences from the Post Office. As a result of negotiations the Post Office agreed to provide them with trunk lines connecting adjacent towns on rental terms.

As the companies' systems were all constructed on the single wire principle, and the trunk lines supplied by the Post Office were essentially twin-wire circuits, it became necessary to resort to the use of translators to enable the companies' subscribers to be connected with the trunk circuits.

(To be continued).

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.Sc., M.I.E.E., FELLOW I.R.E.

(*Continued from page* 134.)

The principle of the double-wave non-switching system is shown on Fig. 35.

The transmitting set causes waves of a certain wave-length, modulated by speech received over the telephone line, to be radiated from the ordinary aerial, while the incoming waves, of a different wave-length, are received on a "frame" aerial. The action of a frame aerial will be dealt with in connexion with direction finding by wireless. For the present it will suffice to say that such an aerial consists of one or several turns of wire, usually supported on a rectangular frame measuring a few feet each way. The frame is so placed that its plane is directed towards the distant transmitting station. Electric waves from that station set up high-frequency alternating currents in the coil, and these currents can be detected in the usual manner.

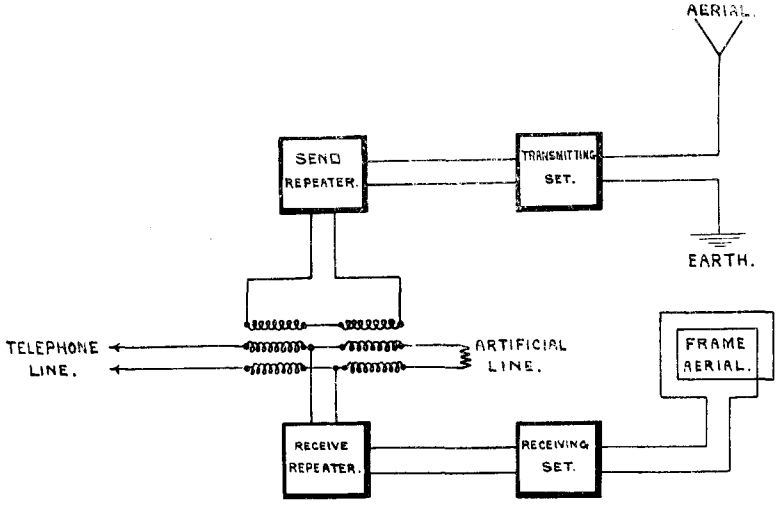

FIG. 35.—NON-SWITCHING DOUBLE-WAVE SYSTEM OF CONNEXION BETWEEN TELEPHONE LINE AND WIRELESS TELEPHONE.

The transmitter and receiver are both permanently connected to the telephone line. It is therefore necessary to provide some means whereby the signals received on the frame aerial and passed to the telephone line do not actuate the transmitter, although any speech currents coming in from the telephone line will do so. This is accomplished by the arrangements shown in Fig. 35. A rather complicated transformer is provided, having six coils which are joined in series in pairs. Each wire of the telephone line is joined to one extremity of such a pair of coils, while the other extremities of these two pairs of coils are joined together through an artificial line, adjusted to be as nearly as possible the electrical equivalent of the telephone line. The centre points of these pairs of coils are joined to a speech magnifying set, known as the receive repeater. The signals received on the frame aerial, after being detected and rectified in the usual manner by the receiving set, are magnified in the repeater, and then passed to the transformer. Here the speech currents divide between the artificial line and the actual telephone circuit. The connexions are such that these currents, flowing in opposite directions in each half of the first two pairs of coils tend to cancel one another out as regards the action which they exert on the remaining pair of coils. This pair of coils is joined to the transmitter, and if the balance between the artificial and the real lines is satisfactory the cancelling out is more or less complete and the transmitter is not actuated. At the same time that portion of the speech currents which passes to the telephone line conveys the speech to the distant subscriber.

The speech currents coming along the telephone line from the distant subscriber flow through both coils of each of the pairs to which the line is joined, and complete their path through the artificial line. Since these currents flow in the *same* direction in each coil of a pair the effects produced in the transmitter pair of coils assist one another, and so the speech currents are passed to the send repeater, magnified there, and passed on to the transmitting set, where they modulate the radiated waves as already described.

Thus the speech of the subscriber at the other end of the telephone line is radiated as modulated electric waves, while at the same time any speech-modulated electric waves of the proper wave-length, received at the wireless station, are transmitted as speech currents over the telephone line, and thus the conversation of the subscriber on that line may be interrupted by his correspondent.

High-speed Working.

In the early systems of wireless telegraphy, manual transmission was exclusively used, and for ship to shore communication the speed of working so obtained is still sufficient for practical purposes. With the introduction of wireless channels of communication between important fixed points and over long distances, however, the need was felt for an increase in the speed with which traffic could be dealt with, in order that the best use might be made of the facilities provided.

The experiments in this direction which were made before the introduction of continuous waves and of the thermionic valve did not meet with great success, and it was only with C.W. transmitters and after the valve could be used to magnify the weak currents previously available at the receiving end, and so to strengthen them that they became comparable in magnitude with the currents used in land-line telegraphy, that high-speed working became thoroughly practicable.

The circuits used are somewhat complicated, and only a brief outline of one high-speed installation will be given here.

At the transmitting station the signals are formed by a special key, actuated by an electro-magnet or by a Creed compressed air engine, and controlled by the signals from a Wheatstone transmitter. At the receiving end the high-frequency oscillations set up in the aerial are first amplified, then heterodyned, and then rectified. The low frequency currents so obtained are magnified, and are then passed on to a second rectifier. The unidirectional currents from this rectifier, which correspond in duration to the transmitted dots and dashes, are of strength sufficient to actuate a delicate relay, which is a modification of the siphon recorder used on submarine cables. In the local circuit of this relay is placed an ordinary Post Office standard relay, which in its turn controls a Wheatstone receiver.

Thus the high-speed dots and dashes from the transmitting station are recorded at the receiving station as dots and dashes on Wheatstone slip.

When signals are good it has been found possible to actuate a Creed receiver from the Post Office relay, and thus to obtain the messages in actual printed characters.

Direction-Finding Systems.

Among the most useful developments of wireless telegraphy are the methods by which the position of a transmitting station from which signals are being received can be determined. These are called "direction-finding" systems, contracted to "D.F." They depend on the fact already mentioned in connexion with the description of the "non-switching" system of wireless telephony,

that a flat coil of wire, placed so that its plane is directed towards the transmitting station, will have high-frequency currents set up in it, which currents can be detected in the usual manner. Suppose we have such a coil ABCD (Fig. 36), and that a train of waves is emitted from a transmitting station situated in the plane of the coil somewhere to the right of the diagram.

When the crest of a wave reaches the side AB of the frame it endeavours to cause a current to flow upwards, or, in technical language, it sets up an electro-motive force acting from A to B. A fraction of a second later, the exact time depending on the width of the frame, the crest reaches the opposite side CD, and again sets up an upwardly directed electro-motive force of practically equal magnitude to that previously set up in AB.

When the trough of the wave we have been considering reaches AB, a downward electro-motive force is set up in this side of the frame, followed, after the interval of time necessary for the trough to cross the width of the frame, by a similar downwardly directed electro-motive force in the side CD.

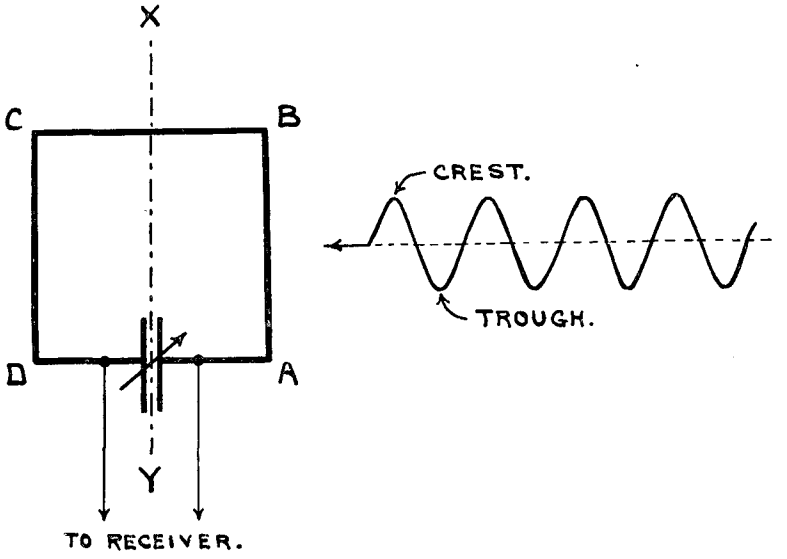

FIG. 36.—LOOP OR FRAME AERIAL.

The crest and trough of each succeeding wave similarly produce oppositely directed electro-motive forces in the sides AB and DC, those in AB always occurring at a definite interval of time before the corresponding ones in DC. The magnitudes of the electro-motive forces in the two sides of the loop at any instant are therefore unequal.

Since electro-motive forces in AB and DC directed both upwards or both downwards act in opposition to one another *round* the loop, it follows that the resultant electro-motive force acting *round* the loop will be the difference between those in the two sides. The magnitude of this resultant electro-motive force evidently becomes greater the wider the frame is made, until the width becomes equal to half a wave-length. In these circumstances the crest is acting on one side while the trough is acting on the other, and the electro-motive force acting *round* the loop is a maximum. It can be shown that this resultant electro-motive force alternates with the same frequency as those in the two sides of the loop. Hence, by introducing a condenser, as shown in the diagram, and tuning the loop to the frequency of the incoming waves, high-frequency currents will be set up round the loop, and these currents can be detected in the usual manner. Since, however, the magnitude of the effects produced in a loop is in general considerably less than that of those produced in an ordinary open aerial with the same intensity of incoming waves, very sensitive detecting devices have to be employed, and it is only since the introduction of thermionic amplifiers that the use of frame aerials has become practicable.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

THE Genoa Conference is now a matter of a finished chapter of international history, no matter what may be our varied opinions upon it, or whatever may be the verdict of posterity regarding it. Maybe before these columns are out of the printer's hands the Hague Conference may also be classed among completed events. In any case it is apposite to remark that the telegraph and telephone have asserted their place as essential factors in all these epoch-making events.

It is therefore with special pleasure that publicity is given to the following message sent by Engineer Marchesi, the indefatigable Italian official, who literally night and day gave himself up to the work of maintaining telegraphic and telephonic communication between Genoa and the various diplomatic centres of Europe. The telegram in question was addressed to the Controller, C.T.O., London, who suitably replied to the communication.

> "Au moment où la Conference Economique Internazionale va tenir ses derniéres séances, permettez-moi, Mr. le Chef Principal, de vous exprimer en mon nom et au nom du personnel de Genes, qui represente actuellement presque tous les bureaux d'Italie, nos remerciements les plus cordiaux. Le Télégraphe et le Téléphone (c'est pas une phrase) étaient bien des outils indispensables au developpement de la Conference et ils n'ont pas manqué leur tache. Or, evidenment ce résultat satisfaisant et flattant n'aurait pu se verifier sans le concours spontané, sans la collaboration empressée amicale des bureaux correspondents pour la plus profitable exploitation des communications prédisposées. Tout va reprendre maintenant son rythme ordinaire et dans peu de jours nous abandonerons quelquesuns la ville superbe pour regagner nos respectifs bureaux mais nous garderons tous un profond et agreable souvenir d'un travail quelquefois peutêtre exceptionellement lourd mais toujours assaisonné de la plus aimable camaraderie. Encore une fois merci de grand coeur et au revoir, Messieurs, si bonne chance le voudra."

In the case of several of the diplomatic centres, a special wire was provided between their respective capitals and headquarters at Genoa. The British Government naturally was provided with a private telegraph communication between Whitehall and the Hotel Miramare, worked by British telegraphists at each end.

By the way it appears not improbable that telephonic communication between this country and The Hague may be a prominent feature of Anglo-Dutch communications, if so, our sister service will find excellent co-operation from the land of the dykes, and little, if any, language difficulty.

In a recent examination for the post of Baudot dirigeur in the C.T.O., one of the aspirants, replying to the question of "What are the duties of a dirigeur?" and in the course of some excellent technical matter, epitomised certain qualifications without which technical knowledge is undoubtedly at a discount. It is hoped that the writer of the following will forgive the publicity given to his excellent epigram on this subject, viz., *Patience and tact are as necessary as the screwdriver*!

To those who know the site of the old G.P.O. East, St. Martins-le-Grand, and the marvellous mass and variety of vegetation which has grown up out of the remnants of brick, stone, mortar and gravel during these many years, it will be interesting to learn that some photographs have been taken by Messrs. H. J. Jordan and R. P. Mitchell of the C.T.O.

The results are excellent, if surprising, for the illusion of mountain rocks and vegetation is complete, while in one case the view brings up a vision of a ruined city with a broken shard in the foreground.

Elektron in his weekly leaderettes on "Current Topics," gave some personal experiences of a telephone call made with a P.B.X. There was apparently no delay in getting through to the subscriber as far as the Post Office system was concerned, but was evidently genuinely vexed at the irritating delays which were not amongst Elektron's first and only experiences of the exchanges run by commercial concerns, for he says:—"There is little doubt that some irritating delay in getting through to the individual concerned with your particular business is incidental to half the telephone calls made to businesses consisting of many and various departments. I have experienced similar vexatious delays on previous occasions when ringing other numbers with numerous internal extensions. It only illustrates the need for proper organisation of any business establishment's telephone facilities."

Unfortunately, few private firms are capable of the fine discrimination between faults on the Post Office system and those due entirely to an ill-organised private system, as is our technical contemporary. One wonders how much of certain newspaper criticism of the Government system has been based upon data of the description above mentioned. *Elektron* seldom fails to point out any defect in governmental practice or procedure, and these very candid comments have therefore an added value.

The latest news of our old colleague, Mr. A. E. Thompson, late of the Cable Room, is that he has invented a scheme of his own for super-imposing telegraph circuits upon telephones, or *vice versa*, and that he had actually demonstrated the same before a representative of the South African Government by means of wires loaned for the purpose by one of our British railways. By the way he has also written *and* illustrated a book on the "Western Electric," as some of our readers are doubtless aware.

The German authorities announce the successful working of the Siemens' High-Speed Printing Telegraph system "through paper core telephone cable between Berlin and Hanover and also between Berlin and Dortmund by means of *sound* waves."

The annual report of the C.T.O. Benevolent Fund was held in the Deputation Room, G.P.O. North, on the 7th of last month, the Deputy-Controller, Mr. A. E. Edwards, taking the chair in the unavoidable absence of Mr. Lee, the Controller. With an all-sufficient balance in hand the Committee felt fully justified in spending the whole of its income for the year just brought to a close, and the meeting therefore cordially endorsed the following paragraph of the 48th Annual Report :—

> "With a record of prosperity unparalleled in its history, both in Membership and Income, the Fund has, during the year, proved itself true to its name and object, in having disbursed in benevolence the whole of its income to cases of urgent distress and the support of orphans of deceased Members."

The success of the Fund has been almost entirely due to the new confidence of the staff, who under the enlightened policy of an enlarged and broad-minded Committee have steadily increased its numbers and have systematically subscribed. The prominence given to the Orphan section and the success of the efforts along this particular line have been largely contributed to Mr. Samuel Pearce, ably seconded by Mr. E. Cooper.

On the sixth of last month the staff said good-bye to Mr. "Billy" Bedford, a much respected member of the Foreign Telegraphs Overseers. Mr. Bedford had for some years been closely associated with "Stationery," a term which by no means adequately described the duties of his post, which were unique as regards the C.T.O., and possibly that of any office in the United Kingdom. Our old friend was formerly a member of the Submarine Telegraph Staff and left us, we are pleased to note, in the best of health on his 60th birthday. He has the intense satisfaction of knowing that he quits the Telegraph Service, which he has served so long and so faithfully, without even the *soupcon* of anything but the best of wishes and the kindest of thoughts for a long and happy retirement.

The British Commercial Secretary at Rome not long since made an interesting statement regarding the authorised projected extensions of communications by the Italian Government. Epitomised, they are to expend 150 million lire on telephones and telegraphs. The telephone program includes :—(1) The completion of the automatic exchanges in the principal towns ; (2) the laying of new lines to carry the increased traffic ; (3) the connexion of 409 important towns with the trunk lines ; (4) the re-establishment of direct telephone communication with the principal cities in Central Europe ; (5) the improvement of audibility between the extremities of Italy ; (6) the completion of the laying of trunk line cables between Milan, Genoa and Turin ; (7) the erection of wireless stations.

Leaving the question of the English equivalent value of so huge a number of lire it is probable that the cost of the following submarine cable scheme outlined by the *Financier* will be covered by the sum mentioned above. The journal just mentioned states that a convention has been concluded between the Italian Government and the Compania Italiana dei Cavi Telgrafi Sotto-marine, for the laying, use, and maintenance of a cable between Italy and South America and of another between Italy and Greece. The former is *to connect Italy with Spain, Brazil, Uruguay, Argentina and—depending* upon the consent of the respective Governments—with the Canary and Cape Verde Islands. The company engages to obtain from the interested foreign Governments the necessary permits for the cable approaches and for the working of offices at cable ends.

For the duration of this convention, which is fixed at 50 years, the Italian Government has agreed not to grant to another person or company the right to bring submarine cables to Italy for direct connexion with South America, and also not to do this on its own account without first notifying the company which, on an equality of conditions, will always be given preference in matters of this kind over offers from other Italian forregn companies.

The completion of the cable to South America must be effected within three years from the date of approval of the convention. Delay is subject to penalty, and a three-year delay will cause the convention to be annulled. The cable between Italy and Greece (from Brindisi to the Bay of Butrinto) is to be completed within two years.

The "Broadcasting" stunt had a first effect in causing a considerable rise in Marconi shares with a drop in Eastern Telegraph Ordinaries, which dropped eight points. Extensions, Westerns, Globes, and Anglo-American all felt the effect of the wireless craze. Undoubtedly certain firms have scented big business, while the excitement and agitation so far as the manufacturer is concerned is humorously rhymed in a successful effort by E. G. C. in *Electricity*, from which I have taken the liberty of lifting one or two verses : It is entitled "Broadcasting—and Broadmoor," by a Works Manager.

"My firm has got the fever, the attack is really bad,
They've found a source of income and all gone wireless mad.
I'm getting rushed and hustled till I don't know where I stand.
If everything they say comes true, the future should be grand.

. . . . .

There's receivers in my armchair, detectors on the mat,
Condensers on the table, insulations in my hat,
Drawings in my pockets and circuits on my brain,
And heaps of correspondence I don't want to see again.
There's castings, dies and samples all scattered round the floor,
My once so tidy office is now like a broker's store.
There's atoms in my inkwell, and wrinkles on my brow.
If something isn't settled soon there's sure to be a row.
I talk all through the morning, in fact I talk all day ;
I talk until my throat is dry and still there's more to say.
I talk *again all evening, and at last when I get home,*
The wife does all the talking then for leaving her alone."

The following item is reprinted from the *Electrical Review* regarding the developments of the chief German wireless station.

> Considerable extensions are to be made to the Nauen wireless station to enable it to deal with a greater volume of business with the American continent. The Transradio Co. is arranging to increase its capital by 25,000,000 marks for the purpose. Included in the improvements is the erection of seven new masts 210 metres high—four of them replacing existing masts. The power plant is to be reconstructed and augmented. As one of the results of the extension communication will be established with Argentina.

The Commercial Cable Company have completed the arrangements for the establishment of a submarine telegraph cable repairing base at Queenstown. One of the Company's cable ships, probably the *George Ward* will be permanently stationed there.

The seasonal wire between London and St. Malo has been opened for the usual potato market and is being worked very satisfactorily by means of the Hughes simplex printer.

On the 12th of last month split Baudot was established between the three countries of Czecho-Slovakia, Switzerland and Germany, the three points being respectively Praha, Zurich and München. Double Duplex Baudot working is also projected between London and Praha in place of the present Hughes simplex circuit between the two capitals, as soon as a suitable submarine cable length may prove available under the North Sea.

The Eastern Telegraph Co. created a telegraphic record by cabling the three winning horses of the Derby from Electra House, London, to Bombay and Durban in 1½ minutes, to Sydney in 2½ minutes, and to Calcutta in 5½ minutes.

The Ether.—The ether of space is at least the great engine of continuity. It may be much more, for without it there could hardly be a material universe at all. . . . It is the one all-permeating substance that binds the whole of the particles of matter together.—Sir OLIVER LODGE.

J. J. T.

BAUDOT MANIPULATION.

IN the training of Baudot operators it would scarcely seem to be necessary to do more than suggest to débutants a few obvious rules and an easy method of learning the key combinations, leaving them to acquire imitatively refinements of form and style from their instructors and other expert operators. Indeed, if a well recognised method existed, that is all that would be required ; but it is a curious fact that in this country the practices at Baudot offices became widely divergent, and, after a number of London Baudotists had visited the Paris Central Office, and had seen their French colleagues at work with a distinctive style of their own, it became a serious question as to what rules provided the best basis for teaching Baudot manipulation.

FIG. 1.

We had the opportunity of discussing the subject in Paris with French experts, and are deeply indebted to M. Mercy, the author of *Le Système de Télégraphie Baudot*, for valuable letters in which he gave details of the theory and practice of Baudot signalling. There can be no question of the substantial advantages which result from such friendly interchanges of views and visits, especially on the part of those engaged daily in a common work,

and who would naturally be quick to observe innovations and to perceive subtle differences in operating methods. Neither can there be any question of the importance of exploring in the greatest detail any system of operating which tends to reduce physical effort, and views concerning Baudot training procedure expounded by M. Mercy command considerable respect. When the French ideas became known additional impetus was given to the movement already on foot for reviewing the rules for Baudot manipulation, and as a consequence a number of operating experts were convened under the chairmanship of Mr. John Lee to consider the subject in detail.

FIG. 2.

The first Baudot circuit in this country was opened between TSF and Paris as long ago as 1897. Experts came over from Paris to introduce the system and train the staff, and it may well be asked why the practices then acquired, which formed the foundation of British teaching, should have been challenged. The simple answer is that the keyboard itself in both countries has undergone an important change during the past 20 years, and our colleagues in France have seen and proved the advantage to be derived from a change in the style of fingering the keys. Undoubtedly we in this country have been at a disadvantage on account of our insularity. On the commercial side of telegraphs we have been cut off from the development of Continental opinion and practice. We have lost the benefit of their instrument room experience, but *en revanche* we venture to suggest that our Continental colleagues would have been the richer if they had been in sympathetic touch with general progress on this side. As it was the French with an extensive Baudot service and long experience evolved a new operating method, but it was unknown to the operators in this country because no means existed of periodically exchanging views freely about such important matters.

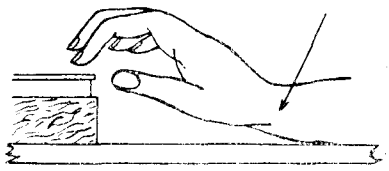

FIG. 3.—FIRST POSITION: THE WRIST IS THE PIVOT OF THE MOTION.

It must not be supposed that there is a monotonous uniformity among French telegraphists in their style of operating, for such is not the case. Slight personal variations are everywhere to be seen; and there are chiefly in use two methods of manipulating the keyboards. These methods are sometimes described by the words "piqué" and "appuyé." The former corresponds fairly well to the "staccato" touch in pianoforte playing. The latter has no exact equivalent, the converse musical expression "legato," being inapplicable: but it is generally known as the "release" method. In the first the fingers are raised after each signal; whilst in the second, the fingers are kept down on the keys which are to send out marking currents during several successive revolutions of the distributor brushes, the other keys being released and allowed to rise to their position of rest. The majority of Parisian operators employ the "staccato" or separate touch for each signal, and the best opinion is heavily in its favour. As mentioned above, the French ideas of sending have evolved with the evolution of the keyboard, The release method was in greater vogue before the locking device for the keys was introduced, in order to ensure that the depressed keys were kept down while the brushes swept over the corresponding segments of the distributor.

In the earlier French books on Baudot technique only a few words are devoted to hints on sending. MM. Poulaine and Faivre in their *Cours d'Appareils Baudot*, while suggesting the separate touch method, are somewhat enigmatic as to the use of the "release" . . . "The fingers," they say, "must be brought down simultaneously and depress without effort the keys forming the combination corresponding to the letter to be transmitted, and this must be done at the precise moment that the cadence beat is heard. The pressure must be prolonged for the longest possible time in the interval separating two successive beats. One may—*à la rigueur*—and after practice, dispense with raising the fingers which are to be brought into play in the next signal." The significance of *à la rigueur* is not quite clear, and perhaps a French mind would suffer a momentary check at that critical point. It is possibly a halting between two opinions, a hesitation at the parting of the ways. In *Le Télégraphe Multiple Baudot*, written some years later by M. Y. Caminade, an illustration, without literary comment, contains the author's directions as to the pose of the hands, but nothing is said on the question engaging our attention. It is in M. Mercy's book, republished early in 1920, that the importance of definite and detailed teaching is recognised, and several pages are given up to the subject. The new edition of this book opportunely came to hand at the time that the matter was being actively pursued in this country. This teaching together with the supplementary letters and the weighty experience of British and French expert operators have come under critical review. Resulting from the enquiries and investigations at offices in this country and in Paris, and with the collaboration of representatives of the staff, the committee has drawn up revised rules, which are quoted in their entirety below.

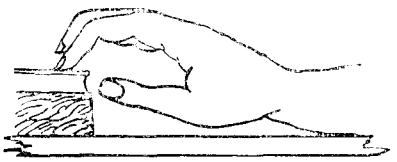

FIG. 4.—SECOND POSITION: THE WHOLE WEIGHT OF THE HAND SHOULD ACTUATE THE KEYS.

In observing French Baudotists at the keyboards, it is noticeable that they adopt a free and comfortable attitude at the desks. The keyboards are placed well back on the table, the forearms from elbow to wrist are laid lightly on the table, and there is no suggestion of rigidity or strain in the pose of the body, the arms or the hands. The fingers are slightly bent, and when the hands are raised, the tips of the fingers are about half-an-inch (1 or 2 centimetres) above the keys. The general posture has been admirably reproduced in the two photographs, Figs. 1 and 2 (which have already appeared in the JOURNAL). It should be remarked, however, that the unemployed fingers, which are shown doubled up in the photographs, may be held in the position that is most natural and comfortable to the operator so long as they are not supported upon the keyboard or desk, and do not restrict the free movement of the hands.

The distinctive feature of their operating is that it is not the fingers which supply the muscular effort for the depression of the keys. The work is done by the controlled movement of the hand as it is brought down upon the keyboard, the operative fingers having been advanced, and the fingers momentarily out of action being slightly raised so that they may not inadvertently touch the keys which are not to be actuated. The hand moves freely from the wrist, none of the unused fingers being supported on any part of the keyboard or desk; to use M. Mercy's figurative words, "the hand of the operator may be compared to a hammer, of which the metal head is represented by the ends of the fingers, and the handle by the whole of the palm of the hand." Diagrams 3 and 4 indicate clearly the general position in the rise and fall of the hand, the pivot of the movement being at the wrist. This style of sending tends to secure an assured depression of the keys in manipulating. It precludes the light flicking touch which gives rise to failures, and, on the other hand, reduces any tendency to produce trailing or extra signals.

So far as the earliest stages in training are concerned, some of our Parisian friends have improved the shining hours of their domestic life by practising without a keyboard, and they have made considerable progress. On the edge of a book about an inch in thickness, they have entertained the family circle with their diligent tapping. In point of fact, experience has shown that the cadence, the locking of the keys, and the control of signals are distractions to be avoided until the learner has become thoroughly familiar with the alphabet, and is able, without hesitation, to put down the appropriate fingers for the particular letters or characters required. When the fingers respond automatically to the demand for any desired combination, the rhythmic formation of symbols is but a short and easy step in advance.

H.B. AND A.B.H.B.

BAUDOT MANIPULATION: REVISED RULES.

"It is desirable that the operator's chair should be placed near the table so that the position of the arms on the table may be perfectly natural. Also to encourage freedom it will be better not to attempt to keep the elbows close to the body.

"The keyboard should be quite free and at such a distance from the operator as will allow the whole of the forearm to rest flat on the table (see Figs. 1 and 2).

"In signalling, the first three fingers of the right hand are used for keys I, II, III, and the first two fingers of the left hand for keys IV and V. Every signal should be made by a distinct and separate movement of the hands (the wrist being the pivot), with the fingers slightly curved and the tips of the fingers near the ends of the keys (see Figs. 3 and 4). None of the fingers or thumbs should rest upon the woodwork of the keyboards. (It is permissible, however, for qualified operators to avail themselves of a change, from time to time, to the other method of formation which retains such depressed keys as are needed for the next signal and releases those which are not required; but this method of signalling should always be regarded as a secondary and not a primary method.)

"If a comfortable position is adopted and a free style of manipulation is acquired, devices such as that of supporting the wrists by message pads, &c., should be unnecessary and should be discountenanced.

"For beginners it is desirable that cadence should not be taught at the outset. The learner should practise the formation of the alphabetical signals without cadence until the fingers required to form any letter take up their positions automatically. From this point, which may be reached after 5 or 6 hours' practice, the following of the strict cadence will be a comparatively easy matter and the learner may then pass on to progressive exercises, such as those suggested on the specimen Baudot Practice Cards."

BAUDOT PRACTICE CARD NO. 1.

Do not pause between words.

AYE	EYE	YEA	SAY	YES	SEA	AGE	EBB	JAY	BAY
GAS	AXE	ARE	AWE	AIR	ERR	WAS	SET	ART	ACT
ARC	ETC	YOU	KEY	ESE	AIM	MET	TEA	OUT	OWE
OFT	CUT	WHY	WHO	CRY	CWT	SIN	ELL	DAY	ADD
LAW	KIN	LBS	DRY	WAR	AFT	FOR	FLY	WIN	DYE
SAD	EVE	WET	123	231	142	332	242	442	223

12345 23456 34567 45678 67890

TGTGTGTGTGTGTGTGTGTGTGTG (use frequently).

PRACTICE CARD NO. 2.

GIST	HELP	WAIT	WREN	CAPE	GEAR	PAWS	DUTCH
TRAIN	THERE	WHICH	FRESH	FORCE	CLASP		
STICK	PROVE	CRUSH	MINDS	CRUST	SHELF		
BAULK	CANOE	TRUMP	CHANT	TRAIT	BLOOM		
DROWN	FETCH	KNOCK	WHELK	FUSED	FROST		
MUSIC	ABOUT	HENCE					

TGTGTGTGTGTGTGTGTGTGTGTG (use frequently).

PRACTICE CARD NO. 3.

ZENITH	MOSAIC	EASTER	WILLOW	MATRON	BEHIND
CLINCH	WELTED	PISTON	MUSTER	BERTHS	PROPEL
SPORTS	CLEVER	STUPID	FILLET	LETTER	WRENCH
BETRAY	BEHEST	BEFORE	DECIDE	SWITCH	SELECT
MIRROR	BEHAVE		CHECKED		PROTECT
TROUBLE	FEALTY		MENTION		WHISPERING
ELEMENT	EMBEZZLED		FABRICATION		FRACTURE
FLEXIBILITY	FORGERY		WELFARE		PERTURB

CRICKET.

The following matches have so far been played by the Secretary's Office this season:—

(1) *Secretary's Office* versus *Exiles* (Eastern Telegraph Co.).—Secretary's Office 60 (W. C. Miller 24); Exiles 126 (D. McKenzie 7 for 49).

(2) *Secretary's Office* versus *Harrow Post Office*.—Secretary's Office 62 (J. C. Dixon not out 20); Harrow Post Office 49 (E. Rieusset 3 for 2).

(3) *Secretary's Office* versus *Alexandra Park*.—Secretary's Office 148 (D. O. Lumley 47); Alexandra Park 141 (P. P. Cove 3 for 27, D. McKenzie 4 for 42).

(4) *Secretary's Office* versus *Stores Dept.*—Secretary's Office 93 (P. P. Cove 21); Stores Dept. 166 (P. V. Townley 26, E. Rieusset 4 for 22).

MULTIVERSAL TEST SET.

MESSRS. SIEMENS BROTHERS & CO., LTD., have sent us a booklet giving particulars and instructions in the use of the above testing set. This booklet is issued by their associated Company, Messrs. Elliott Brothers (London), Ltd.

The more important characteristics of this set are the number of tests which can be made with it, the ranges of voltages being from 0.75 millivolt up to 1,200 volts and the current from 1 microampere up to any magnitude by means of external standard resistances or shunts, the instrument being direct reading in all cases. Insulation resistances and conductor resistances over wide ranges, fault localisation and capacities can also be accurately measured. Amongst the special features of this test set are that:—

The Insulation Switch and Standard Resistance are so arranged that it is practically impossible with ordinary care to damage the Galvanometer in the event of the insulation resistance being low and a high battery power being used.

The Galvanometer Shunt is of the constant resistance Universal pattern with five ranges. The Instrument is direct reading in millivolts and volts.

The Instrument and Shunts can be used as a Sensitive Galvanometer.

A pair of terminals (normally short circuited by a latchet), is provided whereby an external dial, slide wire, or other resistance can be connected into the variable arm of the Bridge, thereby extending the range of measurement at will.

In testing insulation the "Constant" is taken with the same battery power as used for resistance under test.

The Test Set can be used to test Armatures, Commutators, &c., both for insulation and short circuits.

CORRESPONDENCE.

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

Mr W. T. Cousins has been good enough to draw a comparison between Baudot and Wheatstone working which is very much to the disadvantage of the latter system; in fact, the impression it conveys is that of a snail-like Wheatstone System dragging itself wearily along behind the speedy Baudot in the ratio of 85 steps to 120.

In reality, a comparison between Wheatstone (or Wheatstone Creed) and Baudot, does not concern the respective alphabets in any way. Figures may prove that one alphabet is shorter than the other, but they have no actual bearing on the merits of the two systems concerned unless consideration is given to the degree of distortion permissible with the receiving apparatus actually employed by the rival codes.

Mr. Cousins states that a single arm on the Baudot will give a speed of thirty words per minute, yet he knows full well and we all know, that the Baudot circuit giving more than half that output as an average working condition, does not exist, and it is the "average working condition" which is the most convincing.

If the object of Multiplex systems is to fill the line time with working signals, the selection of the Baudot as an example is not a happy one.

A feature of Wheatstone working which commends itself is the ease with which the circuit operations can be observed by the supervisors. A Wheatstone Transmitter can be seen working 100 feet away, and when stopped, the fact that no slip is passing over the platform, or that the slip is not moving, is obvious to everybody. The speed of a Wheatstone Transmitter can be gauged by eye, and providing slip is fed into the Transmitter continuously (a matter of simple organisation), one can be certain that work is being transmitted over the line at a known speed without the waste of a fraction of line time.

This is not the case with the Baudot. Some Baudot operators miss cadences, unintentionally, perhaps, but nevertheless they are omissions which are difficult to detect. Then again, the Baudot key-clerk has to stop to time her messages, and perform other little clerical details relative to manual working. The amount of line time wasted in these operations in astonishing when analysed, and supervisors who are interested in keeping their staff-hour averages as high as possible could study this aspect of Baudot working with advantage.

Mr. Cousins further states that a line which will work at approximately 85 words per minute Wheatstone Duplex should work 120 words per minute (normal speed) on Baudot Quadruple Duplex.

There is a Wheatstone Creed Duplex circuit now working to London, and carrying 10,000 five-letter words every hour (85 words per minute each way) with a total staff of 14, including a traffic supervisor at each end. The traffic on this circuit (mostly short messages) rarely falls below 5,000 words and occasionally rises to 12,000 words per hour.

Would Mr. Cousins, in the capacity of a telegraph engineer, seriously advocate changing this line over to quadruple Baudot Duplex in order to obtain a 30% increase in its output?

If so, would he please tell us what staff he would require? and what arrangements would he make to ensure that the full output of 30 words per minute was maintained on each arm?—Yours truly,

June 15 ARTHUR JAMES POLLEY,

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 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. VIII. JULY, 1922. No. 88.

THE TELEPHONE GIRL GRADUATE.

TENNYSON'S oft-quoted prophetic phrase, "sweet girl graduates," has perhaps never before called up a picture of telephone switchboards or laundries, even though conducted on the most Utopian principles. Yet paragraphs with the above caption in *The Times* and other papers created considerable public interest in the early part of last month. The Savoy Hotel Laundry had advertised in *The Times* for a telephone operator, in whom courtesy, even temper and patience, coupled with a public school or university education, were the essential requirements. What appealed most to popular imagination was probably the fact that the offer of a position carrying £250 a year brought forth 800 applicants, a large number of whom were women graduates; but what is of more interest to our readers is the praiseworthy resolution of the advertisers to ensure that a competent brain was behind their telephone service.

By one of those curious coincidences, which do sometimes occur in real life, the advertisement referred to appeared in *The Times* on June 2, and on the same day in our contemporary, *Electricity*, appeared a series of paragraphs complaining of the vexatious delays the writer experienced in obtaining the desired department of a firm to whom he was telephoning.

"That the long-suffering and much-abused operator," he says, "is not always responsible for complaints levelled at the public telephone service of this country was brought home to me to-day, when, in a large northern city, I had occasion to call up one of the largest provincial branches of a leading electrical concern in this country."

He goes on to describe how he was switched on to four people in succession, only to learn ultimately that the goods he wanted were not in stock. Then, as though anticipating *The Times* advertisement, he continues:—

"Large firms do not attach sufficient importance to the intellectual and tactful accomplishments which go to the constitution of a private telephone operator. They are inclined to think that the job is only a routine one, and that any nicely spoken girl who can be relied upon to answer the fall of an indicator or the glow of a lamp signal will do for this function, and that when the board is not busy she can run errands or keep the firm's books and help out in half-a-dozen different ways. That is no kind of a solution of business telephoning. From the standpoint of outside clients, who, after all, are the more important from any firm's standpoint, the efficient telephone operator should be a personality: she is, in effect, a species of telephone hostess, receiving her employer's telephone visitors with an affable 'Yes, sir, and what can I do for *you*?' sort of air. She should be quick in her methods, and possess an invaluable capacity for soothing down irritation and ironing out trouble."

We adverted to the subject in an editorial in our April issue reiterating the truism that the subscriber plays as important part in the transmission of a call as the telephonist at the exchange, and it should be remembered that the subscriber, for all practical purposes, is the person who answers his telephone. We commend the example of the Savoy Laundry and, while the employment of "sweet girl graduates" is not imperative, we think that important firms owe it to their interest to ensure that their telephone is in charge of a competent and tactful person.

TELEGRAPHIC DEVELOPMENT.

IT is interesting to note in the *Journal Télégraphique* fairly complete statistical tables of telegraphic development for the first time since those relating to 1913. It is true that Austria, Russia, Italy, Bulgaria, Turkey, and Czecho-Slovakia do not furnish statistics for the year 1920, but with the exception of the first three all the principal telegraph-using countries are represented. The following is the development of wires in the larger States of Europe:—

Germany	2,362,023	kilometres.
France and Algeria ...	709,256	
Great Britain	470,148	
Poland	134,455	
Norway	131,224	(June)
Spain	117,878	
Hungary	80,405	
Rumania	73,178	
Kingdom of Serbs, Croats and Slovenes	71,526	

It would probably be found, if statistics were available, that Russia would take fourth, Italy fifth, and Austria sixth place. More than a dozen other States possess less than 50,000 kilometres of wire. On the other hand, if we regard the number of telegrams transmitted, Great Britain is first, France second, and Germany third, and the average number of inland telegrams per kilometre per year works out at about 139 for Great Britain, 67 for France and 27 for Germany, which seems to be a high testimony to the efficiency of the British wires.

It will be noted that some countries whose telephonic development is poor appear on the list of States with the largest mileage of telegraphs. On the other hand, Denmark, Sweden, and Switzerland, where the telephone development is high, have only

14,100, 44,515, and 33,365 kilometres of telegraph wire respectively. The area of Denmark and Switzerland is small and an extensive mileage is not to be expected, but this is not the case with Sweden, and there is no doubt that the universality of the telephone system in these countries affects the development of the telegraph unfavourably. It is obvious that to make a fair comparison the mileage of telegraph and telephone wire should be considered together, and then in relation to the population and area of the States concerned. But a difficulty arises, in that telephones should properly be considered in relation to population and telegraphs to area, because countries of vast extent require to be covered with a network of long lines, and again each telegraph line is in the nature of a trunk, while the telephone system requires a line for each individual subscriber. We hope at least to be able to give our readers a table of combined mileages of the principal States in an early issue.

HIC ET UBIQUE.

WE offer our hearty congratulations to Major T. F. Purves who succeeds Sir Wm. Noble as Engineer-in-Chief of the Post Office. Major Purves entered the service in 1889, became Assistant Superintending Engineer in 1905, Staff Engineer in 1907, and Assistant Engineer-in-Chief in June 1919.

As our readers may be aware arrangements had been made with the Dutch Administration before the war for the laying of a telephone cable between Aldeburgh and Domburg in Walcheren. The cable was actually manufactured, but it was of course impossible to lay it during the war, and it was used in 1917 to provide military and naval cross-channel connexions. In 1921 negotiations with the Netherlands were re-opened, with the result that a new Anglo-Dutch cable has been provided, which at the time of writing is in process of being laid. Telephonic communication with Holland should be an accomplished fact in the near future.

WE have observed before that the proposal of the Post Office to arrange the provincial sections of the telephone directory in one or two alphabetical groups for each section, was met by the objection that the subscriber would have to look through an inordinate number of Smiths in order to find the particular Smith he required. What would the objectors say to the Stockholm telephone directory, in which we note 66 columns of Anderssons, 63 columns of Johanssons, and 48 columns of Pettersons? It is interesting to find a considerable number of telephonists amongst telephone subscribers in Sweden.

As soon as we saw the heading "Telephone Girl Graduates" in *The Times*, we could foresee confusion arising in the public mind between the semi-secretarial employee actually referred to and the generality of exchange operators. Some of our more exuberant contemporaries have "gone in at the deep (or, we should rather say, the shallow) end." The *Sunday Express* foresees:

> Wanted.—Telephone Operators. Assyriologists preferred. No Astronomers need apply.

and asks: "What is to become of poor 'hello' girls now?" But there ought to be no 'hello' girls left by now according to Press prophecies. They were all promptly to disappear when an automatic exchange was opened at Hildesheim in 1908. We prophesy that 'girl-graduates' will prove a more chimerical menace to the telephonist than the automatic.

WE should not like to estimate at a guess the enormous increase in the number of telephonists employed in 1922 as compared with 1908, not only here, but all over the world. The Postmaster-General in his speech on the telephone vote, said that the head of the telephone system in the United States had told them that subscribers there preferred "jaws" to it, meaning the human voice at the switchboard. One daily paper reported this as "George" accompanied by the gloss that George was American slang for a telephonist. He said that the cost of instituting automatic plant in a complex system like that of London was at present prohibitive, so that the extinction of the telephone girls recedes into a still remoter future.

In the same speech he stated that he had secured estimates for telephone development amounting to £35,700,000 for the next five years, and foreshadowed a total of about a million and a half telephones in this country by April, 1927. A resolution authorising the issue of £15,000,000 for the development of the telephone system was agreed to.

MAJOR T. F. PURVES, THE NEW ENGINEER-IN-CHIEF OF THE POST OFFICE.

MR. VICTOR M. BERTHOLD, of the American Telephone & Telegraph Company, has kindly sent us a copy of his History of the Telephone and Telegraph in Columbia. The first telegraph line in the South American republic, was opened by an American Company in 1865, and the system was taken over by the State in 1869. It now possesses 20,597 km. of wire and 678 offices. Telephone service was started in Bogota in 1892 and the system acquired by an English company (the Bogota Telephone Co., Ltd.) in 1900. It now possesses 2,557 telephones. Various other private companies have opened exchanges in Columbia, which had a total of 5,935 telephones in 1920.

WOMEN IN THE CIVIL SERVICE.*

BY MISS L. M. HERRING (*Central Telegraph Office*).

(*Continued from p.* 145.)

Preferential Hours of Duty.

Some comment must be made upon hours of duty; the problem of attendances, as between men and women, arises only in the Post Office Department, and in so far as it adversely affects the attendances of men and the women's claim for equal pay, must be dealt with.

In the telegraph service men's attendances extend throughout the 24 hours. The proportion of women employed in an office is therefore a matter of serious importance, since women are, with few exceptions, precluded from the performance of duty after 8 p.m. or before 8 a.m. The women have no option, their conditions of service are not alterable, and the department have never offered equal pay with men on the condition of liability for all attendances.

To women desirous of bearing their share of the work of a public service the present position is unsatisfactory—they may not offer to perform all duties at their lower rate of pay, and the prospect of an agreement on the bigger question appears remote.

A proposal to exclude women altogether from work involving night and late attendances would not meet the position, because to bar them from work for which they are suitable would be merely to replace a disadvantage to men by an injustice to women.

Personally, I hope that women will seize the opportunity when it comes—to take a share of the late and night attendances—the payment of a special allowance to men for such duties constitutes an alternative, but I hold the view that women would harm their demand for a recognition of their equality, if they cling to treatment which can be termed preferential.

The claims of the women may therefore be summed up under the following headings:—

1.—Equal pay (which will mean recognition of the value of their work and freedom from the reproach of undercutting wage scales).
2.—Equal opportunities.
3.—A just appraisement of work performed.
4.—Freedom of choice of occupation.
5.—Equal status and authority.

Retention of Married Women in the Service.

Another vexed problem concerning the employment of women which will sooner or later become prominent is whether or no they shall relinquish their appointments on marriage. Opinion on the question has not yet crystallised, but there are indications that the regulation which compels women to resign on marriage will at least be the subject matter for friendly debate in the near future, and for that reason it would appear to be desirable that some reference should be made to it, not as a question for immediate practical application, but as one of interest to all those who are watching the progress of women in these days of their greater freedom.

Advocates of the rescindment of the regulation are careful to point out that their attitude towards the matter is to ensure *freedom* of choice, and in no sense involves *compulsion* for women to remain at their service occupation after marriage. They contend that women have three important human rights which are:

1.—The right to freedom of choice of occupation.
2.—The right to choose to be economically independent.
3.—The right to give of their individual best in service to the community.

And that, to demand from them the surrender of these, or their retention only on the condition of celibacy is to impose on women an entirely unjust limitation. Such arguments merit consideration, and it will be found that many who would oppose such a change do so for practical reasons and not in disagreement with the general principle.

Interests of Men and Women.

In work which is performed equally well by men and women the question arises as to how it is to be allotted to them. In the mind of a private employer the problem would receive scanty consideration—he would simply employ whichever worked out the cheaper. But while it is true that the gentlemen of the Treasury are inclined to see eye to eye with the outside employer in this respect, it is also possible to conceive of an earlier change of heart on the part of Government Officials than will be allowed to the average industrial employer by the traditions of his class. It is possible, therefore, to consider the question in the belief that its solution on a higher basis can be looked for as a practical possibility.

To judge fairly upon the claims of men and women in respect of any particular work, or of a certain proportion of a large block of work, needs more than the average amount of care and thought usually expended upon kindred subjects. So far as any particular work is concerned it would appear to be a question mainly of special suitability with the important proviso that to both shall be accorded ample and adequate opportunity of proving their fitness. And even here, provided the difference in suitability was not of any extent, it would better meet the claims of both to allot the *bigger* proportion of the specialised work to the best fitted, rather than to debar one sex altogether.

Men and women hold in common certain rights—they claim equally the right to be economically dependent only on themselves—women assert with men their interest to maintain a recognised equal status in the work of service to the community—in varying degrees both sexes lay claim to the recognition of their obligations to support others; and without doubt, parents contend that they have a right to place their daughters as well as their sons in positions that would ensure reasonable security and happiness.

All things considered, the summing up would appear to be that under present circumstances the responsibilities of men must entitle them to a larger proportion of general work, but that neither sex should be prevented from performing services for which their capabilities are beyond dispute.

Taking the large view of the world's affairs, it is interesting to note some remarks made recently by Miss Maud Royden on the position of women a hundred years from now. She claims for women greater ability in administration and in powers of organisation, and for men specialisation in creative work. While it is certain there would be differences of opinion between men and women on their respective abilities, the broad division she indicates would at least give to both a reasonably equal importance. To reach absolute agreement on such a matter would not necessarily be desirable. Sex rivalry without sex bitterness is quite a healthy state.

Referring to her mention of administrative work, a case could certainly be made out that it contains at least points of contact in opportunities for initiative and quick action, with work within the definition of the word "creative." And a further point might fairly be made that women have always possessed creative power but have not been given sufficient opportunity or encouragement to secure its development.

Special Contribution made by Women.

But apart from the question of the interests of women and men, it is important to consider whether women give a special contribution to the community in their work as Civil Servants. Women, feel, and in my opinion rightly, that they have just cause for resentment against those leaders of the past whose teachings inculcated ideas on women which caused men to regard government of a country, and all kinds of public work, as the particular province of their sex, and from which women must be rigorously excluded. And when women regard the parlous state to which the application through generations of the male point of view, has brought us in 1922, it is not surprising that they feel that such a failure should be educative and that the remedy is obvious. While it can only be a matter of conjecture, many thinkers of to-day hold the view that if the naturally higher value which women place on human life had been given a chance of authoritative expression a century or so ago, there would not have been a great war in 1914.

If this be only remotely true it means that in all matters of importance to the community the contributions made by men and women have their particular and often different values. Different not in quality but in kind.

Much could be said about the value in service rendered by men, but it is the business of this paper to focus attention on women's work.

Without detriment to men, it can be fairly well substantiated that women bring the Service special powers of orderliness in the disposal of work; a high code of honour in dealing with others; an unwillingness to throw blame on other people; quickness and adaptability. In one particular they possess a definite advantage over men. They are not blind, through familarity, to the many evil practices which men unconsciously tolerate under the excuse of the necessities of business competition. To all the experiences of a less-sheltered life, the modern woman brings as a heritage from the past a clearer and purer outlook, the value of which cannot be over-estimated.

Not less in importance to women is the consideration of what a life of public service can give to them as a sex and as individuals.

To many the outlet provided by their admission into the Civil Service has meant freedom from irksome dependence on relatives, and the consequent vigorous growth of a real spirit of independence. They have discovered wider interests and their education in the duties of citizenship has been materially advanced. A business training with office discipline and restraint has helped to build up character and develop personality. In no sense can it be said that any of these attributes would be wasted should there be resignation from the Service. If women choose to marry it is fair to assume that their business training will contribute something of value to the work of training their children. If they do not, they have the knowledge that in their office work, a service is being given to the community that at all times has its own definite value.

Civil Service Efficiency.

To attempt a defence of Civil Servants from the attacks being made against them at the present time is not the special purpose of this paper, except in so far as a presentation of the work performed by over 60,000 women constitutes of itself a contribution in refutation of some of the charges made. In any case the *future* of the Service is of far more importance than the mere correction of misrepresentations, and it is upon that note and the relation between it and the problems concerned in the employment of women that a paper such as this should conclude.

The ideal to be aimed at is obviously a service comprising a body of men and women giving their best, and thereby building up a public service efficient in the fullest sense. They should not be expected to be super-human. There should be room, without disturbing its general fitness to function, for the harmless ordinary rivalries and differences which go to make up human existence. The special contribution which each sex can give should have freedom

* A paper read before the Post Office Telephone and Telegraph Society of London, on Feb. 27.

to attain to its highest development. There should be justice between men and women, and a firm comradeship which would not only strengthen and beautify the Service, but would wield an influence over the lives of all concerned.

To many such a service may seem impossible of practical realisation. To others nothing is impossible. Our sympathies and belief should be with the latter. Obviously nothing can be achieved if nothing is attempted, and a belief in the building up of a public service that could challenge criticism from whatsoever quarter it might come, is the first step on the road towards its realisation. And for women and men mutually to assist cannot fail to produce in the course of time the result we all desire.

REVIEWS.

"Electricity." By Sydney G. Starling. Longmans, Green & Co. 245 *pp.* 10*s.* 6*d.*

This work, which is one of the series "Science in the Service of Man," is an endeavour to impart to the general reader the principles of the present developments of electricity, without resorting to the aid of mathematics, by simple explanations of the physical processes involved. The book appears to us to be lucid in style, and is illustrated by 127 plates and clearly drawn diagrams, ranging from the familiar magnetic lines of force to curves of the transmission of vowel sounds, diagrams of Poulsen arc circuits and photographs of the path of a beam of X-rays. The ground covered includes chapters on the elementary principles of electro-magnetism, the dynamo and electric motor, the principles of alternating currents, electric lighting, telegraph and telephone, and a fairly exhaustive chapter on the electro-magnetic theory, containing a history and explanation of the development of wireless telegraphy and telephony from the discovery of the Hertzian waves, the progress made by Thomson, Duddell, Lodge and the invention or improvements of the thermionic valve by Fleming and de Forest down to the present. The concluding chapters deal with gases and X-rays and radio activity. The author makes no claim to give the latest forms and types of such apparatus or methods as may be found in the current press, but he certainly achieves his object in reviewing the whole field of electrical achievement and explaining the latest principles in a style which may be grasped by any intelligent reader. The book is supplemented by a useful glossary of electrical terms in general use.

"In One Man's Life." Being Chapters from the Personal and Business Career of Theodore N. Vail. By Albert Bigelow Paine. Harper & Bros., New York and London.

Most inventors require the aid of some enthusiast and organising genius to develop the full commercial value of their invention, and Graham Bell certainly found such a man in Vail, whose varied life is very interestingly told in this book. It must be confessed that the lives of financial magnates do not commonly furnish very entertaining reading even when their beginnings have been humble, but the work under review besides doing full justice to Vail's courage and ability presents a lively picture of American life from the 'sixties onward. It is full of interest not only to the telephone and telegraph man but also to our readers on the postal side, containing as it does much information on the organisation of the railway mail system in the 'sixties of the last century. The author begins the first chapter by saying: "This is the story of a man and a period with a somewhat inclusive background. We may call it history, therefore, rather than biography." We can admit that the claim is made good.

Theodore Vail was born in the State of Ohio in 1845, and after receiving a moderate education entered a drug store at the age of 17 as a clerk. Taking an interest in telegraphy, he obtained work in a telegraph office in New York, but, at the end of the Civil War, his father having decided to start a farm in the West, Theodore joined in the adventure. It is amusing to learn that during this period he conducted a village school in that prairie region, although, as his biographer is careful to point out, his English was poor and his handwriting bad. Desirous of making more money, however, he became a telegraph operator on one of the rough newly-opened Western railroads, where he experienced exciting incidents with hostile Indians and snowbound trains. He next obtained an appointment as "route agent" (a kind of travelling postal clerk) on the Union Pacific Railway. Vail devoted his energies to reforming and expediting the happy-go-lucky mail service which existed in those days. Letters were often weeks, even months, on the road. The postal employee had no particular geographical knowledge, and, holding his place by political appointment endeavoured to get through his work with the least amount of time and effort, and draw as much pay for it as his influence at Washington could command. His good work brought him under the notice of George S. Bangs, who, when he became General Superintendent of the Railway Mail Service, appointed Vail his assistant. An interesting account of their efforts to reform the Civil Service follows, and after several contests with influential members of Congress they carried their point. They succeeded in establishing a 28-hour mail train between New York and Chicago in 1875 by which letters were conveyed more speedily than passengers. Theodore Vail succeeded Bangs as General Superintendent the same year and found the cares of office exhausting. A new Congress proposed to cut down the rate of pay to the railways and the existence of the new and successful special mail was threatened. "Blatant and bone-headed reformers," says our indignant author, "had set up a yammer for economy and this was the answer." By playing off the Central against the Pennsylvania Company Vail managed to re-establish the special mail service. An interesting light on American senatorial methods is quoted. Vail applied to Congress for a special appropriation for his fast mail scheme. A senator called upon him and offered to get the Bill through if he were allowed a commission of 10 per cent. on the sum obtained. He got it—by agreement with the railroads. That is the only time, said Vail, that I was ever a party to anything approaching graft.

About this time (1876) Bell's invention created a sensation at the Philadelphia Exhibition—but nevertheless the telephone was considered by business men as merely a scientific toy. Hubbard, Bell's father-in-law and Thomas Sanders, of Salem, financed him in his experiments, and formed the Bell Telephone Company, but found it extremely difficult to attract capital. Hubbard managed to communicate his enthusiasm to Vail, to whose eternal credit it stands that his foresight and his faith in the new invention moved him to resign his office in the Postal Department and undertake the organisation and management of the struggling Bell Company. The Postmaster-General upbraided him with considerable warmth for his folly in throwing up his post for a "damned old Yankee notion," but Vail soon brought chaos into order, the company began to pay a dividend, business waxed rapidly, and by 1880 the value of the shares had soared to such a height that Vail was a comparatively rich man. No difficulties could stop the spread of the all-conquering telephone. Vail resigned from the presidency of the Company in 1887 to take a much needed rest, and the following years of his life were somewhat chequered. The failure of schemes which he had financed crippled his fortune, but ultimately the success of his ventures in Argentina brought him to a period of great prosperity.

In 1907 the affairs of the Bell Company had become somewhat involved and Vail was recalled to the Presidency. The success and enormous expansion which that great Company has achieved under his guidance need not be enlarged upon here. He lived to see the service returned from the temporary State control which was set up during the War to the Company's management. By this time the Bell system controlled 11,795,747 telephones. It only remains to add that the book is most readable and full of matter of extreme interest to all concerned in the telephone service. We wish that we could spare the space to quote particulars of the early struggles of the Company, the establishment of the first long-distance lines and the gradual and astonishing triumph of Bell's "scientific toy."

The Cable Room Monthly, new issue, is a bright little periodical providing matter of something more than local interest. Articles

entitled "Lead on Signals," now running, give some interesting details in the history of telegraphic development, as, for example, the following minimum charges to the continent when the first Anglo-French cable was laid, viz., London and Paris 19*s.*, and Liverpool and Paris £1 11*s.* 6*d.*! This little venture, we understand, is part of a scheme of constructive effort on the part of the U.P.W., and its contents should, generally speaking, most certainly prove helpful in creating a growing interest in the craft of telegraphy.

The second volume of Dr. Eugen Nesper's *Handbuch der Drahtlosen Telegraphie und Telephonie*, is now published, a hefty tome of over twelve hundred pages. The mere cataloguing of its contents would alone occupy more space than we can spare, but we willingly give prominence to the fact of the publication of this highly interesting venture.

LIONS IN THE PATH.

THE following extracts from the diary of a Provincial Postmaster may be of interest to some. In order that no clue may be given to persons and places, the dates, &c., have been altered.

Sept. 13.—Heard to-day that line to XY is now in good order, having been rebuilt! This should at last enable us to get the Quad into good working order. It is an unusual circuit, being ordinary Quadruplex fitted with sounders, but with addition of Wheatstone receiver on our side. It has never worked really well since it was put in, and the experts say that trouble has been due to line faults, and "superposed" sections. Must take interest in this now, because if the line is good at last, the thing ought to work, and if it doesn't, I must know the reason why.

Sept. 14.—The Quad won't work! Watched the experts trying to balance. They asked XY for R and got the Galvanometer needle to steady itself, while they moved A key, by putting resistances in Rheostat. That seems simple enough, and means that resistance of artificial line now equals resistance of real line to XY. Key working on four channels seems to be fair, but they say the B side signals come out on A side, and that when XY runs its transmitter, our Wheatstone slip is simply hopeless and that B sounder is unreadable, wonder why? and ask expert why he doesn't balance against transmitter current, instead of against ordinary key currents. He seems to be rather tickled at this, so I fancy I have put my foot into it! Must not let him see too plainly that I don't know much about it! Must look up Preece and Sivewright on point.

Had great discussion to-day on point whether a major irregularity becomes a minor, or even a case for commendation, when officer concerned says he was too busy to do work properly, and apparently expects praise, instead of blame, for making an ineffectual struggle against great odds. His estimate of greatness of odds is not same as that of casual observers.

Our new motor van is running well. Heard that drivers get medals (or something of the kind) if petrol consumption is kept at about 40 miles to the gallon; or if they invent any easy way of getting the thing to start at the first pull up; or anything of that kind. Must watch what they get up to!

Sept. 15.—Quad won't work, XY wants to know why. Tell them don't know, but propose special tests. Am now fortified by idea that we must overcome not only R, but something called K (short for "capacity"—don't know why they spell it with a K, but that is a detail).

Made special tests for two hours, XY after first failure tried other set of apparatus, and we got good results. Hoped that thing was settled, but XY said they must go back to original set, and did so. Don't know what they were up to at XY, but our Rheostat had to be moved about at numerous changes made at XY, until we were rather fogged. We made about a dozen alterations, and were lucky once, but XY made some other change, and off we went again!

Sept. 16.—Had another shot at the Quad. Told XY in reply to usual enquiry as to reason why we could not read on B side, that it must be their fault, as they would not let well alone. This seemed to give XY food for thought, for they sent for engineer. He first of all gave us R, and we balanced against that. Then, to my astonishment, he said "here R and W." Experts puzzled to know what he meant, but guessed he meant to send transmitter current. My spirits rose after my set back on 14th! There was a difference in R and W, as compared with R alone, of 90 ohms in the Rheostat. Wonder if this difference is what upsets our working when attempt made to run full Quad. [Noticed curious kick in sounder to-day when balancing. Decided that condenser needed adjustment and tinkered about with it. Kick abolished. Evidently K needs watching as well as R.] Can't say that results were much better to-day—but am puzzled about curious observation made by engineer at XY. After giving us R, and then R and W, he said, "I will now put 90 in my 10 plug coil. Suppose he did so, but, if he did, result was not quite satisfactory. Quite clear, however, that he is trying to get rid of effect on our balance of change from key to transmitter working. We have to keep our Rheostat unchanged after balancing against R and W. That seems to be an advance. We have hitherto balanced against R alone, and have left Rheostat unchanged, but, of course, results have been bad. Trials suspended apparently because engineer had to catch a train!

Had great debate to-day about insurability of sub-postmasters. Read up a lot of Post Office circular notices on subject, and studied book of rules, now we must find out whether Sub-postmasters who have made declaration A have net income of £250 (including bonus) after providing premises and paying assistants.

Saw night mail out, must make note of date of Annual Report due in October.

Sept. 17.—Tried Quad again to-day, but did no good. Engineer had left his 10 plug coil behind, apparently, and must arrange next time to try effect of altering Rheostat when change made from key to transmitter working. That ought to keep our balance right!

Worried out to-day use of condenser and resistances on B side. The 50 ohms resistance prevents the discharge from the condenser from damaging the relay. The discharge from the condenser counteracts unfortunate effect of depression of A key on B sounder signals, and is helped in this good work by something called "self-induction" in the coils of the sounder. Gather that self-induction is a kind of disinclination to leave off work—quite unusual in the service. The resistances which can be adjusted are apparently intended to make the sounder speak up without becoming confused in its speech. This little side show interesting, but evidently not cause of our trouble. We get too many dots and dashes on our "slip" still, and now and then annoying gaps. Must be our condenser.

Sept. 18.—Took up the struggle again to-day. It is getting like the battle of Somme, for length, but is a good deal less harmful. We fixed up the condenser adjustment—fiddled about with the pegs till the last quiver disappeared from the galvanometer needle when we balanced, and did ditto with pegs in "retardation coils," a kind of ally of the condenser on the A side. Great triumph all round! We got a good balance. The engineer had his 10 plug coil and used it, so we did not need after all to meddle with our Rheostat after getting R and then R and W. We got the thing to work up to 70 words a minute on the receiver, and got good signals on the B side. We ought to get much more speed. Have now made fresh discovery! R and K are not the only enemies. "Self-induction," which is our friend on the B sounder, turns out to be an enemy on the A side. Have studied Preece and Sivewright Herbert, pamphlet for Skilled Workmen, and Technical Instructions, to see what his hostility needs. Gather that reluctance to cease work on part of coils of magnets in the Wheatstone receiver must be overcome by alteration of resistances in shunted condenser on A side. Very good diagram on this subject in Preece and Sivewright, &c.

If we can only induce the magnets to "speed up," we can get speed on receiver. Quite annoyed because Sunday labour has ceased in the Post Office.

The motor broke down to-day. Had cheerful half-hour watching postman overhaul his electrical bag of tricks and his carburettor. Found loose contact; tightened up nut; and the engine started.

Was nearly sold to-day over Rural Post case. Proposals put up at end of day showed travelling time over 6 hours! Must not overwork postmen, who do not suffer from "self-induction" as a rule.

Sub-postmaster called to know what would happen if he remitted cash to Head Office after banking hours. Strict orders that he must remit through bank, as he is our "accountable receipt" system. He doesn't want to keep a lot of money over night, and sometimes gets a lot after the bank closes. Told him to send it to Head Office, and "wait and see." Expect to get into hot water over this some day!

Sept. 20.—By altering resistances to-day in condenser on A side, we got Quad to work fairly well at 120 words a minute and reliably at 100 words a minute. This probably good enough, so will be content to let well alone for a bit. Had usual Monday morning trouble in balancing. Think this because clerk at XY has been changed through rotation, and does not know virtues of 10 plug coil.

Am wondering why when a Quad of this kind is fitted up, the Engineering Branch does not supply normal adjustment figures for Rheostat, retardation coils, condenser, and condenser resistance. If we had had normal figures as a guide, we could have made adjustments easily by working small variations. Must now write an essay for future guidance of overseer on duty here!

Now understand what Christian felt on his pilgrimage, when he met lions in the path, and found, on boldly walking up to them (with fear in his heart) that they were all held on short chains, and that they looked a deal worse than they really were.

Sept. 21.—Collapse to-day. Sudden new development. When transmitter is running at XY signals appear on our B side. Wonder why? Tell XY that his signals are bad when he is working on both channels at same time. He changes his key, but no good result. Evidently the adjustment at XY to meet change of total resistance when transmitter is in use does not quite meet the whole difficulty. But our A side is now O.K., so that is all to the good. Must now struggle with B side. How can we shut off unwanted current from B sounder: should we put in resistance between relay and B sounder, and switch it in and out when necessary?

Study Technical Instructions and Herbert as to construction of B side relay. Find that to clear A marks off B relay, the distance of armature from cores of magnet in the inside of the thing must be increased. Can we find adjustment which will meet working needs under both sets of conditions with which we are struggling?

Sept. 22.—Found to-day that armature of magnet in B side relay would stand movement away from cores to meet needs pretty well. Will watch results for day or two. If we cannot get one relay to do all the work, must suggest that two relays be fitted—one to work with key currents, and other to work with the different current which we receive when transmitter and B side are both working.

Begin to wonder how engineers sleep at nights. They must have solid constitutions. Will not be able to do much more for a few days with Quad beyond watching progress, as am now overwhelmed with papers about education of boy messengers, sub-office scale payments, sub-office surveys, &c., but have had a most interesting time so far.

THE BAUDOT.—XXXIV.

By J. J. T.

In the two or three articles which still remain to be published, it is intended to touch upon certain developments of the Baudot system. The first of these was introduced by Mr. Donald Murray, to whose courtesy I am indebted for the original prints from which our artist has produced the four black and white sketches, which

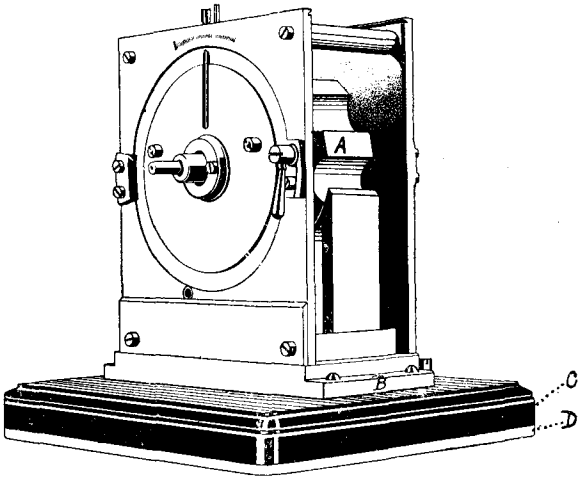

Fig. LXXXI.

now follow. Fig. LXXXI shows this, the phonic wheel and motor A, as fitted inside an ordinary Baudot distributor casing, from which the usual extended axle and governor and all the internal gearing except the epi-cyclic and correcting mechanism have been removed. A cast-iron metal base B (Figs. LXXXI—LXXXIII) is provided and screwed to a polished wooden stand C to the under side of which is fixed a pad of felt D. Figs. LXXXII—LXXXIII give side and full views respectively.

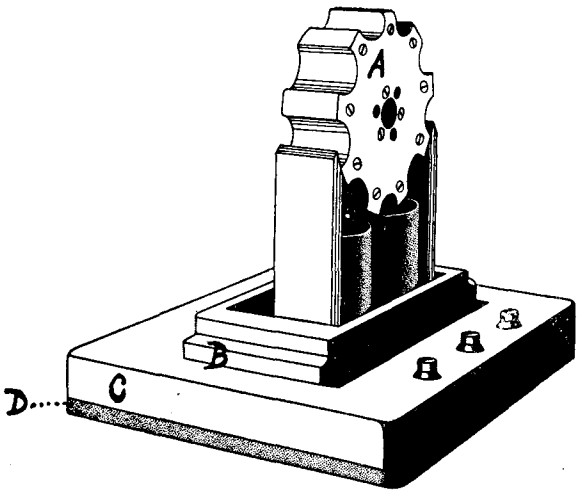

Fig. LXXXII.

The phonic motor consists of a cast-iron wheel and two electro-magnets. The inside of the wheel is grooved, the groove being filled with crumpled iron wire and mercury to produce absolute steadiness of running. The whole is covered by a circular plate fixed by means of a dozen screws. The motor is designed for a maximum speed of about 300 revolutions per minute. The rotary movement of the wheel A is governed and driven by a vibrating reed, one end of which is fixed to an iron base. The vibration

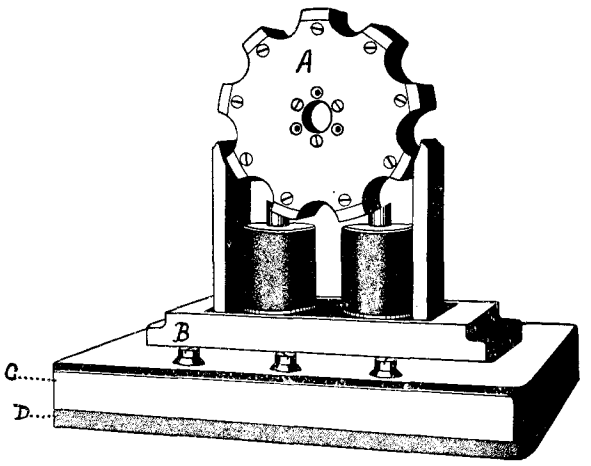

Fig. LXXXIII.

of this reed between two contacts alternately energises the electro-magnets of the phonic wheel, the progression of the latter being determined by the rate at which first one and then the other of the electro-magnets is energised and first one and then the other of the twelve "teeth" of the wheel are successively attracted. The action of the crumpled iron wire produces sufficient interior friction to give the mercury a hold on the wheel, while the mercury adds to the inertia of the wheel, practically converting it into a fly-wheel.

(To be continued.)

OUR BOYS.

The closing meeting of the Gymnastic Class of the "G.P.O. Messengers' Institute," held at Throgmorton Avenue on May 26, was presided over by Sir William Noble, who was accompanied by his daughter, Mrs. Gisborne, and supported by an enthusiastic company including parents and other friends of the boys. Medals, the gift of Mr. W. T. Leech, were handed to the winners by Mrs. Gisborne. The Institute, said Sir William, shows the Department's interest in the welfare of the boys. In his early days nothing at all was done for boy messengers, and only those boys who had ambition attended evening classes. Happily things had changed, and he felt sure that the boys would repay the Department for the interest taken in them.

The novel feature of the evening's entertainment was that it was provided entirely by the members of the Institute. The Instructor led his team through creditable performances on the horizontal bar, parallel bars, vaulting horse and pyramids. Messenger Coe recited, Messenger Braben sang (accompanied by Mr. F. G. Price), Messenger Lambert gave a violin solo, and Messenger Lovejoy extemporised with the Indian clubs. Great interest was shown in a new turn called "Institute Pastimes," one of which, "skinning the eel," provoked much mirth, as also did the tumbling and Japanese wrestling. The surprise of the day was the appearance of an "Institute Orchestra," which acquitted itself with such skill as to win a vociferous encore. The visitors expressed unreserved pleasure at the display given, both athletic and artistic, and the whole-hearted manner in which the boys took their part gave eloquent testimony to the popularity of the versatile leader, Mr. Keay. We know of no tonic like a night with the boys of the G.P.O. Institute. In responding to a vote of thanks, Sir William Noble generously promised to present two prizes for competition next year.

Belgium is open to the service. A modified form of continuous attention is in force on Paris, Brussels and Antwerp, and excellent paid time results are obtained.

The night service hours are from 9 p.m. to 7 a.m. in summer, and 8 a.m. in winter. During the night period we have ordinary and *abonnement* calls. The latter are somewhat similar to the fixed time calls of the inland service. The call is connected at the time required by the subscriber. The minimum duration is 6 minutes per night for one month with either a reduction of the day rate or double time at the single day rate. This service is used by the newspapers and Press agencies.

It is probably known that French is used for operating purposes at all times. The staff is at present recruited from telephonists in the London Telephone Service who, in the case of day staff, have completed 6 months' service in a local exchange. They are tested in French by Trunk Exchange officers, and if found satisfactory or considered worth a trial, are given 3 months' training in the Foreign Section. If at the end of this period they are considered efficient from the language and operating point of view, they are certified as elegible for the language allowance. It appears that there are very vague ideas in existence about the standard of French required, and it may therefore be useful to give some definite idea of our requirements.

The language test is for the purpose of finding out how much the candidate knows about the language, and how much more she is likely to know. Each candidate is examined separately, and there are never more than three people present. The examiner wants the telephonist to talk and to keep on talking about anything. The choice of subjects is unlimited and certainly no objection will be raised to "hats" or "the skirt question."

Attention is given to clarity and facility of expression as well as to correct grammatical construction of sentences. Don't be afraid of mistakes, the examiners are accustomed to them and not infrequently they add to the joy of life. On one occasion a candidate said that he liked the books of a well-known author. He was asked why, and replied to the lady examiner "Parce que je t'aime." The necessities of the Anglo-Continental service require a fairly high standard, and the department has the right to expect it. It is hoped that the examination will shortly be placed upon a broader basis to give greater satisfaction to all concerned.

It should be understood that there is no time to teach French at the positions during the 3 months' trial. Operating phrases have, of course, to be learnt, but the candidate is expected to prove what practical use she can make of the language as a telephonist. Difficulties have to be explained and subscribers assisted on the continental lines even more than on inland lines.

There is plenty of work between 9 a.m. and 6 p.m. and it is more trying than inland operating. Some relief is afforded by the clerical work which includes the preparation of daily and monthly revenue and traffic returns, replies to written enquiries *re* complaints from Continental subscribers. The complaints are made to the administration concerned, and a statement is then sent to the London Telephone Service by that administration so that we do not get the benefit or otherwise of any observations on the service that the complainant may have made.

The possibilities of the Anglo-Continental service are very great. The traffic is waiting, but we require lines. There will shortly be a direct service to Amsterdam, which opens possibilities of use for Anglo-German traffic. It will probably be inadequate even from the outset, but it will be a beginning. The point can be put in a few words. If 14 lines are insufficient to meet the requirements of a country 25 per cent. industrial, how many lines will meet the requirements of a country 75 per cent. industrial, even if the traffic is indirect ?

The French administration advertises a service to Rome *via* Turin, Barcelona *via* Cette, and to Breslau *via* Berlin. May we not hope that we shall soon be in a position to do the same ?

A problem that might usefully be taken in hand is the one relating to international operating procedure. The rules vary in each country, and there is no doubt that unification would materially help and result in increased revenue. Perhaps the 1924 Conference will do something in this direction.

The biggest problem in international telephony is that of frontiers. There are about 30 separate administrations in Europe, each with its own system. One day we may have a central international telephone authority for the whole of Europe with power to make decisions and authorise expenditure. With such an authority the possibilities of international telephony are greater than ever.

A few up-to-date traffic figures relating to the Anglo-Continental service are appended. Calls are considered in terms of "units," *i.e.*, periods of 3 minutes. On the total traffic the incoming is higher than the outgoing. This is partly due to the low exchange rates of Continental currencies and partly to the longer business day.

A comparison of the monthly totals of traffic show an all-round increase.

	July, 1921.	*April*, 1922.
Outgoing	14,212	15,515
Incoming	19,677	22,834
Total	33,889	38,349
Per cent. lost time due to faults ...	28	28

The increase in Anglo-French provincial traffic is seen by comparing the following monthly totals :

	July, 1921.	*April*, 1922.
Outgoing	1,364	2,074
Incoming ...	2,027	2,861
Total	3,391	4,935
Per cent. lost time due to faults ...	28	28

Traffic and Revenue figures. Busy hour Paris, Brussels, and Antwerp.

Tickets.	*Units.*	*Paid Time.*	*Revenue.*
108	205	41.5 mins.	*£70 12*s.* 0*d.*

* Excluding local fees.

Paid Time Results.

PARIS.

Maximum Paid Time (10.30-11.30 a.m.)) ...	42.2 mins.
Average 10 a.m.-5 p.m.	35.3 ,,

BRUSSELS.

Maximum Paid Time (11 a.m.-noon) ...	49.2 mins.
Average 10 a.m.-5 p.m.	33.9 ,,

ANTWERP.

Maximum Paid Time (10.30 a.m.-11.30 a.m.)	51 mins.
Average 10 a.m.-5 p.m.	40 ,,

SWISS TRAFFIC.

	Bookings.	*Effected.*	*Cancelled.*
Jan. 31, 1922	96	38	58
May 11, 1922	137	50	87

The GENOA TRAFFIC figures may be interesting.

	April 10 *to May* 29.
Outgoing	54
Incoming	115
Effected	124
Ineffective	45

The ineffective total includes calls booked during the day period and cancelled before passing to Paris.

THE TELEPHONISTS' COLUMN.

"TALK OF MANY THINGS."

FOR some time consideration has been given to a proposal to introduce a new feature into the JOURNAL, with a view to bringing the telephone staff in London and the Provinces into closer touch with each other by the exchange of items of information of general interest to the exchange staff as a whole.

Through the courtesy of the Editor, a column has now been set aside for the purpose, and it is hoped that supervisors and telephonists through the country will contribute to it. It is unfortunately impossible for us to have personal association with all our colleagues in the Provinces; we cannot all meet; the most elaborately organised "rally" of the operating staff, even if it were practicable, would be only very partially representative. But in this column, each one who contributes has an opportunity of talking to all her colleagues, and in this way we may extend the circle of our comradeship to include many beyond our local acquaintances in the Service. "C.N.B." in "An Apology," quoted below, says, "I read every word of the *Telephone Review*" and got lots of tips about difficulties galore that I never dreamed of!" Let us have those tips. Let us hear of the difficulties experienced, incidents in the local Exchange life, or subjects of wider reference to the whole Service which you notice or read about. "Is it not knowledge," says Bacon, "that doth alone clear the mind of perturbations?" It is the hope of the writer that this column will be the means of at least minimising some of the "perturbations" encountered, and of bringing us into closer sympathy with each other.

Since this is the inauguration of a column devoted chiefly to feminine interests, it is appropriate, perhaps, to begin on a sympathetic note, and to print some thoughts that were suggested after reading Miss Dorothy Turner's plaint, "I have been late."

TO MISS DOROTHY TURNER.

You have been late! That fact I'll not deny,
Nor rigid punctuality decry;
But those who judged, and sent you to your fate—
Have *they* been late?

You have been late! The radial cannot lie,
Yours to repent; yours not to reason why;
But are Attendance Books inviolate?
Have they been late?

You have been late; of cash have been bereft
If you were judge, how much would *they* have left;
Unholy thought! Who then would dare to state
They have been late.

You have been late. Time, tide, the Motor Bus,
Will not turn back for any one of us,
And e'en Canute—no more I'll hesitate,
They *have* been late!

From an American contemporary. London papers, please copy!

DEAR SIR,

Ever since I was a kid
Old enough to use a telephone
I have thought telephone operators
Were a bunch of dumb bells;
And the first thing I learned
About the telephone
Was to kick about the service.
And I always thought
The best jokes in the papers
Were the ones about operators
And wrong numbers
And busy wires
And etc.
But last summer
I went to the mountains
For a vacation
And I met a young lady
Named Carrie,
And I thought to myself:
"What a mighty pleasant creature,
And what a smile!
And also what a voice!"
So when I found out
She was a telephone operator
I thought, "Gee!
At last the voice with the smile."
And she told me
How she liked her work
And some things about it
And about the girls
At the Central office,
And I began thinking
That if they were the boobs
I always thought them to be

AN APOLOGY.

A girl like Carrie
Couldn't rave about them;
So when I got home
She sent me a copy
Of the *Telephone Review*
And I read every word
And got lots of tips
About difficulties galore
That I never dreamed of;
And kept on thinking
The thing over
And remembered
That in everything else
One mistake in a hundred starts
Is considered
A good average;
So I just kept track
Of my telephone service,
And I must admit
That I'm the boob
I thought the operator was,
And every time
I take down the receiver
And hear the cheerful voice
I now always
Recognise the smile
And want to apologise
For my past thoughts
And words;
And won't you let me
Through your magazine
Tell every operator
That I'm sorry
AND SHE'S WONDERFUL?

Yours truly, C. N. B.

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

LONDON TELEPHONE SERVICE NOTES.

Messenger Boys' Institute.

THE writer was privileged to attend the annual Prize distribution and Gymnastic display at the Messenger Boys' Institute at Throgmorton Avenue, on Friday, May 26. In the past it was the practice for the boys to give the displays and for visitors to provide the musical items, but on this occasion the whole programme was given by the boys, and well they acquitted themselves. Under the direction of Mr. Keay, their energetic and enthusiastic instructor, the boys gave a splendid display on the horizontal bars, parallel bars and vaulting horse. Not the least active boy was one we will call Peter Pan, because, at the early age of 16 he stands in danger of being retired because he does not grow up to the requisite height.

The chief item of the musical programme was the first performance in public of the Institute Orchestra, which had been started by the boys on their own initiative, but they roped in Mr. L. Prossor of the Traffic Branch as a coach, with the result that they put up a very good show. A better combination than physical exercises followed by music as recreation for the boys, would be hard to find.

Lady Noble was, unfortunately, not able to be present to distribute the medals, but in her absence Mrs. Gisborne officiated. Sir William Noble, who presided, spoke well-chosen words of advice and encouragement to the boys, and in token of his last attendance at an official function in his capacity as Engineer-in-Chief, promised two prizes for next year's event.

* * * *

Revision of Telephone Charges.

The revised charges which come into force on the 1st of the month can be summarised into a short paragraph, as indeed they were in a recent issue of the JOURNAL, but this gives no idea of the activity behind the scenes. A revision of charges increases the work of all branches enormously, the brunt of it falling upon the Accounts and Traffic Branches. The current work must, of course, go on, but preparation has to be made in advance for concessions to subscribers to be passed on to them by the time they are due. In the Accounts Branch the ledgers and installation cards have to be amended to allow for reduced rental and mileage charges where applicable, and all adjustments have to be carefully scheduled for audit purposes.

In the Traffic Branch preparation has to be made to instruct the operating staff in time for the new conditions to be understood. Call office attendants have to be instructed and many others who attend to the public, at large and small Post Offices all over the town have to be informed of the new conditions.

It is probable that the reduced afternoon rate will encourage subscribers to hold over unimportant calls from the morning. It will be interesting to watch the traffic returns to see to what extent this is done. If it occurs to any great extent, it will have far-reaching effects on equipments and staffing problems.

* * * *

L.T.S. Swimming Association.

In order to cater adequately for its large membership the L.T.S.S.A. have arranged for two galas at the end of the season, to be held on Sept. 15, and Oct. 6, at the Pitfield Street Baths, Hoxton. The reason for changing the venue this year is due to the necessity for providing increased space for spectators. Another drawback which will be overcome is the engagement in several events on the same evening by the same competitors. So keen are all concerned to put forward their best in the championship events that in the past there has been considerable risk of the best swimmers becoming over-fatigued.

* * * *

"Maryland."

Some of us have probably been struck by the strangeness of the name "Maryland" for one of the exchanges recently opened in the London district, and have been led to wonder as to its origin. Maryland, Stratford, was in all probability named after Maryland State, U.S.A. Maryland Point is a cluster of houses near Stratford. The first ones were erected by a merchant who had a fortune in Maryland, U.S.A., and from that colony it is stated, they took their name.

So far as Maryland, U.S.A. is concerned, the name "Maryland" (Terra Mariae) was bestowed upon the colony by Charles I. in honour of his Queen, Henrietta Maria.

The Charter of Maryland, which constituted the first proprietary government established in America, was obtained from Charles I, by Sir George Calvert, first Lord Baltimore, who had been one of the principal Secretaries of State to James I. Lord Baltimore died before patent passed the Seals, and it was issued to his son, second Lord Baltimore, June 20, 1632.

In 1633, Lord Baltimore dispatched a number of emigrants under command of his brother, Leonard Calvert, to colonize the territory. They settled at St. Mary's on March 27, 1634, and the first legislative assembly met February, 1635.

WHERE TO STAY.

The attention of our Readers is directed to the following list of Boarding and Apartment Houses.

BOURNEMOUTH.—"Glen Cora" Boarding House, Hawkwood Road, Boscombe. Superior and Comfortable "home from home." Central and few minutes from sea. Liberal table. Highly recommended. Stamp for tariff. Mr. and Mrs. Halliday.

BRIGHTON.—Rusthall Boarding Establishment, 11-12, Cannon Place Central. One minute West Pier. From 2 guineas weekly.

DEAN FOREST.—Severn-Wye Valleys. Beautiful Holiday Home (600 ft. up). 60 rooms, extensive grounds, motors, golf. Boarders 47*s.* 6*d.* to 63*s.* Prospectus—Littledean House, Littledean, Glos.

SHANKLIN.—Glenavon Private Hotel. Comfortable, homely. Brd.-res. Electric light, billiards. Excellent cuisine, first-class reputation. New management. Mrs. Geere.

SHANKLIN.—Comfortable board-residence, central position, close sea, liberal table, moderate terms, recommended. O.P., "Stockland," St. George's Road.

TORQUAY.—Homely board-residence, central for everything, 3 minutes Strand, Shops, Trams, Harbours, Piers, Promenade, Seafront, Pavilion. Good cooking, recommended, no children,—Pridham, 2 St. John's Place.

HOLIDAYS IN NORTH WALES.—Sea and mountains, mild climate, beautiful excursions. Comfortable, refined and magnificently situated Guest House, in extensive grounds. Produce from own gardens. 52*s.* 6*d.* week, inclusive. For full particulars write Corresponding Secretary, Bryn Corach, Conway.

The Baltimores were Catholics, and Maryland was designed to be a place of refuge for English Catholics ; but from the earliest period religious toleration for all Christians was proclaimed and practiced.

Maryland has always claimed the honour of having been the first Government in which liberty in matters of faith was established by law.

* * * *

Culled from the Exchanges.

Items under this head are not so numerous as usual, and it may be that the drought is responsible for the small crop. The compilers of these columns are anxious for contributions to be sent along from the exchanges regularly, if possible, although they do not go so far, of course, as to suggest that functions should be arranged for their special benefit so that notes shall be forthcoming.

Hop Exchange.

A very successful outing was given to 190 poor children by the staff at Hop, on Saturday, May 27. The children, who were drawn from the Mint Mission, Borough, the Ragged School Mission, and the Lycett Mission, East End, were taken to Chingford by char-a-banc, where a good substantial tea was provided at Rigg's Retreat.

After tea, races were arranged, where the competition between the schools caused some amusement.

It is always a great pleasure for the Hop staff to have their old chief with them, and on this occasion Miss Ashmead kindly consented to give away the prizes. The Children's Outing Committee wish to thank Mr. Beaumont and Mr. Law for the valuable assistance they rendered, and take this opportunity of thanking members of the staff who attended and the Superintendents of the schools for their help.

* * * *

Regent Exchange.

MONDAY MORNING.

Oh, the sun is warmly shining just the same as yesterday,
And the trees, I make no doubt, are just as green,
Along the lanes they border, all aleaf down Richmond way,
With the river glimpsing silver in between.

But it might as well be pouring hail and sleet and snow and rain,
And the birds might croak and trees turn drab and gray,
For I'm slogging hard at work and saying "Number please," again,
Just as if there'd never been a yesterday.

Oh, it's base ingratitude to talk in this way, I suppose,
And I guess I'll just get used to it again,
But the week-end seems to spoil me for the job of "dousing glows,"
And I'm full of little moods I can't explain.

It started from the moment when I reached the switchroom door,
As I sniffed again the grim, official smell,
And I trod the dark stone stairway which I've trod so oft before,
And which leads to regions very near to —— well !

When I donned the same old instrument and ragged switching gloves,
And otherwise prepared me for the fray,
For it's *work* I'd got to think of, not the little joys and loves
That make yesterday so different from to-day.

Don't you see? It's Monday morning and I'm "fed up" to the teeth,
You all know what it is—you've lived it too !
But the proper sort of spirit's lurking somewhere underneath,
So I'm going to "buck me up" and help it through.

DOROTHY TURNER.

A LAMENT.

TO A SUPERVISOR UPON BEING TRANSFERRED TO ANOTHER EXCHANGE.

Our Supervisor now departs,
Weary are our broken hearts.
Ah ! now we say with many a tear,
"To those who knew thee, thou wert dear."

Subscribers often used to "straffe,"
Then thou would'st cheer us with a laugh.
Now when of thee we sit and think,
Our spirits down to "zero" sink.

We cannot now thy features see,
We miss thy smile at the "I. D.,"
The silv'ry sweetness of thy voice,
That used to make our hearts rejoice.

Perhaps we'll meet thee in that land,
Where telephones soil not the hand.
No supervisors then we'll need,
But on thy love and laughter feed."

G. M. TURNER.

LONDON ENGINEERING DISTRICT NOTES.

The Engineer-in-Chief.

SIR W. NOBLE, who in the course of his career served both as Assistant Superintending Engineer and as Superintending Engineer in the London District, handed the chains of office on May 31 to his successor, Major Purves. There can be no doubt that the Engineering Department as a whole is delighted that Major Purves has been honoured by promotion to one of the premier positions, if not the premier position in the engineering profession in this country. It is a work of supererogation to paint a lily and it is sufficient to wish the new Chief every success in his new position and to assure him of the loyal support of every member of the engineering department.

Contracts.

The policy of the department is that certain classes of work shall be put out to contract. The reasons for such a policy need not be detailed here, but certainly there is no doubt that the work could be done quite satisfactorily by the Department's own staff as has been proved in several instances. The policy, although it results in a smaller permanent staff of workmen than would otherwise be required, places upon the engineers a considerable amount of work and responsibility in connexion with such works.

The following are some particulars of procedure relating to contracts :—

Lists are held of approved firms willing to undertake contracts for Post Office works, and invitations to tender are issued when the "lay out" of plant has been approved and funds are known to be available. The Department's form of tender and contract for underground work is a printed document of 44 pages. It embodies the Conditions of Contract, and a specification comprising five schedules indicating the scope of the work and the manner in which construction shall be carried out, and it allows for the insertion of rates which the contractor proposes to charge for specified items of work to be carried out under given conditions. Drawings explanatory of the details of pipe and conduit laying and jointing chamber construction are supplied.

A contract is created by the acceptance of an approved signed tender by or on behalf of the Postmaster-General.

The charges for the work are brought to account by means of day to day certified entries in a diary which is kept on the work. The diary entries are summarised by the contractor and carried into priced accounts, which are rendered to the Superintending Engineer. Payments on account as the work proceeds and a final payment upon completion, are made in accordance with a payment clause in the contract. Certificates for payment in respect of work completed are given by the Superintending Engineer and by the Engineer-in-Chief, and warrants in accordance with such certificates are forwarded to the contractors by the Accountant-General.

One of the duties of the engineer during the progress of a contract is to satisfy himself by an inspection of the contractor's wages sheets, that the "Fair Wages Clause" of the contract is being faithfully carried out.

The work is kept under constant supervision on behalf of the Department in order that it may be ascertained that the rate of progress and quality of work are satisfactory. Every portion of the work is checked to ensure that it is in accordance with the specifications and drawings or patterns.

During the financial year contracts were let in the London Engineering District involving payments to contractors of a sum approaching three-quarters of a million pounds.

Among the larger works completed during this period may be mentioned the London portions of the London-Manchester, London-Southampton, London-Barnet, London-Brighton, London-Weybridge, and London-Uxbridge main cables. Heavy duct routes have been laid in such important thoroughfares as Ludgate Hill, Gracechurch Street, Fenchurch Street, Eastcheap, and Mark Lane in the City of London, and a considerable mileage of conduit has been provided throughout the various sections of the district.

Despite labour and transport difficulties hampering manufacturers, exchange equipments or extensions have been completed and handed over by the various contractors at Avenue, Clerkenwell, Harrow, Hornsey, Lee Green, Maryland, New Cross, Streatham, Toll and Willesden. Exchange equipments at present in the hands of contractors include Barnet, East, Gerrard, Hop, Ilford, Tottenham, Walthamstow and Wembley. An interesting work about to be undertaken by contract is the adaptation for receiving Post Office cables of the brickwork and steel tube, lately the property of the Pneumatic Despatch Company, which runs between the G.P.O. building in Newgate Street and Euston, *via* Holborn and Tottenham Court Road. On April 12 the Postmaster-General presented to the House of Commons "a Bill to confirm an agreement made between the Pneumatic Despatch Company, Limited, and the Postmaster-General for the acquisition by the latter of a certain tube running between St. Martins-le-Grand and Eversholt Street in the Metropolitan Borough of St. Pancras, and for purposes connected therewith." The measure was read a first time. This tube has been derelict for a number of years and when restored will prove a valuable addition to the Post Office underground system.

"Where the Rainbow Ends."

Youths seeking employment in the present year of grace frequently have, owing to restriction of employment, many disappointments before they obtain an appointment. But they are, generally speaking, better equipped for

life's struggle than their progenitors. It is painful to those whose duty it is to have to inform promising youths that there are no vacancies, especially when the applicant is convinced that he possesses a rudimentary bâton which he is certain will act as a magic wand and carry him swiftly to a position in which he can wield it as a fully developed emblem of authority. Such a youth is evidently one who wrote as follows :—"What I desire to impress upon you is, I do not want a big wage, but only a chance to improve myself, just a little start at the bottom rung *and the rest may be left entirely to me*"

Awards For Suggestions.

The 50th list of awards has been published, and it is gratifying to note that members of the London Engineering District take nine of them. Five of the suggestions refer to telegraphs and four to telephones. The recipients have a much greater reward than is expressed by the cheques, namely, the feeling that they have contributed something to the improvement of the service that is of such value to mankind. They are, in fact, public benefactors

Wireless.

At the present rate of progress it will soon be difficult to find anyone who has not taken out a licence for the reception of wireless signals. It is natural that members of the Engineering Department should take an interest in this subject as they certainly are doing, judging by the large number of applications for permits. Demands are also flowing in at an ever-increasing rate from members of the public. People who don't know the first thing about electricity and magnetism are beginning to talk glibly about wave lengths and close couples. It is to be hoped that the interest in wireless will not meet the same fate as other inventions of the *Daily Mail*, the *Daily Mail* hat for instance, which is as scarce as a halfpenny daily paper. By the way, is it not time that the *Daily Mail* was reduced to its pre-war price of one halfpenny, or are the expenses of producing a paper in the interests of economy on the part of others too great ?

Pneumatic Tubes.

According to "Scientific American" sending telegrams by compressed air is the latest innovation in American telegraph methods. Greater speed and efficiency and perfect accuracy are the reasons given by the Western Union Telegraph Co., for its recent expenditure of millions of dollars in building underground pneumatic tubes radiating from its central operating rooms to its numerous branch offices in the larger cities of the country. The tubes are of copper encased in creosoted wood ducts. If readers will turn to the November, 1921, number of this JOURNAL, they will obtain some particulars of the pneumatic tube installation in London. The system has been in use in this country for very many years.

Atoms.

Professor Rutherford's *Kelvin Lecture* on the Constitution of the Atom has engendered in one student a desire to make a detailed study of the subject. As a first step he is making a collection of relevant literature and has already purchased Marie Corelli's *Mighty Atom* and *Secret Power*.

Making a Water Reservoir Speak.

For many years water engineers have been experimenting with apparatus which would automatically indicate to the responsible officer who may be stationed some miles away the level of water in each reservoir. A number of systems are in use, and have met with varying degrees of success.

A disadvantage of most of the existing systems is that the height of the water is shown on an indicator located at a particular point, and that if no one is permanently stationed at the point where the indicator is situated, a special journey may be necessary in order to ascertain the state of the reservoir.

A system is now upon the market in which the use of a gramophone in connexion with a water float and a line to the public exchange, connected up in the same way as an ordinary exchange line, will permit any water official to make a call to the allotted exchange number and to receive information as to the exact height of the water without any human intervention except that of the exchange operator.

The operation of the system is briefly as follows :—

A water-float at the reservoir connected by a system of cords and levers to the needle of a gramophone and the movement of the float causes the gramophone needle to travel in a horizontal plane over the disc. Normally the gramophone disc is still and the needle is not in contact with the disc. The gramophone is connected through an induction coil to a public exchange circuit to which an exchange number is given. The insertion of a calling plug in the exchange number causes the disc to revolve and brings the needle into contact with the disc. The disc is engraved with various words such as "Reservoir Empty," "Reservoir Full," "Water 24 feet," &c., and these words are repeated four or five times.

The actual words heard will depend upon the point at which the needl is brought into contact with the disc and this again will depend upon the height of the water.

It is said that the clockwork only needs winding once for each hundred times that the machine is operated.

The idea of using a gramophone in conjunction with a telephone is not new, but this particular application is novel.

If the experiment is entirely successful an extensive development may be expected. For instance, how comforting it will be for the man at a club to realise that the machine at his office can be relied upon to say, "I really must finish these accounts, dear, but expect to be home about 11.30," with suitable variations for subsequent calls.

PERSONALIA.

LONDON TRAFFIC STAFF.

Resignations on account of marriage :—

Assistant Supervisor, Class I.

Miss G. H. EVANS, Minories.

Assistant Supervisors, Class II.

Miss G. E. MCARTHUR, Avenue.
Miss E. COSTER, Langham.
Miss S. M. WAKELING, London Wall.
Miss E. KITE, East.
Miss E. C. GOLDSMITH, Trunk.

Telephonists.

Miss E. M. SEARLE, Palmers Green.	Miss K. M. G. HOOKER, Bexley Heath.
Miss O. B. WATTS, Park.	Miss J. WATES, Bexley Heath.
Miss D. E. SMITH, City.	Miss D. J. SMITH, City.
Miss M. A. TEES, Central.	Miss A. D. FREWING, Hammersmith.
Miss A. WALKER, Central.	Miss P. O'SULLIVAN, Paddington.
Miss M. L. LITTLE, Victoria.	Miss C. W. MARSHALL, Central.
Miss LEVERSUCH, Victoria.	Miss I. G. RUSSELL, Central.
Miss L. C. DUNSTONE, Victoria.	Miss E. M. MORGAN, Holborn.
Miss E. G. CARTER, Victoria.	Miss A. G. WHITELOCK, Putney.
Miss G. I. CANHAM, Holborn.	Miss G. L. M. SIMPSON, New Cross.
Miss E. M. FORSDIKE, New Cross.	Miss E. WADHAM, Erith.
Miss G. SPITTLES, Avenue.	Miss L. V. BUNKER, Bromley.
Miss E. W. WEIGHT, Dalston.	Miss C. I. WOOLHEAD, Bromley.
Miss W. M. BROOKS, Streatham.	Miss F. H. DORLING, Victoria.
Miss L. A. FINCH, Bexley Heath.	Miss F. A. NICHOLAS, Victoria.

YORK DISTRICT TELEPHONES.

Mr. T. W. JOWETT, Contract Manager, York, who was transferred to a similar position at Exeter on May 14 was presented by the District Manager and staff with a travelling bag and attaché case.

Miss E. E. HULME, Writing Assistant, was presented by the District Manager and staff with a case of fish knives and forks and servers on her resignation from the service on the occasion of her marriage.

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CONTENTS.

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THE ANGLO-CONTINENTAL SERVICE IN 1922.

BY H. W. CAMP (*London Trunk Exchange*).

THE use of amplifying relays usually known as repeaters by the various European administrations, has pretty well solved the transmission difficulty which was at one time a very big problem in long distance telephony.

The success of the London-Genoa service during the recent International Conference opens up great possibilities, and if the various countries can find the money for the lines and repeaters, there will be a tremendous increase of international telephone traffic, and this country will occupy a very important position in relation thereto.

At the present time the London Trunk Exchange has 12 lines to Paris, 3 to Brussels, 2 to Antwerp, and one each to Calais, Boulogne, and Lille. Two of the Paris lines have repeaters inserted between London and Paris, and the two Antwerp lines have repeaters at La Panne. Swiss traffic and most of the French provincial traffic is circulated *via* Paris where repeaters are employed for all long distance through traffic.

The traffic characteristics follow very much the lines of the British trunk traffic—ordinary business calls, Stock Exchange calls and social calls, the latter mainly in the evening, but in addition there is a very considerable amount of Foreign Exchange traffic. It may be easily imagined that considering the fluctuations in the various continental currencies and the eagerness of all interested to profit thereby, the lines to the Continent are not idle for lack of work. All this means, of course, that during the business hours of the day we are overwhelmed with work, and delay becomes considerable.

Four Paris, 2 Brussels, and 2 Antwerp lines are put through direct to the respective Bourses and these lines take all the Stock Exchange calls and the majority of the Foreign Exchange calls. The Paris Stock Exchange (Bourse des Valeurs) is open from 11 a.m. to 4 p.m., and the Foreign Exchange (Bourse de Change) from 1.30 p.m. to 4 p.m. Brussels is open from 1.30 p.m. to 4 p.m. and Antwerp 2 p.m. to 4 p.m.

Calls to the French provinces *via* Paris are mainly for places in Alsace and Lorraine, particularly St. Louis, a suburb of Bâle just inside the French frontier. This frontier suburb appears to possess a peculiar attraction for many business people, and it will be interesting to watch developments in this quarter.

As previously mentioned, all Swiss traffic goes *via* Paris, and London traffic takes its turn at Paris with waiting French traffic. Communication to any part of Switzerland is good, but most of the traffic is of the business type. During the evening there is no delay to Paris and very little between Paris and Switzerland, so that calls between London and Switzerland could be effected almost without delay.

The bulk of the Belgian traffic is also effected during the business hours of the day when we are "full up," but we can give a "no delay" service after 6 p.m. on the Brussels and Antwerp routes. At the moment communication with Belgium is limited to Brussels, Antwerp, Liege, Ostende, Ghent, and Charleroi. No doubt additional traffic will have to be handled when the whole of

THE BAUDOT—XXXV.

BY J. J. T.

FIG. LXXXIV gives a view of the vibrating reed FH which governs the phonic motor wheel shown in the previous three figures. The reed is fixed at F and is loaded at its free end by a sliding weight W capable of adjustment along the end H, its position being fixed by the capstan-headed screw S. The vibration of the reed between the studs K and K^1, and in front of the electro-magnet coils E, is first started by hand. A spring stud J is joined in circuit

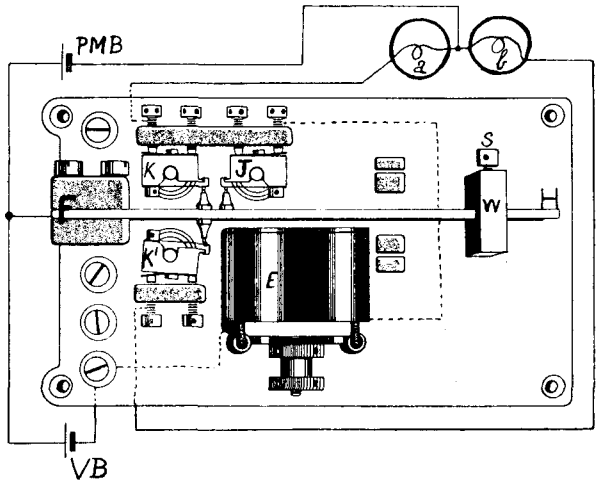

FIG. LXXXIV.

with the electro-magnet E, the vibrating reed battery VB and to the vibrating reed itself by a teed connexion at F, so that when FH rest against J a current from VB energises E and attracts FH towards the latter, breaking the circuit J, E, VB and F. In so doing FH makes contact with the stud K^1 completing a circuit through the coil *b* of the phonic motor and the motor battery PMB causing the phonic wheel to move forward one step. The reed being in vibration swings back again to K and J, thus closing the circuit through the coil *a* of the phonic motor and moving the phonic motor wheel forward a second step. Following immediately upon this, the circuit J, E, VB and F is again closed, the reed FH being again attracted and the cycle being repeated at the rate of the natural vibration of the reed FH.

The position of the bob or weight W along FH, according to the law of pendulums, will determine the rate of the vibrations and this in turn, as will have been observed, determines the regular alternate energising of the phonic wheel motor coils *a* and *b* and hence the speed of rotation of the phonic wheel and by direct drive the brush axle of the Baudot distributor.

A second and smaller weight is sometimes added to the vibrating reed in order to obtain an adjustment of *small* differences of speed. Obviously the nearer W is positioned towards the end H of the reed, the slower, and towards the fixed end F the faster the speed obtainable.

It is not desirable to fix the reed itself upon a table where it is likely to be subject to vibration from street traffic, heavy machinery in the same or adjacent buildings, &c., &c. It should therefore be fixed to the most solid wall or masonry available. Its extended use in large offices where electrical power is easily obtainable is certain, but in small towns and offices, as is often the case in this country, where power plant is scarce and current not easily available, the supersession of the older-fashioned but well-tried Baudot governor is likely to be considerably retarded.

RE-TRANSMITTERS.

The introduction of automatic Baudot re-transmitters has materially added to the pliability of the system, and has indeed made the possibility of working the system over long distances only limited by the circumference of the globe. The electrical difficulties attendant upon an ordinary re-transmitter such as a repeater dependant upon the loss of time and energy even of the fastest relay are admitted, but given lines of average stability with a system of intermediate Baudot re-transmitters, communication between London and Constantinople by Baudot quad *via* the shorter Channel cable should be a comparatively easy proposition.

The types of Baudot re-transmitters at present in use are two in number.

The simple principle of type one may be quickly grasped by a study of Figs. LXXXV-VII. The *axle* of each selector lever *c*, of a Baudot receiver (see Art. XV, December, 1920), is equipped

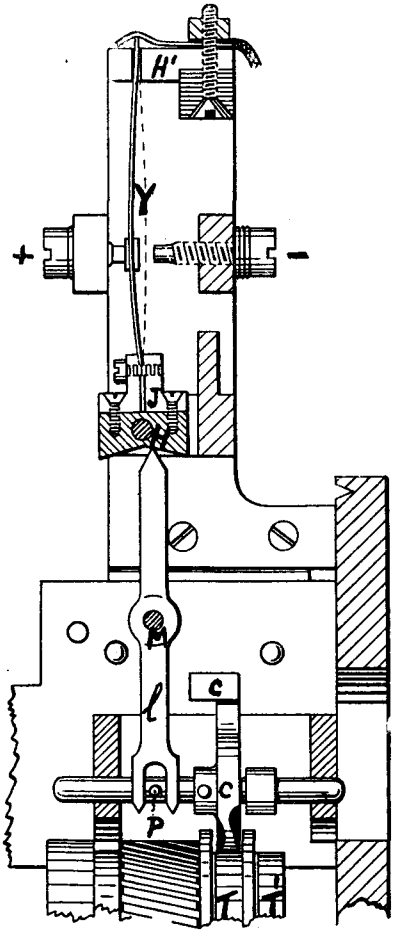

FIG. LXXXV.

with a small projecting pin P. Built above the ordinary receiver is an attachment of 5-forked levers l^1-l^5 (Fig. LXXXVI), one of which is shown in section Fig. LXXXV freely pivoted at its centre. The forked ends of these levers fit over the pin P and their upper ends taper to a finely tempered and polished knife edge. Surmounting this lever is a supporting metal piece H also pivoted at its centre, and to which is fitted an ivory holder J which grips the lower end of a flat steel spring Y. The upper end of this spring fits into a slit in the metal bridge piece H^1. Both sides of the

spring Y are fitted with a thin sheet of platinum at the centre, immediately facing two contact screws—which latter are connected to the main spacing and marking batteries.

From our previous studies of the Baudot receiver we can see that when any one of or a combination of the five selector levers, C^1 to C^5, is made by the transmission of the distant station which we will call A, the respective appendix levers will be actuated at the intermediate office B, and eventually each attendant selector or selector lever, Fig. LXXXV will be thrown forward on to T^1, forming the necessary combination and printing the letter signalled as usual. At the same time as C moves forward the pin P will pull the forked end of the lever *l* forward with it. This will throw the knife edge of *l* to the rear side of H tilting the latter upwards and throwing forward the centre of the imprisoned flat spring Y

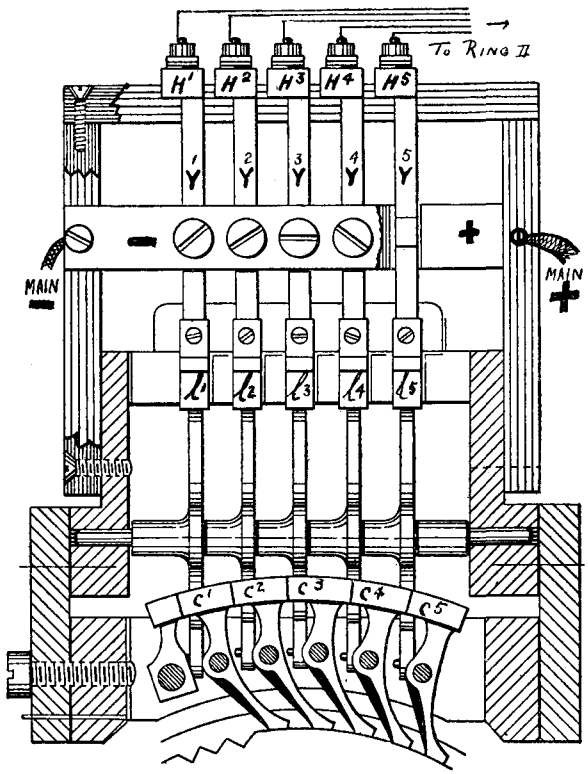

FIG. LXXXVI.

to the marking stop of the re-transmitter. If the ends of the springs Y^1 to Y^5 be connected at their respective bridge-pieces H^1 to H^5, and these to five convenient segments of Ring 2 of another distributor, the re-transmission will be complete, the signals being " stored " in the receivers for practically three-quarters of a revolution of the distributor, when they will be automatically re-transmitted to the distant station, firm full-value signals.

In fact automatic re-transmitters of this type do actually effectively re-place manual transmission so that their insertion at various points in a line whatever may be its length, does not give an *accumulative* effect to line retardation effects. That is to say, the effect of placing two re-transmitters at offices in a line the length of London—Aberdeen, say one each at Leeds and Glasgow, would simply result in the speed of transmission being fixed at that of the normal speed of the slowest section, *i.e.*, there would be no delaying effect due to relay inertia of a mechanical or electrical description as is inevitably the case with even the fastest working *repeater* generally understood by that name.

(To be continued.)

THE TELEPHONE COMPANIES OF GREAT BRITAIN AND IRELAND.

BY ARTHUR E. COTTERELL.

Continued from p. 150.

Owing to complaints as to the restriction of exchange areas the Postmaster-General of the time (Mr. Fawcett) decided to withdraw the restriction in 1884 and fresh licences were issued which permitted the companies to work anywhere within the United Kingdom and to run their own trunk wires. In addition they were permitted to open public call offices and to connect their exchanges with Post Offices for the transmission and reception of telegrams.

Several other companies and persons applied for these new licences, of which a few words will be said presently.

Armed with the 1884 licence the principal companies entered into joint arrangements for the erection of long trunk lines between the principal towns in their respective areas in addition to providing for short trunks themselves within their own borders. Amongst the main joint schemes may be mentioned such circuits as London to Birmingham, thence to Liverpool and Manchester, Birmingham to Derby and Sheffield, thence linking up with the principal Yorkshire towns; Cardiff to Liverpool, and Birmingham to Worcester, Gloucester, Bristol, etc., etc.

Of course London was the name to conjure with, but it was not until July 1890 that the trunk line was completed between the Metropolis and Birmingham, thus opening the service to the latter place and the northern cities beyond.

Most of the other trunk circuits had been completed several years before this event, and the inter-working between the various companies naturally led up to a closer association which ultimately resulted in the " big three ": the United, the National and the Lancashire & Cheshire Companies amalgamating in May, 1889, under the title of the National Telephone Company, Limited, which was enlarged for the purpose. Matters did not stop there, as the Northern District Company was absorbed in April, 1890, and the South of England Company in October 1890. These were but stages of a determined policy to bring under the proprietorship of the National Telephone Company, Limited, practically the whole of the telephone business for the British Isles, a policy which was attained by the purchase of the interests of the following remaining companies, viz. :—The Western Counties & South Wales Company in January, 1892; the Sheffield Telephonic Exchange & Electric Light Company in March, 1892; and the Telephone Company of Ireland in January, 1893.

In addition to the above the National Company acquired several small concerns which had private wire businesses or licences from the Post Office for exchange business, viz. :—The Caledonian, the Univeral, the Isle of Man, the Home & the Thanet Telephone Companies, all of which were acquired between 1892 and 1894.

The main value attaching to several of these last-named small companies arose from their possession of Post Office 1884 licences, covering the whole country, which might have got into other hands and lead to some attempts to compete actively with the National Company; moreover, the Postmaster-General had announced in 1892 the Government's intention to acquire the trunk lines of the National Company and to issue no more licences for the whole country, and had made it a condition of his terms with the Company that it should acquire any outstanding licences.

Although the National Company had command of exchanges throughout the country, it was not entirely without opposition, as apart from such exchanges as the Post Office had, there was one outstanding licence in possession of the Mutual Telephone

Company, which had established an exchange in Manchester and another in Bolton. This had been rendered possible by the expiry of the Bell patent in December, 1890, and the Edison patent in August, 1891.

The National Company had reduced its tariff charges, on the expiry of the patents, but the Mutual Company, working on a co-operative system with its subscribers, offered much lower rates. As the National Company was naturally not prepared to allow inter-communication between the subscribers on its exchange and those of the Mutual Company, it followed that many firms and persons were compelled to subscribe to both systems.

In 1892 the Mutual Telephone Company's business assets and licence were acquired by the New Telephone Company, after passing through two intermediate sales, viz., first to the Electric & General Investment Company and then the Pioneer Telephone Company. The New Telephone Company, Limited, under the vigorous chairmanship of the Duke of Marlborough, threatened the National Telephone Company with intense competition throughout the country, not only promising lower rates but to provide all subscribers with metallic circuits—an obvious improvement on the single wire circuits in use by the old Company.

The National Company had the enormous advantage of being well established throughout the country, which placed the New Company at many disadvantages. On the other hand, the latter Company could enter the field without a heavy load of watered capital and armed with up-to-date information instead of being faced with all the arduous and costly pioneer work which had been the lot of the old companies. Space does not admit of a lengthy discussion of the obvious reasons which led the two companies to arrive at the conclusion that it would be in their joint interests to work in harmony, a conclusion which first of all led to the National Company subscribing one-third of the capital of the New Company with representation on the directorate and shortly afterwards ended in the National Company acquiring the whole interests of the New Company, which was eventually wound up. In course of time after the expiry of the subscribers' agreements the exchanges opened in Manchester and Bolton by the Mutual Company were closed.

On completion of these transactions the National Telephone Company once more held the field unassailed. True it had been obliged to give up perhaps its strongest weapon in selling the Trunk wires to the Post Office, but it obtained various concessions which were of great help, added to which the Government had decided to grant no more licences for the whole country and only to consider an application for any particular town if supported by the local municipal authority.

In 1898, however, a Select Committee was appointed by the House "to enquire and report, *inter alia*, whether the Telephone Service was calculated to become of such general benefit as to justify its being undertaken by municipal and other local authorities." The Committee reported in favour of competition, both by Municipalities and the Post Office. The Government decided that the Postmaster-General should establish an exchange system in London and grant licences to municipalities when desired. Some 60 local authorities applied for information, but eventually only 13 licences were issued to municipalities. Probably largely as a result of the vigorous campaign engineered by the National Company many of the municipalities were discouraged from proceeding further than obtaining information or procuring licences. In any case only six established exchanges. That five of these were short-lived may be seen from the following table :—

Glasgow	Licensed 1900	Sold to Post Office 1906
Tunbridge Wells ...	,, 1900	,, ,, N. T. Co. 1902
Brighton	,, 1901	,, ,, Post Office 1906
Portsmouth	,, 1901	,, ,, ,, ,, 1912
Swansea	,, 1902	,, ,, N. T. Co. 1907
Hull	,, 1902	Still in existence and has acquired plant formerly belonging to N. T. Co.

The first Post Office exchange was opened in London on March 1, 1902. Meanwhile, on Nov. 18, 1901, the Postmaster-General and the National Telephone Company had entered into an agreement, with a view to avoiding wasteful competition and unnecessary duplication of plant, which provided also for the purchase on "tramway terms" of the Company's London system on the termination of the licence, which was due to expire on Dec. 31, 1911. Having arrived at such a result the later agreement of Feb. 2, 1905, providing for the purchase of the whole of the Company's system at the end of the licence was only what was to be expected.

Around the movements which have been so briefly recalled, many interesting stories could be told, but space does not admit of them here and now.

MODERN WIRELESS TELEGRAPHY AND TELEPHONY.

BY F. ADDEY, B.SC., M.I.E.E., FELLOW I.R.E.

Continued from p. 152.

From the explanation given of the action of a loop or frame aerial it will be evident that as the transmitting station is moved sideways away from the plane of the loop, or, what comes to the same thing, as the loop is rotated about the vertical line XY, the signals will get gradually weaker, because the difference in time between the corresponding effects in AB and in CD will get less and less, and so the electro-motive forces in these sides at any instant will be more and more nearly equal and therefore will more and more nearly neutralise one another round the loop. When the loop has been rotated through a right angle, so that its face instead of its edge is directed towards the transmitting station, the effects produced at each instant in AB and CD will be exactly equal, since these sides are now acted on by any particular portion of the incoming waves simultaneously. Hence the electro-motive forces set up in AB and CD will exactly neutralise one another round the loop, no current will flow and the detector will be unaffected.

We have, therefore, in such a rotatable loop a means of ascertaining the direction of the line through the receiving station on which a transmitting station is situated. The loop is turned round, and the directions in which it points when signals are of maximum strength, or in which they disappear, are observed. It should be noticed that with such an arrangement we can only ascertain the *direction* of this line. No indication is given as to the side of the receiving station on which the transmitting station is situated. The determination of this further point, which is known as the "sense" of the bearing of the transmitting station from the receiving station, can, however, by suitable means be accomplished. The method is described below.

In order to avoid having to rotate the actual loop aerial on which the signals are received, a D.F. system has been developed in which the aerial system is fixed, and only a small coil of wire, mounted in the receiving apparatus itself, has to be rotated.

The principle of the arrangement is shown in Fig. 37. Two wire loops A and B, usually of triangular shape for convenience of erection, are set up at right angles to one another. A double coil is connected across the bottom of each loop, as shown in the diagram. These coils form the primary coils of an oscillation transformer, the secondary coil of which is a third coil C, which lies in the space in the middle of the two primary coils. The coil C, which can be rotated about a vertical axis, is joined to the receiver, and takes the place of the rotating aerial previously described.

If the transmitting station lies in the line of aerial A only that aerial will be affected by the incoming waves. Consequently, when coil C is turned so that its axis lies along the axis of coil A the effects produced in C, and hence the loudness of the signals will be a maximum, while when coil C is rotated through a right angle no signals will be received. In the same way, when the transmitting station lies in the line of aerial B the maximum strength of signals will be obtained when the axis of coil C points along the axis of coil B. Thus for these two cases the axis of the coil C points towards the transmitting station when the maximum strength of signals is obtained. When the transmitting station is in any intermediate position both aerials will be effected, that pointing more nearly towards the transmitting station being affected more strongly than the other. Currents of proportional strength are set up in coils A and B. As the coil C is rotated it comes under the influence of the currents in both these coils. It can be shown that in this case also, when the maximum strength of signals is received,

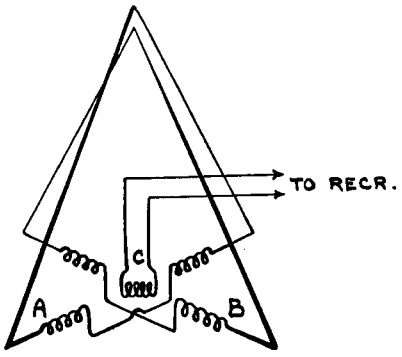

FIG. 37.—DOUBLE LOOP D.F. AERIALS.

the axis of the coil C points towards the transmitting station. Further, for the same intensity of incoming waves, the maximum strength of signals produced is the same in this case as when the transmitting station lies in the direction of either aerial.

"Sense" of Bearing.

The "sense" finding device is a modification of the arrangement just described. The connexions are shown in Fig. 38.

The centre points of the coils A and B are joined together, and are connected through the coil P and the high resistance R to earth. The coil C is joined in series with a coil S (which is the secondary coil of an oscillation transformer of which P_1 is the primary), the condenser K, and the primary coil P_2 of another oscillation transformer. The secondary coil S_2 of this oscillation transformer is joined to the receiver. The circuit $C P_2 K S_1$ is tuned to the frequency of the incoming waves.

The action of the loop aerials on coil C is exactly the same in this case as with the arrangement shown in Fig. 37. The whole aerial system, however, now acts in addition as an ordinary open aerial, and when signals are received high-frequency currents are set up in the path P_1 R between the aerials and earth. Thus the circuit $C P_2 K S_1$ is acted on simultaneously by the electro-motive forces set up in the coil C from the coils A and B and those set up in the coil S_1 from the coil P_1. With this arrangement properly adjusted it can be shown that when the coil C is set so that its axis is pointing towards the distant transmitting station, the signals heard on the receiver will be a maximum when the transmitting station is on one side of the receiving station, while no signals will be received when the transmitting station is on the same line but on the other side of the receiving station.

Thus the "sense" as well as the direction of a transmitting station can be obtained.

Position Finding.

When the bearings of a transmitting station from two or more receiving stations, the positions of which are known, have been obtained, the position of the transmitting station can be plotted on a chart. Lines are drawn through the positions of the receiving stations in the observed directions and the position of the transmitting station is evidently the point where these lines cross.

Present-day Applications of Wireless.

We have now dealt with the purely scientific aspect of the various sections of the subject mentioned in the introduction to these articles. It will, however, no doubt be of interest to indicate briefly how these various developments are being applied to practical use.

Stations for communicating with ships at sea are now provided by practically all maritime countries.

In this country we have such stations at Cullercoats, Grimsby, North Foreland, Niton, Lands End, Fishguard, Seaforth and Port Patrick, while in Ireland there are stations at Malin Head and Valencia. These stations are all fitted with spark apparatus. The average range is about 300 miles. In addition there is a station at Devizes, fitted with a valve C.W. transmitter, for working to ships provided with C.W. apparatus. This station can communicate with ships over distances up to 2,000 miles.

Many powerful stations for long-distance communication have been erected in this and other countries. Here, the Marconi Company have erected stations at Carnarvon and Clifden for the American service and at Chelmsford for communication with Paris. The Post Office has the arc station at Stonehaven, which works to Berlin, Posen and Budapest, the valve station at Caister for communicating with Amsterdam, and finally, the large arc station at Leafield, with its associated receiving station at Banbury, for communicating with Abu Zabal, near Cairo—the first link of the Imperial Wireless Chain. An arc station has also been opened at Northolt, near London, for medium distance continental communications.

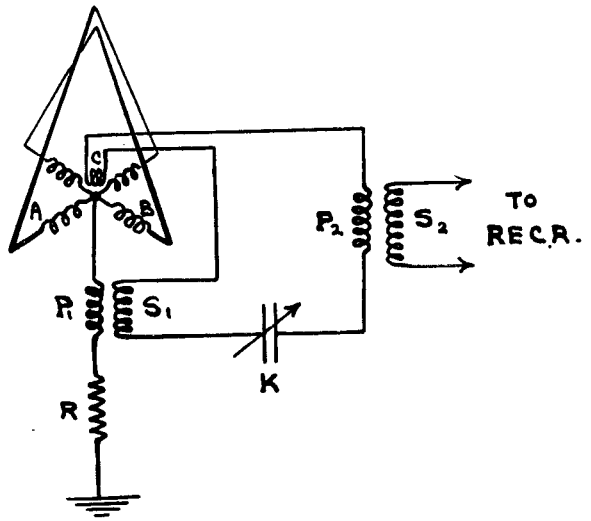

FIG. 38.—ARRANGEMENT FOR DETERMINING "SENSE" OF A BEARING.

Direction-finding stations are in course of erection at various points round the coast to facilitate marine navigation, and before long it is to be hoped that a ship will be able to find her way when approaching land in foggy weather as easily as she can do at present when all the lighthouses are visible. For aircraft a series of wireless telephone stations has been erected on the line between London and Paris. The occupants of an aircraft can thus communicate with the ground, and, by means of the switching system described above, can be put through to the ordinary telephone system. By D.F. apparatus at the ground stations the pilots are kept informed of their position, and they can thus find their way even when the ground is hidden by fog.

Between Los Angelos, in California, and the town of Avalon, on Santa Catalina Island, a telephone circuit is provided which consists of an ordinary trunk line on the land at each end with the connexion across the San Pedro Channel carried out by wireless.

The two-wave non-switching system is used, and subscribers at either end can communicate with one another exactly as if they were speaking over an ordinary line. Signalling between the two terminal exchanges is also carried out over the wireless link.

Conclusion.

In conclusion, it should be mentioned once more that the foregoing articles have been written for the general reader who has only a slight acquaintance with the fundamental principles of electricity and magnetism. It has, therefore, been necessary to deal with the subject in a very elementary manner.

It is hoped, however, that the treatment, so far as it goes, has been such that any reader who wishes to learn more of the subject will be able to continue his studies not only feeling that he has nothing to unlearn, but rather that he has a sure foundation on which to build his subsequent work.

REVIEWS.

"Wireless for the Home."—By Norman P. Hinton, B.Sc. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C.2., and Radio Press, Ltd., 34/35, Norfolk Street, Strand, W.C.2. 2s. nett.

"Written by an expert for the amateur." is what the publishers say, and it is an excellent description of the book. Couched in simple language, shorn of the robe of mystery, and rich with illuminating similes, this book is just what it purports to be—a guide to the main principles for all who contemplate installing wireless apparatus. Mr. Hinton does not purport to teach a person without any knowledge of wireless how to build an effective receiving set out of a cigar box, a packet of hair-pins, and a little bell-wire; but he does offer capable advice as regards the right type of apparatus and why.

We notice that the old dimensions of the standard aerial have been retained, probably owing to delay in the press; and we doubt whether the use of a small generator for preliminary tuning on continuous wave will be permitted in connexion with broadcast reception sets.

Elementary Determinants for Electrical Engineers. By H. P. Few. S. Rentell & Co., Ltd., 36, Maiden Lane, W.C.2.

This work, which is a reprint and revision of articles in *Electricity*, deals fully with the methods of evaluating determinants and the application of determinants to problems in electrical testing, telegraphy, telephony, power distribution, balancing of cables, &c. Good exercises are appended to each chapter so that students may readily test their progress. The work is well compiled, and should prove useful to electrical engineers and students of electrical physics.

GOLF. MANCHESTER.

On June 12 a golf match was played between the Head Post Office and the Newton Street Office, at Manchester. The match was played on the Mnnicipal Links in Heaton Park, and resulted as follows:—

Head Office.		*Newton Street.*	
Mr. G. R. W. Jewell	0	Mr. J. G. Maddan	1
„ F. H. Gibson	1	„ W. Brookes	0
„ J. Waterhouse	1	„ Alan Cameron	0
„ P. H. Greenhouse	1	„ R. H. Fitton	0
„ R. Campbell	1	„ R. Crewdson	0
„ F. Evenson	0	„ C. Sillitoe	1
„ A. O. Bourdeaux	½	„ C. H. Carter	½
„ T. W. Capenhurst	1	„ J. Farran	0
„ Arch. Cameron	1	„ G. M. Alexander	0
„ J. M. Lucas	1	„ F. Cockerlin	0
„ G. P. McDonnell	0	„ C. A. Morgan	1
„ J. McDonough	0	„ J. McCourbie	1
„ C. MacFarlane	1	„ J. Eastwood	0
„ G. F. Staite	1	„ J. W. Little	0

Totals: Head Office 9½ games; Newton Street, 4½ games.
Head Office won by 5 games.

The Club holds the usual competitions during the summer season, and a winter medal competition for players with handicaps of 18 or more.

FROM TELEGRAPHIST TO POSTMASTER-GENERAL.

To start from the bottom of the official ladder and rise to the top is a career few telegraphists can hope for, but such has been the career of Major E. A. Sturman, C.B.E., now Postmaster-General of the Union of South Africa.

He joined the C.T.O. in 1879, but finished his London service in the Metropolitan Engineering Branch, being transferred in '89 to the Cape Colony C.T.O. He was not destined to serve there many years, as his all-round abilities and capacity for organising soon gained him promotion to the Administration Branch of which he became Chief Clerk in 1910. After the Union of the South African Colonies, he was made Assistant Under-Secretary in 1912; Under-Secretary in 1919 and now Postmaster-Gemeral. Holds South African War Medal 1899-1901. Was Officer Commanding Army Post Office, and Chief Field Censor in German West Campaign. Mentioned in Despatches, and made Officer and subsequently Commander of the Most Excellent Order of the British Empire, 1918. Also organised the S. A. Gifts and Comforts Committees.

The athletically inclined among the older members of the C.T.O. will no doubt remember him as a prominent runner, both on the flat and across-country, whilst for some years after his departure the name was recalled by means of the annual competition for the "Sturman" Cup, a challenge cup presented to the old Electric Athletic Club by his father, Dr. Sturman.

The appointment is a very popular one as can be gathered from the fact that the Cape P.T.C.A. entertained Major Sturman to dinner in honour of his promotion.

ELECTRIC VALENTINE.

A CORRESPONDENT sends us the following cutting from an old number of *Nature*. Some of the allusions will give a vague indication of the date when it first appeared:—

TELEGRAPH CLERK (*a*) to TELEGRAPH CLERK (*b*).

The tendrils of my soul are twined
With thine though many a mile apart;
And thine in close-coiled circuits wind
Around the magnets of my heart.

Constant as Daniell, strong as Grove;
Seething through all its depths like Smee;
My heart pours forth its tide of love
And all its circuits close in thee.

Oh, tell me, when along the line
From my full heart the message flows,
What currents are induced in thine?
One click from thee will end my woes!

Through many an ohm the Weber flew,
And clicked his answer back to me
I am thy Farad, staunch and true,
Charged to a volt with love for thee.

MUSHROOMS IN TOWN.

A LITTLE group of workmen stood outside the Museum Telephone Exchange, near to Goodge Street Station. Under a grating a bunch of healthy fungi was discovered. A scientific professor, from University College close by, after careful examination, pronounced them to be mushrooms, both "edible and nutritious."—*Daily Graphic.*

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 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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TEAM WORK.

IT is with feelings of keen interest, great hope and much encouragement that I take up the position of Director of the Telephone and Telegraph Services. During the past 40 years I have seen various Telephone Administrations struggling against adverse circumstances which tended to retard development and efficiency, the culminating adversity being the Great War and its aftermath. We have, however, strong reason to hope that the path of development in the future will be smooth and straight. I am encouraged to think that full advantage will be taken of the improved conditions of to-day by the knowledge that I shall have the whole-hearted assistance of a body of workers of all grades throughout the country, whose ability and devotion to duty are sure guarantees that no effort will be wanting to provide the efficient Telephone Service which is so vital a necessity in the domestic, social and commercial life of the community. It is our responsibility to bring the Telephone and Telegraph Services to the highest possible standard of usefulness and efficiency, and no member of the staff can but help feeling the stimulus of being part of a great and progressive organisation in partnership with the nation.

Within recent years we have passed through a strenuous and difficult time. The stoppage of progress led to the accumulation of very considerable arrears of necessary works. These arrears have now been largely overtaken, and the time is propitious for a great development which will add to the amenities and resources of our people. If the Telephone Service is to be adequate to the needs of the community, it should not only be widely extended in the towns, but also in the country and the scattered farms. To justify itself, it must be a satisfactory servant of the people, and every subscriber and member of the public should come to feel that the Post Office is ready and anxious to meet their requirements and to help in overcoming their difficulties. The public, on its own part, requires to be educated in telephone knowledge, and there can be no more successful form of telephone propaganda than for every individual man and woman in the Service to assist in spreading that knowledge. Much the same applies to the Telegraph Service in rather different circumstances, and though public attention has been directed mainly to the Telephone Service, I have no intention of overlooking the possibility of the further adaptation of Telegraphs to the public needs.

By strengthening the links of the chain which bind the various sections of the Services, and by working as one team with a single object, we shall in due time achieve our purpose. I am confident that, in this joint effort, the JOURNAL will take as it has done in the past, a most important part.

R. A. DALZELL.

A PROBLEMATICAL "LUXURY."

WE usually hesitate to touch upon politics, and, above all, on international politics, in the JOURNAL, but where the politics concern telephone development we think the reproof *ne sutor ultra crepidam* can hardly be applied to us if we make a comment. According to the Press, the Inter-Allied Commission has had to make strong representations to the German Government regarding their scheme for placing the trunk lines underground. The Germans pleaded that the outlay was necessary for the efficiency of the Service, and the Commission is alleged to have replied to the effect that it was for a luxury which France and Britain did not permit themselves to afford. Great Britain, however, as our readers are aware, is well advanced with an extensive scheme of subterranean cables for her long-distance lines.

We need hardly say that we hold no brief for the German Government, but we do hold a brief for the development of the telephone in Europe. So long as the view that the telephone is a luxury is cherished by Governments so long will America outdistance the Old World in the development of the telephone. What Europe needs for her economic and commercial welfare is the highest efficiency and the fullest expansion not only of her internal lines but also of her international lines. When this is realised, Ministers of Posts will no longer need to offer to their legislatures apologetics for the poor figure their countries cut in comparison with the United States.

HIC ET UBIQUE.

WE offer our hearty congratulations to Mr. R. A. DALZELL, C.B.E., on his appointment to the newly-created post of Director of Telegraphs and Telephones. Mr. Dalzell was born at Poona, India, 1865, and educated at Edinburgh and Dulwich College. His telephonic career began in 1881 in the service of the Globe Telephone Co., and we publish elsewhere some details of his career.

THE Anglo-Dutch telephone cable was laid between Aldeburgh and Domburg (Walcheren) on July 8, after considerable delay own to bad weather. The adjustment of the land lines is proceeding, and a service, at least to the Hague, will probably soon be available.

WE learn from the Press that the Anglo-Portuguese Telephone Co. has had authority to raise its rates 75 per cent. on business connexions and 50 per cent. on residence connexions.

ACCORDING to the *Automatic Telephone*, Russia is spending a million dollars on automatic telephone plant. The payment we are told will be made in gold.

THE Postmaster-General has sent the following commendatory letter to the retiring Engineer-in-Chief :—

June 1.

DEAR SIR WILLIAM NOBLE,

I cannot let you leave the Post Office without telling you in writing what I have already told you in conversation—how great is my admiration for your record in the service of the Department.

Commencing as a telegraph boy 48 years ago, you reached in 1919 the position of Engineer-in-Chief, and you have had under your control in that capacity plant of the value of £100,000,000, an annual expenditure of £15,000,000, and a staff of 25,000. You have also been the chief advisor to the Department on the placing of contracts involving the expenditure of many millions of public money. These great responsibilities you have discharged with conspicuous efficiency and with a single eye to the public interest.

During your career you have served under seventeen different Postmasters-General, and I am sure all of them who are still living would join with me in saying that your record in the Post Office is an outstanding example of what can be accomplished in the face of great difficulties by grit, capacity, hard work, and long-sightedness. I am sure the record of your career will be an inspiration to every boy who joins this great Department.

The salary which the country considers adequate for technical services such as yours appears parsimonious when compared with the rewards obtainable in private enterprises; but although as a Scotsman you have borne this with patience, I hope you have some compensation in the knowledge that your name is held in respect in every postal administration in the world.

You leave the British Post Office with the admiration and affection of all your colleagues.

I am, dear Sir William Noble, yours faithfully,

Sir William Noble. F. KELLAWAY.

MISS ANNE BARNES, Travelling Chief Operator to the Iowa Telephone Association, frequently enlivens the pages of *Telephony* with short moral tales addressed to telephonists. She tells the story of two little girls who entered the village school on the same day. Alice Marie gave perpetual trouble to the sweet-voiced teacher. "She left school at an early age and was married to a worthless cigarette holder. To-day she is a small town divorcee." Marceena was always a good little girl. You will perhaps guess that she married a worthy cigar-holder and is now a large town divorcee. You are wrong. "To-day she is chief operator in a city and has 100 operators under her supervision. Moral: When considering an applicant for telephone work enquire into the applicant's school life record. You will be safe in making your decision then."

CONSTANTINOPLE TELEPHONE SERVICE.

Mr. F. Douglas Watson, so well known to many of our readers, sends us the following interesting information from Constantinople.

The telephone system in Constantinople, notwithstanding the utter stagnation of business generally in the city, continues to make satisfactory progress. During 1921 the stations increased from 6,822 to 7,697—or nearly 13 per cent. During the same period the calling rate per subscriber per day rose from 4.7 to 5.5. The system being entirely on the message rate basis, the last-named increase is specially important.

The population of Constantinople have acquired the telephone habit, and the service given is good, with an average delay in answer by the operator of 6.7 seconds.

With anything like a return to normal business conditions, the management anticipate a quick development. But until Anatolia and Southern Russia are opened again for trade, it is feared there will not be much improvement in the business of the city.

There are the usual difficulties experienced by British staff in conducting a telephone service in any foreign country—only more so! All operators must speak correctly at least two languages, Turkish and French. Many speak more. Some can speak seven or eight, including English. The operating staff is entirely native, Greek, Armenian and Jewish—with a very few "hanoums" (Turkish girls). The last named class are the most difficult to train, thanks largely to the past generations of isolation of the hanoum in the harem. But all the native races are intelligent and capable of being taught.

[*Photograph by Elliott & Fry*

MR. R. A. DALZELL

(*Director of Telegraphs and Telephones.*)

SOME AUTOBIOGRAPHICAL REMARKS.

WHEN I entered the service of the Globe Telephone Company in the early eighties, we were not a great deal advanced from the time when only musical sounds could be transmitted by means of the telephone. Indeed, it was only some five years earlier, in 1876, that Sir William Thomson (Lord Kelvin) had introduced Bell's speaking telephone to the British Association meeting in Glasgow, and it was then regarded by some people as little more than a scientific toy. The *magnum opus* of the Globe Company, if I may so describe it, was the erection of a telephone exchange at the Wool Exchange. All the lines were single circuits. The Post Office started the first metallic circuit system at Newcastle, and when eventually I went to Newcastle to assist the Northern Telephone Company, we adopted a similar system. The difference between the two systems was that the single circuit caused a lot of cross talk from circuit to circuit and the lines were not "silent." With the metallic circuit two lines were used instead of one; this obviated disturbances from circuit to circuit and prevented interference through extraneous electrical causes.

When the Globe Company became defunct as the result of litigation with the United Telephone Company over questions affecting patents, I transferred to the latter Company for the purpose of supervising the Globe Company's apparatus which was then in operation. Neither of those early companies was overburdened with subscribers; the United had about 3,000 subscribers and the Globe a few hundreds. On moving to Sunderland as electrician to the Northern District Telephone Company, I found that they had no subscribers in Newcastle. However, we soon established an exchange larger than that of the Post Office, which had just previously set up its first large exchange in the country at Newcastle, and we got together a fairly extensive clientele.

It is interesting to recall that in the old days two operators were required to handle a subscriber's call. Under the original system, the subscriber pressed a button on his telephone. This caused a shutter to fall in front

of the operator at the switchboard. She manipulated a flat plug, which she inserted in the switchboard, and thus connected the caller with another operator sitting immediately behind her. The second operator asked: "Number, please," and then passed it to the first operator, who proceeded to establish the connexion. The whole process was comprised in one operator speaking with the subscriber and the other operator moving the plugs as required.

After successive periods of service as Manager of the Blackburn and Leeds Districts of the National Telephone Company, and District Manager of the Western District of London, I became Assistant Superintendent for London, an appointment which carried with it supervision of both the engineering and administrative sides of the business. I then moved on to Bristol, where I was Superintendent of the West of England Province, and I was stationed there in 1912, at the time of the transfer of the telephones to the Post Office. Shortly afterwards I returned to London, and in 1916 was appointed Inspector of Telegraph and Telephone Traffic; in 1919 I became Chief Inspector.

At the time of my connexion with the Northern Company, the country was practically without trunk communication; but we established trunk working between Leeds and the North *via* Northallerton with Hull, Grimsby, York, and other towns in the neighbourhood.

Prior to the opening of the Bristol Exchange, telephones were worked on the magneto system. Bristol was the first Central Battery exchange in the country. Kensington Exchange, in London, was the next. Subscribers on those exchanges were relieved of the necessity of turning a handle to cause a bell to ring or a shutter to fall, in order to secure the attention of the operator. Instead, most of the electrical apparatus was concentrated at the exchange, and the mere act of lifting the receiver at the subscriber's end caused a lamp to glow at the operator's desk in the exchange. This is the principle followed at the present day at practically every exchange throughout the country. I have therefore seen the development of the so-called "scientific toy" from the original single circuit wire, with Blake or Hunnings' transmitters and without multiple switchboards, through the period of metallic circuits, multiple switchboards, and magneto operation, to the Central Battery system which, in its turn, is giving place to the automatic system. Automatic telephony is being rapidly developed, and I think that the future of telephony lies largely in that direction, although I would make the reservation that there will always remain exceptional cases where manual operation will be necessary, either as regards more economical working or more efficient service, or both. I hope to see the automatic telephoning of London commenced in my time, but it will be many years before such a scheme can be completed. Apart from technical considerations it requires deep economical study.

As regards telephone development, I shall try to give effect to the P.M.G.'s stated policy, and I want the public, who are, after all, the most important part of the organisation, to be in the full confidence of the Post Office and to understand thoroughly what is being done in the way of research and development. It is only with the subscribers' assistance and co-operation that real efficiency can be secured, and it is then our duty to ensure rapid and efficient development.

TELEPHONE DEVELOPMENT STUDIES.

By H. Julius Maclure.

Were it possible to forecast definitely the actual number of lines which would be working on any given exchange on a particular future date, telephone men would be saved much trouble, although they would be deprived of a large amount of work which is fascinating to those whose duties bring them into contact with development studies.

As it is, present circumstances require that estimates must be compiled of at least the number of direct lines, external exchange extensions, private wires and trunk and junction circuits, which should be provided for in particular areas during a certain space of time, usually the ensuing 20 years divided into 5-yearly periods. When automatic exchange equipment is in contemplation, the estimate requires to be amplified by so distributing the figures under the general heading of "direct lines" that development may be provided for under each of the following sub-headings: namely,

Direct single exchange circuits (excluding all coin box circuits).
Auxiliary and P.B.X. circuits.
Subscribers' coin box circuits.
Coin box call office circuits.
2-party circuits.
Rural party circuits.

Obviously if success is to be obtained, the figures to be furnished in the case of the larger Exchanges must be based upon a "block" survey, in connexion with which past, present, and future conditions must have received full consideration, and been allowed for. When very small exchanges are concerned, an actual block survey may not be imperative, but nevertheless when preparing these estimates it is equally necessary to take all points into consideration.

The accuracy of development forecasts depends to a large extent upon the temperament of those who compile them, and one who is lacking in enthusiasm as regards telephone service, in imagination, and in a love of detail will, of a certainty, fail to evolve reliable data. Perhaps capacity for imagination is of the most importance, but it must be practical imagination, and not that of an Alnaschar order.

What man is there of those who helped to develop, and who used the service in the early eighties, who even dreamed in those now far-off days of the hundreds of thousands of telephones now in London alone? Yet we are still many years behind our American cousins, and with their example before us, we should appreciate that the telephone service is only in its early stages with us, and that the education of the public on telephone matters is most elementary.

The present-day British telephone man must refuse to understand the meaning of the word "saturation." There is time enough for consideration of the import of the word to be left to his grandchildren.

The constant mistake in British telephone circles has been in providing insufficient plant to meet the needs of actual development. Who can recollect a case of over-provision? Who fails to remember the innumerable instances where, but for shortages of plant, hosts of telephone users would have become subscribers months, or even years, earlier than was the case?

If, therefore, adequate plant conditions are to come about, those responsible for development forecasts must bestir themselves, and evolve such reliable figures of future growth as will warrant the provision of plant equal to all requirements. More thousands of pounds of revenue have been lost, month by month, in the past, by the non-provision of plant really required, than there is any remote likelihood, with our innate conservatism, of being lost, in the next twenty years, in interest on the value of plant provided with too lavish a hand.

The duty of examining and criticising very many sets of development forecasts, covering all parts of the country, leaves the impression that in many instances the past, rather than the future, has received the greater amount of consideration. This suggests a lamentable lack of imagination. True it is that what has taken place in the past should be set out clearly, and have every consideration, but the main factor to concentrate upon is the future.

When setting out to compile a development estimate, it is reasonable to assume that plant to meet all requirements will be available in the future, that reasonable rates will be able to be quoted, that a good service will be given, that continuous canvassing under business conditions will take place, and that telephone service will become as much a matter of course with the public as present-day sanitation, fixed baths, electric light, trains, motor travel, and a dozen other now every-day aids to health, and at any rate relative happiness, which were never even dreamed of, and when awakened to, laughed at at first, by our fathers and grandfathers.

When, therefore, it comes to the point of tabulating figures for the future, the past has of course been examined as also the future, the latter be it assumed, with practical but optimistic imagination. Houses have been visualised where now there are open spaces, large houses in particular localities regarded as converted into flats, at present decayed private residences thought of as transformed into good offices, a florishing City, or even a Tube station looked for in place of what is now a very mean back street site or building, and, in country districts, a pushing little Town sometimes seen where at present there is little more than a sleepy Village, this because a once-quiet lane will often in a few years become a busy motor-route.

Starting, therefore, with the gross direct exchange line figures set out in, say, four 5-yearly periods, thus covering 20 years, these should first be examined by the aid of geometrical increase tables to see what results. Perhaps there has been set down—

	Years.	Direct Lines.
(*a*)	1922	1,000
(*b*)	1927	1,403
(*c*)	1932	1,923
(*d*)	1937	2,397
(*e*)	1942	2,917

Applying the tables named, the results will be:—

(*b*)	7 per cent.
(*c*)	6.5 „
(*d*)	4.5 „
(*e*)	4 „

and at the first glance the rate of progress appears reasonable. But the progress should also be examined from a strictly arithmetical point of view. This will give:—

		An average annual growth of
1922	1,000	= 403 or 80+3
1927	1,403	
1927	1,403	= 520 or 104
1932	1,923	
1932	1,923	= 474 or 94+4
1937	2,397	
1937	2,397	= 520 or 104
1942	2,917	

Why the drop in the annual rate of growth at the 1932-37 period? Unless there is some actual reason for this inequality, it is obvious that some adjustments in the figures are necessary.

This brings us to the subject of the value of the geometrical increase percentage tables. They provide the means of applying a very useful check to see that any estimated increases are within reasonable limits, and they mark clearly any more or less heavy variations. For example, they might when applied to certain figures show a percentage increase of 30 per cent. for a first period, 10 per cent. for a second, 15 per cent. for a third, and 3 per cent. for a fourth. Thus, unless wholly abnormal development conditions happened to apply in that particular instance, the figures quoted would be direct evidence of something being wrong.

The tables also afford the most simple means of extending an approved figure for a required period, or periods of short duration, but they should certainly not be used as the sole means of arriving at estimated figures of development in conjunction merely with details of past growth.

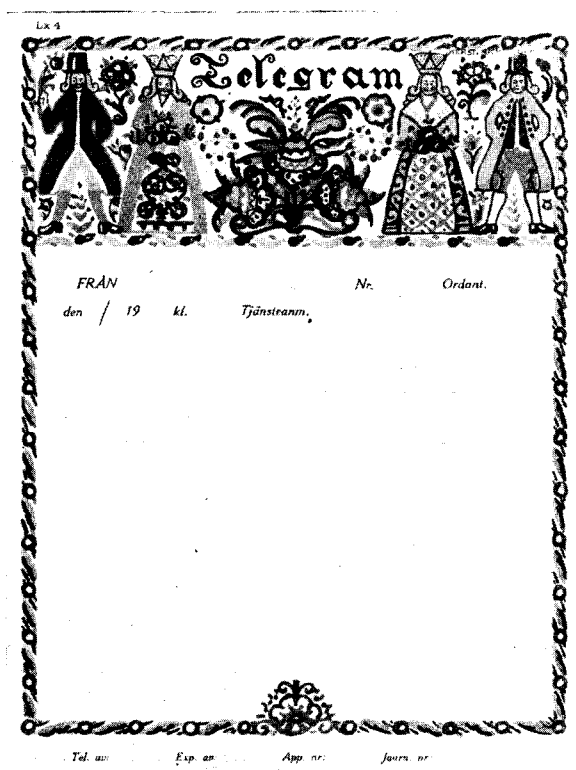
But perhaps the most difficult figures to arrive at are those distributing gross totals between Direct Single Exchange circuits, Auxiliary and P.B.X. circuits, Coin Box circuits (Subscriber and Call Office), and Party Line circuits (Two-party and Rural party). The mere application all round of percentages would give misleading results. Perhaps in the case of Auxiliary and Private Branch Exchange circuits, all other matters being equal, percentage calculations based on the existing proportion will carry the matter a long way, but as regards Coin Box and Party Line circuits, the only safe way is to estimate each class, and for each period, strictly on the merits of the local conditions as they can best be visualised during each period. In the matter of Private wires, and External Exchange Extensions, here again the estimates can only be based on the same factors as have been taken into consideration in the case of ordinary direct Exchange lines, but local conditions have frequently a greater bearing on these classes of circuit than they have, as a rule, on ordinary direct exchange line circuits.

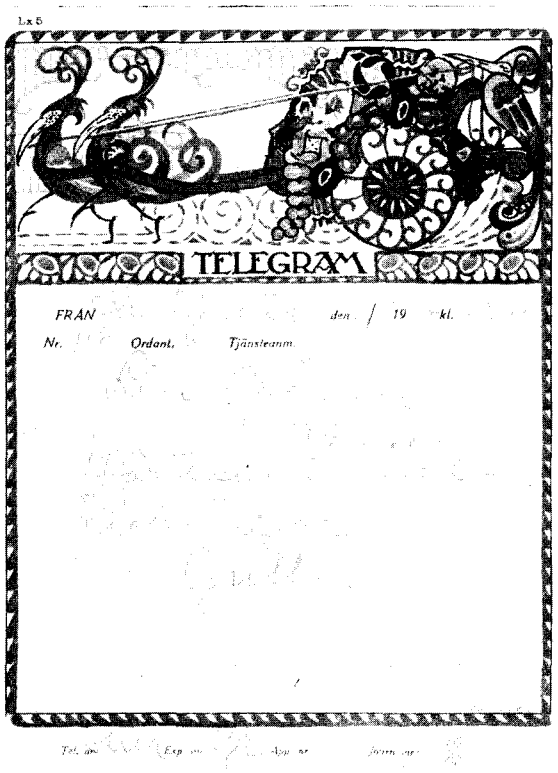
The question of Trunk and Junction line development figures is one outside this short article, and is left to be dealt with by another pen.

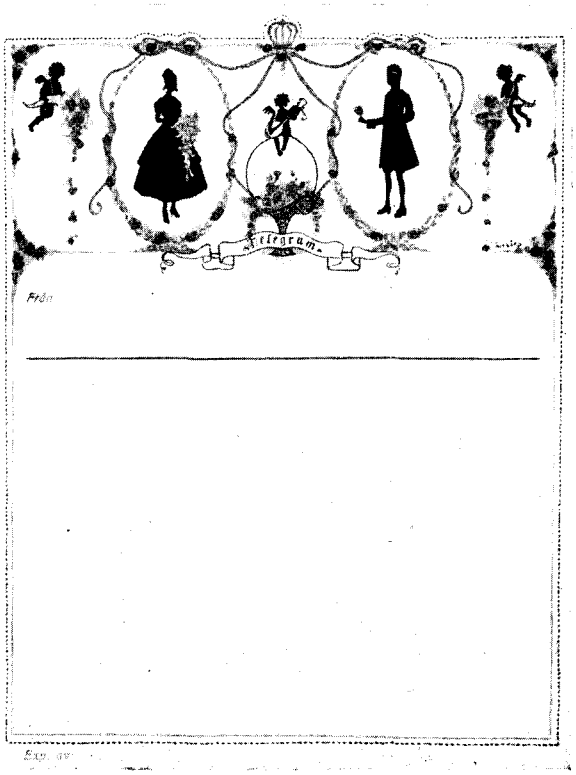
ILLUMINATED TELEGRAPH FORMS IN SWEDEN.

By ALEC B. EASON, M.A.

THE use of congratulatory telegrams is widespread in Sweden because festivals in the home, such as birthdays, anniversaries of weddings, and "name-days" are celebrated to a far greater extent than in England. "Name-days" refer to the fact that each day of the year has been allotted a person's Christian name, and when the day arrives which bears your Christian name you may be the fortunate recipient of a present: someone will certainly do something to let you know that it is your "name-day." One way in which people celebrate festivals is by dressing up to represent historical or theatrical personages. Swedish artists, Carl Larsson especially, delight in showing such festivals in their pictures, and it is evident that the Swedes are not such matter-of-fact people as ourselves. Friends send congratulatory messages on the occasion of any festivity and usually employ one of the "luxury" forms as shown in the figure herewith. When the sender hands in his telegram he states which form is to be used, and the delivery office writes or types the message on the relative form. The sender pays the ordinary fee for the number of words in the telegram,







and in addition pays 10½*d.*, of which 4½*d.* is for the form and 6*d.* goes to the National Society for Prevention of Tuberculosis. The forms are punched on the left hand side so that they can be bound and kept as a memento of the occasion ; it is usual for a number of the messages to be in rhyme and to be humorous. The following four instances of the number of telegrams received may give an idea of how much the forms are used. The people concerned were ordinary middle-class folk.

At the weddings of the daughters of two doctors in the same town—a place similar in size to Guildford in England—154 luxury and 23 plain forms were received in one case, and 27 luxury and 47 plain forms in the other. One of these doctors received 90 luxury and 20 plain forms on his 70th birthday, and a banker in Malmö on the occasion of his retirement from the bank at the age of 60, received 140 luxury and 70 plain telegrams.

By means of these artistic telegraph forms the Scandinavians combine a little business with philanthropy and pleasure.

TELEGRAPHIC MEMORABILIA.

THE C.T.O. is gradually becoming quite a centre for wireless traffic. Gradually and quietly, without fuss or advertisement, it is advancing with modern developments. Long before the Press had boomed the art of "broadcasting" it had transmitted two or three times daily an interesting *resume* of the day's news, and for what is now a matter of years had dealt with a considerable amount of ships' telegrams. It is true that these latter were not sent off from the aerial that surmounts the Post Office buildings but they were transmitted direct by special wire to the nearest jumping-off point. From this stage there is apparently gradually evolving an improving system by which the depression of a key in London, by means of wires led direct into the wireless station proper, controls the distant wireless transmission on to the aerial, the intermediate re-transmission at the wireless station thus being transmitted automatically and without actual re-handling of the telegrams.

Certain services are still dealt with by indirect re-transmission, that is to say, the wireless station takes off the telegrams from London and re-transmits them by hand on to the aeria'. Of these may be cited the communications between Great Britain and Poland, Roumania, Italy and Egypt, and certain ship services. Of the wireless communications which are controlled directly by London and worked by Wheatstone or hand transmission at the respective average speeds of words per minute as indicated by the bracketed figures it is interesting to note, are the wireless circuits of London and Berlin (23), Cologne (100), Amsterdam (25), and Halifax, Nova Scotia (30). The respective English re-transmitting or controlled points of the Anglo-German and Anglo-Dutch communications are Stonehaven, Aldershot and Caister, that of the Anglo-Canadian is Banbury-Leafield for outward transmission. The Berlin circuit is controlled on the German side by means of a land-wire between Berlin and Königswusterhausen and the Cologne circuit by a land-wire between Cologne and Riehl. The Berlin circuit is worked duplex, the outward signals being sent out from the C.T.O., London, by means of a TS—Stonehaven wire on to the Stonehaven aerial while the inward signals are received on an aerial positioned on the C.T.O. roof and passed down by means of a relay into the Cable Room where on occasions they are received by Creed printer. The Cologne circuit, which for certain technical reasons is by far the better of the two Anglo-German circuits, is a simplex one, traffic being dealt with in half-hourly "runs" by means of Gell-perforated Wheatstone slip at a speed of 100 words per minute. Higher speeds have been attained. When the ether is fairly free from "atmospherics" remarkably well-defined signals are obtainable which may be printed off with perfect ease by means of a Creed printer, and on these occasions it is of course quite unnecessary to run the slip more than once. The London-*cum*-Banbury-*cum*-Leafield combination is as is well-known primarily for use in the Imperial Chain, and when good conditions obtain throughout may be easily read as far away as Perth, Western Australia. As a daily practical and reliable service this latter is not however a working proposition and was never designed so to be. It is cited simply as a token of possibilities. The Anglo-Egyptian communication though still at its infantile stage is an accomplished fact through the medium of London, Banbury and Lefield on English and Cairo and Abu Zabel on Egyptian territory. Excellent work has also been accomplished on the Anglo-Canadian circuit for weeks in succession working off the aerial at Leafield controlled from London through the medium of the London-Banbury-Leafield wire. The co-operation on the Canadian side in the case of the latter communication has left simply nothing to be desired. From four to five thousand words of press have been dealt with nightly, sometimes with but a couple of R.Q.s.

A contributor, who by the way points out that the *Court Circular* in recording the visit of the Duke of York to the C.T.O. in May last described the building as situated in Aldersgate Street instead of in St. Martin's-Le-Grand, reminds our readers of the historic interest attaching to the site upon which the huge London telegraph office stands and excerpting from Stow relates how : "The old college of St. Martin's-le-Grand claimed great privileges of sanctuary, &c., the abuse of which led to the place becoming a mere refuge of rogues, ruffians, thieves and murderers. Any rascal who stabbed his pot-companion, or struck down an innocent traveller in a dark bye-street, any red-handed brawler, could rush through the monastic gates and shelter himself in this den of crime. Here, also, harboured picklocks, forgers, coiners, makers of sham jewellery, carders, dicers, and other gamblers. Altogether quite a savoury resort ! Stow also chronicles that after the dissolution (in 1548) a large wine tavern took the place of the old college church !"

On July 7, Mr. F. Tharratt, Overseer of the Cable Room, retired on pension owing to ill-health. The best wishes of all old colleagues go with him and the sincerest hopes that freedom from office strain will do more than medicine to restore jaded nerves to something approaching the normal.

Mr. Dalzell has associated himself so thoroughly with the T. and T. Society that his new appointment cannot but deeply interest readers on the Telegraph side, who respectfully tender their sincere congratulations.

The Old Guard of T.S. were once more very much to the fore in the muster they made in Kew Gardens on June 7. Upwards of 130 veterans of the supervising Telegraph Service assembled, many having travelled from considerable distances in order to meet old colleagues and to exchange hand-grips, which latter sometimes express more than mere words. Though a veteran's gathering there were those present who had not yet touched the sere and yellow period, as for example the grand-daughter of a T.S.-ite who retired as far back as 1883 ! The weather was ideal and the "ALL OUT" call but too soon for many of the visitors who lingered long within the gates of this beauty spot and when outside the gates apparently found it difficult to say "Good-bye."

On July 4, American Independence Day, the German Telegraph offices notified their various correspondents as follows :—"*Zu einer Kundgebung fuer die Republik ruht hier der Betrieb von* 3 *bis* 3.10 *uhr.*" This desire for ten mintes' silence in honour of the republic was duly observed by the offices in direct communication with the various German telegraph centres.

From *The African World* it is understood that a private firm has offered the Government a scheme for broadcast wireless telephones throughout the Union, the cost of which would be recouped by the sale of receiving instruments at from £5 to £10. It is considered that "the scheme will prove to be a valuable educative influence on the Veld." This latter, judging from what one has read of broadcasted matter emanating from certain quarters, would certainly depend on the nature of the programs. The Minister of Italian Telegraphs stated a short time ago that the wireless traffic in Italy had increased from 700,000 words in 1919 to 4,834,000 in 1921.

The *T. and T. Age* of America states that Major-General G. O. Squier (so well-known to members of the I.E.E.) has invented a new development in wireless telephony by means of which speech can be received by attaching the usual receiving set to an electric lighting circuit and eliminating the antennae. One is not sceptical but it would be just as well if amateur wireless folk were to hesitate before tampering with the connexions of the local electricity supply. The results might not be as satisfactory as the press-man has indicated !

With reference to other paragraphs regarding the developments of trans-Atlantic cable telegraphy, the following condensed account of the report of the directors of the *German Atlantic Telegraph Co.*, of Cologne, which by the way is the first report issued since 1917, will prove of interest to readers :—

> "The cable sections ceded under the Treaty of Versailles included the greatest parts (7,361 nauts) of the two cables between Borkum-Fayal and New York and the Emden-Vigo cable of 860 nauts. There remained in the possession of the company three sections, from Borkum to the Straits of Calais, as well as two sections on the Spanish and American coast, of a total length of 1,335 nauts. The question as to the bases upon which Reich compensation was to be calculated and as to the manner in which payment was to be effected had not yet experienced a definite legal settlement, although the negotiations were expected to be concluded in the near future. The accounts for 1918-19 show a loss, and those for 1921 net profits of 1,370,000 marks, including the balance forward. It is proposed to pay a dividend at the rate of 5 per cent. for 1920. The participation in the North German Marine Cable Works is booked at 3,000,000 marks. With the assistance of the compensation from the Reich, and the amalgamation of the company with the German South American and East European Telegraph companies it is proposed, in the first place, to establish a cable between Emden and Horta (the Azores), which will there have a connexion with a new cable betweeen Horta and New York, belonging to the Commercial Cable Co."

It may be recalled in this connexion that the directors of the Mackay Companies in their report to shareholders, dated Feb. 15 of the current year, therein stated that the Mackay interests had entered into an agreement with the German Government on Jan. 17 for the laying of a cable *via* the Azores to Emden which was to be open for traffic by October 1923.

Further permission is being sought from the American Government, and by this time may have been granted to lay a second Pacific cable. A cable from New York *via* the Azores to France has also been decided upon *and power to deal direct with the public in France is being sought.* It would be no surprise to the well-informed in this country if the italicised portion of this proposition were to receive the hearty support of a number of influential people across the Channel.

Mr. T. W. Stratford-Andrews, Chairman of the Radio Communication Co., Ltd., has made a suggestion in connexion with distress calls from ships at sea which deserves serious attention. It is simply the substitution of

the present SOS signal by what he terms the bugle-like call of DDO repeated three times with a pause after every three repetitions. It is, in fact, an old call adopted many years ago by the Indo-European Telegraph Co. for calling the attention of all stations along the line at any desired moment. Telegraphists will doubtless appreciate the rhythmic attraction of this suggestion. Its introduction, however, would need to be accepted at a sitting of the next Radio convention before it could become internationalised.

New London offices have been secured by the Commercial Cable Co. in Wormwood Street, so that there appears to be a gradual movement of the telegraph companies towards, and even over, the northern boundaries of the city proper of the Metropolis. The Eastern and Spanish companies have for some years occupied Electra House near Moorgate Street Station, the Marconi Co. have recently moved in the same direction, and the Western Electric interests occupy a site almost on the edge of the boundary line.

An informant of mine in the Antipodes sends me the interesting item that Baudot Quadruple has been working successfully between Wellington, N.Z. and Christchurch for over six months. The line is a mixed one comprising about 16 miles of land line at the Wellington end (300 lbs. copper) followed by 37 to 38 nauts across Cook Strait (about 350 ohms) terminating on the Christchurch side with 226 miles at 3.5 per mile. The keyboards are equipped with Murray keyboard perforators and work at the usual speed of 30 w.p.m. per channel.

As far as one is able to judge at the moment of going to press, the vexed question of the landing of the Western Union Company's cable from the Barbadoes to Miami, Florida, has only been solved to a very limited extent. The shore end has actually been landed with the provisional authority of the United States Government but the cable is to be sealed. According to the Exchange Telegraph Company's information these conditions will obtain until such time as the All America and Western Telegraph Companies shall have given their consent to the abandonment of a policy of exclusive privileges on the eastern and western coasts of South America.

A new international telegraph line has been opened for three months now between Albania and Czecho-Slovakia *via* Antivari and Scutari.

Recent trials of Baudot Double Duplex between London and Prag *via* Emden and Dresden have shown the practicability of telegraph communication over this line and by means of this system. No actual traffic has yet passed up to the time of writing, but given a further stabilisation of the continental land lines it is hoped that the new means of a more rapid service with this energetic new country will soon become a very solid fact. The number of channels available should at present give full scope for traffic development which it is hoped will aid in the mutual benefit of the two countries concerned.

Chance.—Chance will not *do* the work,—Chance sends the breeze,
But if the pilot slumber at the helm,
The very wind that wafts us towards the port
May dash us on the rocks—
The steersman's part is vigilance
Blow it rough or smooth.—*Old English Play, 15th century.*

J. J. T.

THE TELEPHONISTS' COLUMN.

"TALK OF MANY THINGS."

WE are pleased to find that this new feature, commenced last month, is appreciated by our readers. In place of further remarks of ours on the inauguration of this column, we have great pleasure in printing the first contribution received—from Miss Dorothy Turner—and commend to one and all the excellent advice contained therein.

WITH GOOD INTENT.

Eureka ! In truth we must confess, that is not a very ladylike exclamation, but when we have explained the reason of our transports we feel sure we shall be forgiven.

Girls, have you realised our triumph ? At long last we have been given a whole column of the JOURNAL to ourselves alone. Imagine ! A whole column into which no male person may intrude. Never a word of the mystifying "Baudot" will be permitted to appear. Oscillating waves—whatever they may be—will not undulate in these paragraphs. Here we may safely speak on all the thousand and one interesting matters which concern the feminine portion of the telephone world. Hitherto, the JOURNAL has been a purely masculine concern*, containing matters learned and necessary even interesting from a masculine point of view. These matters could hold out no inducement to us. We had no desire to buy the JOURNAL, simply because we have had no electrical training, and therefore, it is all as Greek to us.

After many appeals, and many gentle reminders that we are greatly in the majority and a force to be properly considered in the Telephone Service, the Editor has conceded us a column. It is now *up to us* to make it a great success. In some measure we feel a sort of friendly rivalry towards the masculine section, and it is, perhaps, excusably feminine if we want to do better than they do. Anyway, we can make a good bid for it. We are not suffragettes. Neither do we *really* desire a vote (who would own to being over 30 !) but we *do* like to make our presence felt and take our proper share in the affairs of the day.

We want to do, we *must* do well in this column. So well indeed, that presently we shall overflow into other columns. And even (how alluring the very thought !) the time may come when we shall *be* the JOURNAL ! Then, as we are great we will be merciful and say to the gentlemen, "Here are *two* columns for you in which to publish masculine affairs."

We would much like to know more of *you*, our colleagues in the provinces. It would be good to compare notes as to our respective hours of duty. Details concerning your exchanges, dining rooms, rest rooms, social and sports clubs would be interesting to know. Will you not write for us, please, and send your contributions to Miss McMillan, our Editress ? She needs all our support and co-operation.

There are two great qualities which are difficult to define, and perhaps for this reason they have always kept the names by which they are known in France. They are *Noblesse Oblige* and *Esprit de Corps*. They are wonderful qualities, and are absolutely necessary to the well being and furtherance of any great and good project in which a body of people are involved. Show that you understand the meaning of it now, O ye telephonists, by writing for the JOURNAL whenever the opportunity occurs, and more especially by *buying* it every month.

Just one little word more let us whisper to you. Don't let anybody read *your* JOURNAL over your shoulder. Tell them it only costs threepence per month, and henceforth it is going to be well worth while.

DOROTHY TURNER.

To judge from the caustic comments still being made by many telephonists regarding the appointment of Miss K. M. Cornish, B.A., to the Savoy Laundry in Clapham Road, they will agree with the remarks of "The Man in the Street" in the *Daily Sketch*,, when he says :—

"Obviously Miss Cornish must be possessed of the qualifications which the manager of the laundry considers necessary in a telephone operator, but what I am wondering is whether these qualifications were acquired as a result of her University training, or in spite of it. The laundry may, for all I know to the contrary, have a very exceptional lot of customers who when they ring up to enquire after the health of their boiled shirts couch their remarks in Greek hendecasyllabics, or they may speak in Latin when asking why it has been thought necessary to remove *all* the buttons from their singlets. But from what I know of laundry customers, although their language may at times be somewhat violent, it is almost invariably colloquial. So I should think that a lady who had never heard of the differential calculus, and was quite unaware that Gaul was divided into three parts would be well able to attend to the 'phone ! This appointment seems a little unfair to the telephonists, hundreds of whom, in the words of one of them, "are prevented from graduating through lack of means—*not* through lack of wit and gumption. Certainly it is our experience that our telephonists would have passed with honours that part of the test which required the possession of "Resource," "Observation," "Pertinacity," and "Judgment."

Our knowledge of Greek and Latin has, alas ! grown rusty through desuetude ; though we all make frequent use of one Greek word, *i.e.*, "Telephone" from "tele," afar, and "phone," sound or voice ; and with regard to Latin, we may only dimly remember being told to "learn the declension of Bonus." but we have every reason to remember it now. Four twenty-sixths ? Zeus ! " ———

At a "Wireless" dinner at the Lyceum Club, the guest of honour, Senator Marconi, said that when the whole history of wireless came to be written, it would be found that the original inspiration for the discovery came from a woman. We await that history with interest.

THE DEAR REDUNDANT STAFF.

According to the "peg count" we have redundant staff,
Now we can have a little chat, enjoy a merry laugh.
We go downstairs just when we like,
Have cups of tea, and take a "mike."
There's nothing else to do, we can sit and sing,
As the dear redundant staff comes flocking in.

Each morn when early duty all our cords we test,
The sweet subscribers "calling," they never let us rest.
We test some lines from "point to point,"
Until our arms are out of joint.
There's nothing else to do, we can sit and sing,
When the dear redundant staff comes flocking in.

Many of us love our work, we never should complain,
We sometimes wonder if we're mad, or if we're really sane.
With "buzzers stuck" we vainly strive,
The "Service board" keeps us alive
There's nothing else to do, we can sit and sing,
As the dear redundant staff comes flocking in.

We had three girls at eight o'clock, now we've only two.
We mutter signs of protest—but that's 'tween me and you.
To those who rule we humbly say,
We want more staff another day.
The superviser's answer makes we poor mortals "strafe,"
According to the "peg-count," we have redundant staff.

GERTRUDE M. TURNER, *Hop Exchange.*

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

* We must claim an exception for the able articles by supervisors, telephonists, and others, not forgetting the Editress of this column, which we have published from time to time.—EDITOR, *T. & T. J.*

LONDON ENGINEERING DISTRICT NOTES.

Valediction.

ON July 4 the Deputation Room in G.P.O. North was packed with representatives of all grades of the Engineering Department who had gathered together to support Major Purves in making a presentation to Sir William Noble on his retirement from the Post Office. Major Purves, in his ingenuous style, reviewed the splendid work consistently performed by Sir William throughout his long career and laid emphasis on his very human qualities.

Speeches were made also by Messrs. McIlroy, De Lattre, Sinnott, Plumber, Moir, and Allen. Mr. Allen, in expressing the goodwill of the Stores Department, said that in the company of P.O. Engineers he always felt that he was among friends. Sir William Noble, in his reply, gave away the secret of his success. He claimed never to have worried either himself or anyone else. This quality together with his love of hard work had the results that ended in his attainment of the high office he recently vacated.

Sir William said he felt exceedingly fit and this fact should help towards a realisation of the wishes expressed at the gathering, that he should live many years of active life before carrying his energies to the next plane of existence.

New Assistant Engineer-in-Chief.

Congratulations to Mr. J. Sinnott, who has been appointed to fill the vacancy caused by the promotion of Major Purves. Mr. Sinnott is a man with an extensive knowledge of the engineering work of the Department, and one with a broad outlook. The new Engineer-in-Chief and his two assistants form a strong team with some years to go before any changes due to the age limit will be necessary. Under the circumstances great progress in the work of the Engineering Department may be looked for with confidence.

Institution of Electrical Engineers.

Congratulations to the Institution of Electrical Engineers on their selection of Mr. Frank Gill as their President for the forthcoming session. It is fitting that an Institution which was originally founded by Engineers interested in communications, should occasionally choose someone from the telegraph and telephone world to preside over their activities. Those who know Mr. Gill's immense capacity for work will rest content in the knowledge that the standing of the Institution will have been greatly improved before his term of office expires.

In the last Annual Report of the Institution, the following special awards were announced :—

Mr. J. G. Hill	Institution Premium	
Mr. L. B. Turner	Wireless	,,
Mr. E. S. Byng	Fahie	,,

These three gentlemen are well known to every member of the Engineering Department and in fact throughout the profession generally.

Mr. Hill is the only one of the three who is at present on the Post Office staff, being attached to the Research Section. Mr. Turner left the Wireless Section of the Post Office some time ago to take up a lecturership at Cambridge. Mr. Byng was at one time on the engineering staff of the late National Telephone Company, and is now one of the "lights" of the Western Electric Company.

Ireland's Loss is England's Gain.

Welcome back to Mr. E. Turner on his transfer from Ireland to the Engineer-in-Chief's office, London.

Mr. Turner, who left the London District on his promotion to the rank of Superintending Engineer, spent a long period as Assistant Staff Engineer in the Engineer-in-Chief's Construction Section, which he will in future control. The occasions on which members of the L.E.D. have dealings with the Construction Section are numerous, and under Mr. Turner's control the relations are bound to be as agreeable in the future as heretofore.

Morkrum Printing Telegraph.

A new departure with reference to local telegraph working has recently been made by the installation at the Borough High Street Branch Office of a Morkrum Printing Telegraph. This system presents some of the features of both the Hughes and Baudot printing telegraph systems. The apparatus, which is very compact, comprises a keyboard transmitter and a printer combined in one instrument. The apparatus is actuated by a small D.C. motor. The Baudot alphabet is used, but the 5 selective impulses are preceded by a positive starting impulse.

The operation of a lever on the keyboard sets up a combination on the commutator springs, from which a revolving spindle transmits to the line the elements of the letter corresponding to that on the lever depressed. The printing arrangement and method of letter selection is very similar to that of the Baudot receiver, *i.e.*, on the same axle as the type wheel are fixed two discs on the rims of which are cut notches arranged in accordance with the Baudot code. The selective levers which fit into the respective notches are actuated by plungers which are themselves selected by the receiving electromagnet in conformity with the letter impulse received.

The receiving mechanism is adjusted to run at approximately the same speed as the transmitting mechanism. A governor is provided for regulating the speed of the motor ; the speed being gauged by inspection of equidistant white spots on the rim of a fly-wheel on the motor, by means of two slots in vanes attached to the opposite legs of a forked vibrating reed. The messages are printed on gummed tape, which is affixed to the message form in the ordinary way.

The machine at the Borough High Street Branch Office is designed for simplex working, and has been placed at the office mentioned to meet special traffic requirements.

Somerset House Fire Alarm System.

A new fire alarm system has recently been installed at Somerset House and replaces a system of battery signalling bells which has hitherto served the purpose.

The new installation consists of 46 telephones, No. 47 wired in six separate groups serving the separate wings of the buildings to a special C.B. switchboard fitted in the Police Office. In addition, a Gamewell Indicator System is installed by means of which the number of any station from which a fire call is received may be signalled from the Police Office and registered on the indicator fitted in the extrance lobby of each wing. The instruments forming each separate group are wired to a strip of ten jacks, and eyeball signals *via* ringing keys, which are linked in two groups of five.

The calling signal on the switchboard is operated by the removal of the receiver of telephone No. 47, and in the event of a fire call being received, the whole of the bells in the building would be rung by the starting up of a dynamotor and the throwing of all the linked ringing keys which lock in the ringing position. The position of the fire would be signalled to the Gamewell indicators in the various wings immediately after the alarm bells had been operated by the Officer-in-Charge. The position of the fire would be signalled by the selection of a toothed wheel—one of which is provided to correspond to the number allotted to each station—its insertion in the Gamewell transmitter and the depression of a lever. On the operation of the alarm bells, the constables in the various wings are instructed to proceed to the entrance lobby in their particular wing and to ascertain the position of the fire from the Gamewell indicator.

An emergency ringing supply is provided by means of a power ringing lead from the Central Exchange, but in the event of the use of the emergency supply, the ringing keys would be thrown in the reverse direction to that of the local machine ringing. The former position is non-locking, and one group only—two sets of five keys—can be rung simultaneously as the keys need to be held in the ringing position. This is necessary as efficient ringing could not be obtained were the whole of the bells connected simultaneously to the power lead.

Two 14 Cell Leclanche batteries have been provided, one battery serving the Gamewell System and the other the fire alarm telephones and switchboard. Switches, however, are provided so that the two services may be connected to either battery in the event of fault or for maintenance requirements.

The whole installation has been subjected to very close examination and tests by officers of the Office of Works, Inland Revenue and Post Office Engineering Departments, and has been accepted by the Office of Works and Inland Revenue Department as entirely satisfactory.

New County Hall. Telephone Installations.

By the time these notes appear the opening ceremony of the New County Hall will have been performed and general descriptions and photographs of the building will no doubt have appeared in the daily Press. Much time and thought have been devoted by the members of the Engineering Department to the telephone installation, and it is believed that the following information may prove of interest as supplementary to that which may appear elsewhere. During the War that portion of the building which was at all habitable was adapted by the Office of Works and occupied by the Food Ministry, and a telephone installation of considerable size was provided by the Post Office.

The installation was of a temporary nature ; the cables which ran from the switchroom to those parts of the building occupied by the Food Ministry officials terminated on distribution cases in rooms and corridors, and internal or office wires were run aerially through rings to the different instruments. The permanent installation is, however, of a very different character. The switchboard, which is of the No. 9 multiple type, has 10 positions equipped with a multiple for 600 circuits and is that which was installed for the Food Ministry. It is intended to replace this ultimately by an automatic exchange. The main frame has a capacity on the external cable side for 2,760 pairs, and on account of the vast size of the building and the necessity for fitting as many distributing points at the outset as possible, the external cable provision has been liberal, hence the greater portion of the external side is already appropriated.

One of the requirements of the L.C.C. in connexion with this installation is that no wires or cables shall be visible when the installation is completed, and this applies equally to the Council's own plant as well as that of the Department. Ample arrangements have, therefore, been made in corridors, in rooms, and between floors for the various services, *e.g.*, electric light, power, heating, bells, telephones, &c. Beneath the floor of each corridor is a duct-way that extends the whole width of the corridor and is about 18 inches deep. access to which is gained by man-holes suitably placed. Steel conduits are run through this duct-way to accommodate the telephone cables and wires, and at frequent intervals cast-iron boxes with covers are fitted. From these

cast-iron boxes other conduits are run into the individual rooms. The end of the conduit terminates in a metal trough which runs round the room behind the skirting-board.

The building is divided into eight blocks or sections, and the rising mains of the various services are brought out into a control room on every floor in each block and as there are eight floors, it will be seen that there are sixty-four control rooms. In each of these control rooms, the Department has fitted a distribution case on which the cable from the switchroom is terminated, and from this distribution case the wires pass through the conduits, joint-boxes and troughings to the various instruments.

It will be realised that the quantities of material used in this installation have been considerable. There are approximately six miles of steel conduit and over three hundred cast-iron junction boxes, both these items being provided and laid by the L.C.C. for the Department. Already seventeen miles of flameproof cable (1 pair) has been run, to say nothing of the large lead-covered cables which connect the main frame to the various control rooms.

The distribution cases which, as before mentioned, number sixty-four, vary in size and accommodate from twenty to a hundred and sixty wires.

It is believed that the method of installation is unique, and it was not without considerable discussion at the outset that the method of cabling the building was decided on.

The practice of leaving draw wires in conduits was not followed in the construction of this installation, steel tapes having been used instead of draw wires.

At present there are 500 extensions working and at the time of writing an order has just been received for a further 50 with a request to increase the multiple capacity by an additional 100 circuits.

In concluding these notes, it is pleasant to be able to place on record that the relations with the L.C.C. Engineers, the Contractors staffs, and the Department's Engineers and workmen, have been cordial throughout the work.

LONDON TELEPHONE SERVICE NOTES.

Away Dull Care.

THE holiday season being in full swing, each week-end finds us bidding *au revoir* to one or other of our colleagues, and on Mondays we greet others on their return to the common task. One hears glowing accounts of well known and also of obscure places on the coast and inland as well as abroad, the most wonderful stories being related by those who have spent their leave in Germany or Austria. Although the spending power of the English pound is not so high as it is represented to be by the rate of exchange, the number of marks obtainable for that amount gives the visitor a sensation of unusual affluence. One colleague just returned relates how he was host to a party of eleven at a dance, considered to be most exclusive, the total cost to him being equivalent to fifteen shillings. Another, it is said, had to walk a hundred miles as a result of changing a five-pound note, there not being accommodation on the train for him *and* his money.

Not long ago a newspaper published letters from some of its readers protesting that women in the Civil Service should be in a position to afford holidays in Switzerland. Apparently we can do nothing to please certain of our critics, but in the matter of holidays at least we may claim to please ourselves. There is an interesting sidelight in this connexion. There is a fund called the Children's Country Holidays Fund, which provides for holidays for poor school children in need of a stay in the country, who cannot otherwise go on a holiday. The Post Office collection amounted to £1,742 12*s.* 0*d.*, the L.T.S. contribution being £103 17*s.* 0*d.*, taking second place to the Engineer-in-Chief's Department. We are not, therefore, unmindful of the needs of others. In the yearly report of the Fund, just to hand, some extracts are given from letters written by the children. The following is a gem: "Pigs eat almost anything, and they deserve their name."

* * * *

Exchange Names.

Following upon last month's notes on the derivation of "Maryland" two others are given in brief. "Maida Vale," was named after the Battle of Maida, a place in Calabria, Italy, where on July 4, 1806, the British defeated the French under Reynier.

"Minories" is derived from an old Convent of Minoresses (Sorores Minores) or Nurses of St. Clare, the old church of which is represented by the Church of the Holy Trinity (rebuilt 1906) in Church Street leading east from the Minories.

* * * *

Langham Choral Society.

This Society will commence its season's activities earlier than usual on account of its having undertaken the organisation of a concert at the Crystal Palace on the occasion of the Post Office Fete Day on Saturday, Aug. 26. The Choir will sing Elgar's "Banner of St. George," and a miscellaneous performance will also be presented for which Miss Beatrice Miranda and Mr. Barrington Hooper have been engaged, and it is hoped to add the name of Mr. Joseph Farrington.

The Hon. Sec., Mr. W. R. Child, of the Contract Branch, will be glad to hear from anyone who would like to assist in the Choir on this occasion. The rehearsals will be held at the "Rangers" Hall, Chenies Street, W.C., on July 25, Aug. 15 and 22, at 6.30 p.m.

* * * *

Culled from the Exchanges.

Gerrard Exchange.

We have had some excitement this afternoon. For the first time the exchange staff have been posing for the Cinema, and doing it very well, too.

From 1.30 onwards the Western Electric Company have been busy getting the lights ready. Of course we only saw a portion of the room lit up, but it was like nothing we had ever seen for brightness. It is understood that the cost of lighting the whole exchange for a photo would be 300 dollars. When the Cinema operator actually did arrive with his suite (a small army with a big accent) the staff on duty, and those who elected to stay behind, had quite an interesting experience of how a moving picture is taken with artificial light. It is very sad that this wonderful radiance entirely effaced the subscribers' calling lamps, but as we received no complaints ,we hope and trust nothing will happen; as we say after a "Fire Drill." Of course we are principally thinking of the observation results.

The photos were taken from the "A" side, both ordinary and slow movements. Then the "B" positions were taken, showing up the high multiple. Of course, the Special Enquiry being the highest point, the staff got very busy with these circuits for a few moments, giving quite a spectacular effect to the proceedings. The testing position came next, and it was funny to watch the Cinema operator close up to the position directing the movements of the voltmeter, which was permitted only dignified movements. In fact it was made to understand that it was having its photo taken. Of course we are prejudiced, but we think that the girls who operated for the picture looked very nice, and we hope that the result will be worthy of them and of our Exchange.

* * * *

Regent.

"WHY, THEREFORE . . . ?"

Full oft I've sat and pondered me
On many vexing things that be,
And one did most perplex my mind
Yet no solution could I find.
Methinks, I'll hie me to a sage
And seek his counsel to engage.

"O Great and Brainy one," I quoth,
"Give me your wisdom, learning—both."
I' faith I cannot but perceive
When supervisors go on leave
Or lack-a-day are sick, mayhap,
An operator fills the gap
That supervisors well may fare
And do no more than is their share.

Yet we are absent by the score
And no one bothers to restore
Our ranks to meet the urgent need
Of spaces, gaps they take no heed.
And oft we're in a sorry plight
Th' adjacent one is lost to sight
So many spaces intervene."

The Sage replied in tone serene,
"But what of the 'Redundant Staff'? '
At this I scarce forbore a laugh,
For sooth, 'twas humorous to think
That one could thus a Sage hoodwink.
"Redundant they are *called*, 'tis true,"
I answered him, "Yet if you knew
Experiences teach. Indeed
They only meet our normal need."

The Sage then reasoned thus with me—
"O Foolish One, can you not see
That supervisors surely are
The most important factors far?"
And humbly, for I feared to vex,
I begged "Forgive, it doth perplex
Me still, for if it should befall
We'd ne'er a 'super' left at all,
Subscribers would not have a care
If *operators* still were there.
But just suppose that we were gone
Who would there be to 'carry on'?"

The Sage assumed great dignity
And waved his hand dismissing me,
Remarking as I turned away
"You've wasted all my time to-day.
I'm known for wisdom, learning great,
I engineer Affairs of State,
But . . . this he said with pride immense—
"I do not deal in *Common Sense*!"

DOROTHY TURNER.

EXTRACTS FROM LETTERS HOME OF A YOUNG TELEPHONE ENGINEER.

(SENT OUT TO INDIA TO INSTAL THE FIRST AUTOMATIC SWITCHBOARDS USED IN THAT COUNTRY.)

Calcutta, May 13, 1921.—We've four natives in the office as well as the coolie boys and the chokra—a little messenger boy, aged eight, with big brown eyes and a snowy white turban; he's a pretty kid. There's the storekeeper and cashier—a tall thin man with a wonderfully gentle voice—clad in an English shirt and a linen sheet, with a white ruffle round his neck. He sits and chews pahn—a weird native concoction of leaves and betel nuts and lime and other things—and deciphers the most atrociously-written stores-chits which the operators can produce. The way in which he can read a language foreign to him, written in writing far far worse than this, is very wonderful—he rejoices in the name of Ok-eye. Then there's little Gobbin, the typist—a poor, little deformed chap—earning twenty-five rupees a month—just a shilling a day. He has lately betaken unto himself a wife, aged seven; and last, but in no sense least, there is Durga Dass, the letter clerk and amateur actor. On the morning after his great success he told S., that his uncle, a very famous Bengalee actor and partner in the Monomohon Theatre (I was introduced to him when I went "round the back," he was in his office lying on a couch smoking his hooka; the respect the natives showed him almost amounted to worship), had offered him eighty rupees a month to act for him. Asked why he didn't take the job when the Company was only paying him 30, he stammered: "I c-c-an't l-l-leave my f-friends in the office—m-m-money i-isn't everything w-with *us*."

May 31.—Working down at the Telephone School is great—only you can never get a move on properly because they keep having holidays. Last Saturday was the last in the month so we had to shut down. Next Saturday is the Emperor's birthday so, of course, we've got to shut down again, and so on. The voyage made a terrible mess of the switchboard—it was all bent about and twisted to the dooce. However, I got busy on it with a good heavy hammer and a crowbar and it don't look so bad now. We got the battery on it to-day, and although we weren't able to get a call through as all the wires were not joined up, so far as it went it wasn't so bad—one or two "bugs" here and there, but that, of course, is expected and only makes it more interesting.

Thursday, June 9.—This holiday stunt is getting beyond a joke, Yesterday and to-day are holidays again—Muhammed's birthday—how he can have a birthday on two days I don't quite see—but there it is. Id-ul-Fitr, they call it. It's very convenient having so many religions here; you see, as this is a Muhammedan holiday you can still get a taxi driven by a Hindu, or ride in our lift driven by a Brahmin. It's only the Christians who are sufficiently broad-minded to recognise all the holidays. I like the Muhammedans best—they're far more refined than the others, far more logical, they call the Hindus "Jungle-Wallahs"—a wonderful epithet—a thousand times more effective than "fool" or ass (even when rhymed with "glass"). It implies that they're poor, ignorant fellows, irretrievably on the wrong tack, obstinate, deserving of pity and a thrashing at the same time, a hopeless case, and so on. Yesterday, the Muhammedans finished their forty days fast—Ramuzan—they ate or drank nothing between 3 a.m. and 7 p.m. all the time. Out on the Maidan forty thousand of them formed up in a great square to pray, attired in every colour of the rainbow, with a generous use of gold lace. They all stood stock still in the sunlight and the fresh morning breeze, arms folded, heads bent. Then, altogether, the first line went down and touched the earth with their foreheads—then the second line, then the third, and the wave ran right back to the other side of the square, and all you could see was the roundnesses of forty thousand gay-clad backs. Then the wave ran across them again, like the wind in a cornfield, and then arose wailing "Alla-a-a-h, Alla-a-h." After he'd finished his devotions my boy came home and gave me the sack, as he was going for a holiday. That's what they do, you know, work for a few months and save a few rupees, and then go off on a holiday. If you have a motor-car they take it along with them usually, and the police will find it for you all smashed up and left by the roadside. I think it's rather inconsiderate.

June 19.—Since I have started working I have fallen into some sort of a routine and there is not much happening "to write home about." Take to-day for instance: I gently slid from sleep to a sort of semi-conscious state to the sound of Abdul's voice whispering: "Sahib! Sahib! Chohtah hazree hai!" (early tea is ready). Then I ate the bananas and toast, drank the tea and went off to sleep again while he got the bath ready. Eventually he managed to wake me again and I staggered to the bathroom, went through the daily ritual of telling him that he had made the water too hot (he always has done and always will) and then bathed, was dressed and went in to breakfast 8.30 a.m., wrote a few letters, smoked, looked at the papers, and then went around with S. to the music shop to help him choose some rags to send to his spouse,—called in at the book shop, bought "Our Mutual Friend"—taxied home to see if the mail had come in,—it hadn't, of course, it was only due last Saturday—to-day's only Tuesday—then off to Alipore where the Tele. Stores is—that's just over two miles away; the storeyard is a sort of park with the river at the bottom of it; arrived about 11 o'clock, lit a pipe, said "good morning" all round the engineers, received profuse salaams from the wiremen, porters, messenger boys, and so on, and then found Mendoca, the Indian I'm teaching the Relay system to. We joined some other Indians and discussed non-co-operation (a kind of Indian Bolshevism—I don't know anything about it, but M. says it very wicked—he's a very decent sort of chap), Monsoons, languages, University training, and eventually tactfully brought ourselves face to face with the work on hand—then we broke away for Tiffin. After Tiffin we had some more discussions and worked round to telephones about 4 p.m. Then gave the wiremen instructions what to do to-morrow—which is a Hindu holiday—the wiremen are Mohammedans, you know—and went on our way rejoicing.

C. G.

(To be continued.)

CORRESPONDENCE.

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

DEAR SIR,—Mr. Polley apparently takes exception to the statement in my notes—when comparing the five-unit system with the Morse code—that "The object to be achieved in substituting multiplex systems for Morse working, is to fill the line." This article was not written with the intention of making a comparison with any particular system, but to show the comparative difference in length between the codes used in inland working.

It is not claimed that thirty words per minute is obtained in actual working. This is practically impossible with the five-tapper keyboards, and a distributor speed of 180 revolutions per minute, but the day may not be far distant when keyboard perforators, with possibly, a distributor speed of 240 revolutions per minute, will take the place of the five-tapper keyboards on the more important lines.

Mr. Polley also states that "in reality a comparison between Wheatstone and Baudot does not concern the respective alphabets in any way." I have little hesitation in saying, that if the five-unit code were adaptable for Wheatstone working, the Morse code would cease to be used for that purpose.

July 18. W. T. COUSINS, *C.T.O.*

PERSONALIA.

LONDON TRAFFIC STAFF.

Resignations on account of marriage:—

Assistant Supervisor, Class II.

Miss F. E. M. CONSITT, Gerrard.
Miss E. WARING, Richmond.

Telephonists.

Miss M. M. V.VOGAN, Holborn.
Miss M. E. Meacham, Holborn.
Miss A. R. M. KING, London Wall.
Miss B. R. HOLLEY, London Wall.
Miss H. R. GOODYER, London Wall.
Miss M. HIRONS, City.
Miss E. J. M. WEBB, City.
Miss F. W. HOLLAND, City.
Miss F. H. SAYBOURNE, Chiswick.
Miss D. A. V. DAVIS, Gerrard.
Miss D. V. TYSON, Gerrard.
Miss M. Williams, Gerrard.
Miss E. A. Fairbairn, Dalston.
Miss J. L. WEBBEY, Avenue.
Miss H. F. DESSENT, Avenue.
Miss F. M. B. HARRISON, East.
Miss D. V. PATRICK, East.
Miss L. A. PAYNE, Streatham.
Miss E. MARTIN, Redhill.
Miss F. E. SHAW, Trunk.
Miss M. JOHNSON, Trunk.
Miss M. D. GLOVER, Trunk.
Miss V. M. SMITH, Chiswick.

C.T.O. STAFF.

Mr. C. E. TYLER to be Overseer, *vice* Mr. W. Bedford, retired.

Miss L. E. KELLAND, Telegraphist, to be Assistant Supervisor, *vice* Miss J. M. Mallandain, retired.

Miss E. G. GAMMON, Telegraphist, to be Assistant Supervisor, *vice* Miss A. E. Groves, retired.

Miss H. F. GILSON, Telegraphist, to be Assistant Supervisor, *vice* Miss F. R. Powell, retired.

MANCHESTER.

Miss M. REILLY, Supervisor, City Exchange, resigned on account of her approaching marriage.

Miss L. YATES, Assistant Supervisor, Class II, Central Exchange, resigned on account of marriage.

Miss M. R. SHARPHOUSE, Assistant Supervisor, Class I, has been appointed Supervisor, Trunk Exchange, *vice* Miss Hawkins, retired.

THE

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HOW CAN WE IMPROVE THE USE OF OUR LONG-DISTANCE TRUNK LINES?

BY F. LANGE. (Frankfurt-am-Main).

(*Translated and Abridged by* H. W. CAMP, *from "Telegraphen und Fernsprech-Technik."*)

THE long and heavy trunk lines of the State Telegraph Administration have become so valuable on account of the permanent rise in the cost of labour and material that a close examination of their use appears desirable, especially as the bad financial position of the State necessitates a drastic economic handling of its sources of revenue.

In order to determine closely whether the system of working the long distance lines is economically sound, the expenditure and revenue should be compared and the tariff question investigated. It is not proposed to deal with the latter point here, and we shall confine our examination to whether the system of working exhausts all revenue possibilities or what loss of revenue occurs and the reasons for the loss (lack of system or of lines).

We shall, therefore examine: (1) How many speech units ought to be normally carried by the lines during the working day or hours; (2) To what extent the present results are behind the normal values working; (3) What loss of revenue arises; (4) What improvements suggest themselves.

To be able to determine safely how many speech-units should be normally expected from a trunk line during the day, extensive statistics are required in order to see how the tariff should develop under given circumstances. For this purpose, records are used which show a continuous and close examination of trunk line working. The records also show to what extent the regular day period is used for traffic in relation to the lines at one's disposal.

Now we come to the essential point—how many of the 60 minutes of the working hour are revenue-earning and how many are lost? Non-revenue earning time arises:

1.—By the passing of service communications between the telephonists at each exchange (other than the passing of required numbers), the method of working, passing forward "urgent" calls, cancellations, queries *re* duration, &c.

2.—Through the calling of the subscribers (calling, waiting for reply, testing, engaged number, explanations between subscriber and telephonist, misunderstandings, wrong local connexions, faulty junctions, &c.)

3.—Hindrances to supervision on account of having other lines to operate, passing information, pricing or because the telephonist is lazy.

4.—Through faults—,

(*a*) Lines completely out of order.

(*b*) Faults developing during the working and creating difficulties

STANDARD TRAFFIC VALUES OBTAINED BY MEANS OF OBSERVATION OFFICE RECORDS.

Frankfurt Trunk Exchange possesses an Observation Desk served by two telephonists to which the trunk line and the telephonists' transmitter set can be connected. The telephonists enter the results of the observations in a book in the form which, according to general experience, is considered the best. See Table 1.

Although the Frankfurt desk does not compare with the size of the exchange, the observations have already proved valuable. The satisfactory carrying on of the trunk working as a result of this permanent supervision can only be mentioned incidentally. More important is the creation of extensive statistics which, with the current exchange statistics *re* loads and faults, enable a correct solution to be found for a series of economic and technical traffic questions.

All observations of separate events depend upon the existence of data of a universally valid nature, and of standard value with which a comparison must be drawn in every case.

The main questions, therefore, are as follows:—(1) With how many speech-units can a trunk line be loaded? (2) what period comprises a standard speech-unit? (3) in what proportion is the duration of the speech -unit distributed according to the actual speaking time of an effective conversation and the unoccupied time? (presenting subscribers, &c.) (4) how does this proportion change on account of the differences of position-loads and the introduction of the summer system of operating?*

* Summer system of working. A phantom circuit is made up and over this circuit all service particulars are passed so that the physical lines are used solely for subscribers conversations.

TABLE 7.

Actual Revenue and Traffic						Possible Revenue and Traffic.	
Line.		Traffic Load.				Normal day output.	Daily Receipts.
No.	Type.	Average hourly units.	Daily average units.	Fee for urgent calls. Marks.	Daily total receipts (24 hours) Marks.	Units.	Marks.
1	2	3	4	5	6	7	8
8	Physical Lines	9	126	12	12,096	180	17,280
3	Phantom Lines	4.1	57.4	12	1,378	160	3,840
1	„ Line	4.1	57.4	9	517	160	1,440
					Total 13,991M.		Total 22,560M.
					22,560M.		
					13,991M.		
					Loss 8,569M.	daily or yearly (300 days) 2,570,000M.	

THE ECONOMIC RESULTS OF THE DETERIORATION IN THE UTILISATION OF THE LINES.

The previous example of the eleven Frankfurt-Berlin lines will again be used. In the following summary the net revenue obtained and the possible revenue are compared. As a result of the deterioration the administration loses about 2.5 million marks a year. In view of the earlier investigations it cannot be said that the possible revenue is put at too high a figure.

SUGGESTED IMPROVEMENTS.

The necessary requirements for the improvement of the working of the long-distance trunk lines are as follows :—

1.—Single line loading of positions.

2.—The introduction of the summer time system of working.

3.—Long-distance lines to be operated by specially-selected telephonists whose duties can, if necessary, be shortened. Change over from very busy to very slack positions.

4.—Closer supervision of the working by the installation or enlargement of the observation office.

TELEGRAPHIC MEMORABILIA.

WE were pleased to welcome the delegation from the French Telegraph Administration which recently visited this country in order to study telegraph organisation, &c., here. The quartette was composed of Messieurs Leon Raynal and Jacobs, engineers, M. Goerens, Director of the Paris C.T.O., and last but not least our old and honoured friend and author, M. Mercy. They were unfeignedly pleased with their visit and the facilities given them of enquiring into every possible detail which suggested itself to them or to ourselves. A visit to the South-Western District formed one item of their itinerary, while visits to the cable companies also figured in their program followed by journeys to certain provincial offices. Opportunity was taken of many informal conversations concerning matters of mutual interest relating to international communications.

It was with renewed hopes for the future welfare of Anglo-French telegraphy that we bid *au revoir* to our colleagues. The personal friendships made and renewed on this occasion should greatly facilitate a more complete telegraphic *entente* between the two administrations, and to lasting improvements in the public service for which the chiefs of the two administrations concerned are equally responsible

During the same week, by a strange coincidence (it is not often that we are honoured by the visits from two foreign administrations at the same time), Herr Wollin of the C.T.O., Berlin, and Herr Rudolph of the important repeater office at Emden also arrived on a similar mission and were also unmistakably gratified at the cordiality of their reception and the freedom with which they were able to study British methods. Here again interchanges of views on methods of organisation in the two countries represented were freely expressed with what must surely prove to be a lasting benefit to the Anglo-German telegraph service which, despite all the difficulties of post-war conditions, has probably never worked so smoothly as during the last twelve or eighteen months. They also paid a short visit to the new repeater office at North Walsham, and returned to their respective posts in Germany with the confirmed assurance of the goodwill of the British Post Office in matters relating to the Anglo-German telegraphs.

It is sometimes annoying to the writer that this JOURNAL only appears monthly as it is feared that frequently items published in these columns are "a day behind the fair!" This may possibly apply to the following two paragraphs. Perhaps before these words are reproduced in print, in any case German engineers are very sanguine that, before long, they will succeed in telegraphing from Nauen across the Atlantic by means of the Siemens' high-speed printing telegraph at a rate of 500 letters per minute. The maximum speed at which this apparatus is capable of working is twice that rate.

An Italian committee of half-a-dozen wireless experts is on its way to this country and to Germany with a view to visiting Carnarvon and Nauen, and of examining these two stations very thoroughly in order to aid their Government in regard to questions relating to the granting of wireless concessions.

L'Audion is responsible for the statement that the Italian technical press is divided in its opinion regarding the relative values of the Marconi and the Telefunken wireless systems. In certain quarters very decided beliefs are held that the latter is the superior.

From a report by H.M. Commercial Secretary, Santiago, comes an item bearing on this question. It reads :—

"The Chilean Government concluded a contract in October, 1921, with Messrs. Siemens, Schuckert, Ltd., in consideration of which, for the sum of $1,385,000.00, the contractors agreed to erect eleven radio telegraph stations at Santiago, Valparaiso and Punta Arenas, all capable of communicating with Buenos Aires, and at Iquique, Antofagasta, Taltal, Tocopilla, Caldera, Concepción, Valdivia, and Chiloé, with a maximum radius of 1,550 miles. The system to be installed is the Telefunken."

And, strange to say, from the same source, originates a paragraph which relates how in the following month of the same year the editor of an Italian paper published in Buenos Aires visited the same country "with the object of interesting his compatriots in the proposed laying of a submarine cable connecting Italy with South America." Some details of this rival to the two above-mentioned rivals have already appeared in these columns.

The Directorate of British Civil Aviation, Great Britain, France, and Belgium have prepared a vocabulary of standard phrases in English, French, and Dutch. Each phrase and word is numbered for the benefit of operators unacquainted with languages other than their own. With this code the only parts of a foreign language a pilot or ground wireless operator need know to carry on a conversation are the numerals, the code consisting simply of the figures 1 to 85, each figure representing a phrase dealing with such matters as weather, illness, time, and position. For example, the operator of an air station who hears "70" knows to "Arrange for a doctor." The code number "44" is a request for weather conditions, and "48" conveys the news "The sun is shining."

There will, therefore, be no need to puzzle one's brains over the correct meaning of one's French telegraphist colleague as when the latter rattles

off printed sentences on a high-speed multiplex circuit such as the following phonetic actual examples received on a London-Paris circuit :—

CASEPEUTBIENKELAMINDELDRESSOITENKOZ

ENTTCASJEKONÉPALANGLAÉ JESAISPASCEKELÉCE FILER

JEVAISTJRSDEJEUNER CESERAPTÉTREBONCESOIR

BONAPETIMRS !

Through the medium of the *Electrical Review* we cull the interesting information declared by M. René Corteil of the Wireless department of the Belgian telegraphs. The Belgian Government, as is known, have decided to erect an immense wireless trans-oceanic wireless installation at Ruysselede, for communication with the U.S.A. and the Belgian Congo. The State would have to install the feeder lines and the telegraph and telephone lines, and these and other works would increase the total expenditure on the station to 20,000,000 fr. The station will extend over an area of 350 acres, having a length of 2,035 metres and a width of 700 metres. The antenna alone will cover 118 acres, and the power of 500 kw. will be furnished either by one or two alternators.

From the same source it is understood that a contract has been granted for the construction of a wireless station near Tegucigalpa (Republic of Honduras). There will be two towers, each 458 ft. in height, and direct communication will be furnished with the United States. It is expected that the station will be in operation next month, while the total cost is not expected to exceed 350,000 gold dollars (£70,000).

Also that the Government of the Republic of Nicaragua has authorised the Tropical Radio Telegraph Company to erect and operate wireless stations n or near the capital Managua as well as the towns of Bluefields, Cape Gracias à Dios, &c.

Writing on Imperial Wireless some few weeks ago, *The Times* made the following very interesting remark :—" We infer from the Postmaster-Gerneral's statement (in the House of Commons)that the advice of the Norman Committee is to be followed, at least in England and in India ; the stations are to be constructed by the Imperial Government, not by a private company. Apparently, also, they are to be managed by the Governments—a wise decision in a matter on which at any moment the vital interests of the Empire may depend."

The thought that runs through one's mind regarding this " wise decision " so much bound up with the interests of the Empire is insistent. When the interests of the Empire are really thought to be at stake and it appears to be something which must be done well and thoroughly, then entrust it to a State department. After all the telegraphs of Great Britain cannot be quite so badly managed if our leading daily journal considers it a " wise decision " to place the Anglo-Indian wireless service in the hands of the Post Office staffs.

According to *Eastern Engineering*. The Compagnie Générale de Télégraphie sans Fil is building a big wireless station at Phuto, near Saigon. The station will be started in September. It will communicate directly with the stations at Sainte Assise and Tananarise, and it is hoped will finally be able to communicate with Paris.

In Europe the same company has signed several agreements. Thus agreements were entered into with the Société Romaine Radioelectrica—which is now the Société Radioromana—with the State of Czecho-Slovakia and the Société Marpendante Belge de Télégraphie sans Fil, as well as with various foreign companies interested in the establishment of transmarine wireless communications required by the South American Republics. In Asia an agreement was signed with the High Commissariat in Syria for the construction and working of a station near Beyrout.

Another excerpt is that from the report of another of His Majesty's Commercial Secretaries, that from Stockholm, Sweden :—

In wireless telegraphy, the outstanding feature in 1921 was the examination by the Telegraph Administration of the important project for the erection in Sweden of a high-power station which, it is claimed, will be one of the largest in the world, inasmuch as it will be equipped for the transmission and reception of messages to and from the American Continent. British, French, American and German systems were examined by experts. The Swedish authorities, however, decided to suspend the placing of the order for this high-power station until the financial position improved. The site of the new station has not been definitely chosen, but it will probably be situated on the South Coast. Other wireless developments are to be traced in preliminary discussions which have taken place for the linking-up of Sweden and Finland by wireless.

As is well known the use of the telephone has reached a high state of development in Sweden. During 1921, a telephone cable was laid between Sweden and Germany, and work is rapidly proceeding with the installation of another telephone cable between Stockholm and Gothenburg, passing through Köping, Västeras, Orebro, Sköfde and Allingsas. Telephonic communication between the two principal Swedish cities is rapidly on the increase, and the completion of the cable is, therefore, anxiously awaited. Serious attention is being paid to the possibilities of the practical use of the wireless telephone.

Reference has already been made to this extremely interesting cable between Germany and Sweden, and here again one sees the rivalry of wire and wireless. The *financial position* which Sweden is waiting to see improve may be that situation, which, by closer practical experience of cable telephony with the latest improvements and highest speech values will enable her the better to compare the economic advantages of the two systems.

The Jubilee of the Eastern Telegraph Company was celebrated with due *eclat* and with feast and ceremony well worthy of the occasion. The record of this company is indeed one of which any band of enthusiastic scientists might well feel proud, owning as it does 130,000 miles of submarine cable representing a capital of £25,000,000 sterling. Those of us who were intimately connected with the cable services during the war are not likely to forget the splendid service rendered to the British Government in more than one important, not to say thrilling, enterprise during the war. The staffs of the Eastern Associated Telegraph companies anticipated the auspicious occasion by forwarding a cheque of £1,000 to St. Bartholomew's Hospital for the naming of a bed to the memory of Lady Denison-Pender.

Roland Belfort in the *Electrical Review* paid as handsome a tribute to the work of the company and to the name of Pender as one could well desire in his recent articles entitled " The Nerves of the Nation " or the Romance of the Submarine Cable.

The report of the Great Northern Telegraph Co. of Denmark to which reference was made a couple of numbers back, provides some interesting information which lack of space has, up to the present, prevented the full publication. For example, up to 1920 it was impossible to repair two or three of their submarine cables owing to the dangerous condition of the waters on account of mines. It has not even yet been possible to repair their Petrograd-Libau cable, although the Russian Government is doing its best to clear the mines from the interrupted area.

The company has also had to deal with 21 interruptions on eight of its cables in Europe, and 12 interruptions on 5 cables in the Far East. The cable steamer *H. C. Orsted* has been occupied in European waters for 253 days, of which 12 have been for the account of other administrations, whilst in the Far East the *Store Nordiske* and *Pacific* have been in commission for 191 days, including 120 days on which they were chartered by other administrations. Both the Russian Government and the company have done everything in their power to re-establish telegraphic communication between Europe and the Far East *via* Siberia. Whilst the telegraph lines through Russia and Siberia are maintained in good condition by the Russian Government, it is at present impossible to establish communication between the Russian telegraph system and the cables and landlines in the Far East either *via* Vladivostock or *via* Kiachta owing to the total interruption of both these routes. The restoration of the Vladivostock route is hindered by the state of war existing between the Governments of Tchita and Vladivostock, whilst the restoration of the Kiachta route is dependent upon the Governments of Peking and Urga succeeding in arriving at an agreement. Under these circumstances the company has had to fall back upon another scheme, which became possible of realisation thanks to the facilities granted by the Russian and Chinese Governments resulting in the establishment of a quite new route by means of a wire placed at the exclusive disposal of the company by the two administrations between Irkutsk and Peking *via* Blagowestschensk—Helampo—Harbin, and worked in connexion with the company's direct wire between Petrograd and Irkutsk. A repeater station, equipped by the company and manned by Danish operators, has in this connexion been established at Harbin. Communication was thus re-established on March 26 this year after an interruption lasting nearly four years.

The company was able to re-establish telegraph communication with Petrograd on Jan. 18, 1922. The concession which has been granted by the Russian Government binds the company to open a telegraph station at Moscow, thereby placing the Russian capital in direct telegraphic communication with the company's European cable system. Various causes have, however hitherto prevented the carrying into effect of this undertaking. The Russian terminal traffic exchanged with Western Europe and America is, so far, quite inconsiderable as compared with the corresponding traffic in pre-war times. Preliminary discussions with the Chinese Government were commenced last year by the company in conjunction with the Eastern Extension, Australasia & China Telegraph Co., with the object of obtaining a prolongation of the existing agreements between China and the two companies. Owing, however, to the decision come to by the International Conference in Washington to include the question of telegraph communication in China amongst the items for discussion there, it became necessary temporarily to suspend the companies' own negotiations in Peking pending the receipt of information as to the result of the Washington discussions. A new cable steamer, destined to replace the *Store Nordiske*, is now being built at a Danish shipyard (Nakskoy Skibsvaerft) for delivery in the course of the summer. At the invitation of the Lettish Administration a Telegraph Conference was held at Riga last September, attended by representatives from all the countries bordering on the Baltic Sea, as well as from England, Norway and the company. The principal object of the conference was to decide on the telegraph rates to be applied between the various administrations represented.

The *Financier* states that the Polish Government, as the successor of the former Russian and German Governments, has given to the Indo-European Telegraph Co. a concession for that part of its line from London to Teheran which extends from Schneidemuehl on the west *via* Thorn and Warsaw, to Rowno on the east, which is approximately the frontier point between Poland and Soviet Russia. The Soviet Government has also promised the same company a concession for that part of its line extending from Rowno (Berdiohew) to Djulfa, on the Persian frontier.

Among the best-known names, respectively of the Controlling and Superintending ranks of the C.T.O., who have recently retired from the Service, may certainly be placed those of Messrs. Fernyhough and F. W. Miles.

The former was practically compelled to stay some little while after he had actually reached the age-limit for reasons which the Controller made particularly clear to the gathering that crowded his room on the occasion of the presentation of a set of silver table ornaments to our colleague. Mr. John Lee's appreciation of the quality of the services rendered to the C.T.O. by the ex-Assistant Controller was unique in its aptness and delicate in its manner of expressing the affection of those of us who were present and who, less able to mould the fitting phrase, could only vocalise their thoughts into the words, "Dear old Ferny!"

Of Mr. F. W. Miles, it may be said that he was a cheery colleague, always ready to assist and zealous to a fault. He was born in May, 1862, and appointed on May 31, 1877, retiring practically on his birthday. As it is understood that there is a movement on foot for a wider and more practical expression of the esteem in which Mr. Miles is held it would be presumption to add more to these lines at the present juncture.

Stay! Both the above gentlemen, though reared amidst the conditions incidental to Inland as against Foreign telegraphy, have always been among those officers, at one time an almost negligible quantity, now one is pleased to acknowledge a growing number, who recognise the distinct differences between Inland and Anglo-Continental telegraph conditions, and who do *their best to realise the special difficulties incidental thereto.* To have gone thus far when in certain quarters the trend of official policy was at one time in a less sympathetic position is but to indicate a measure of their courage and sincerity.

Mr. Donald Murray has entered a gentle protest against the wording of a paragraph in *Memorabilia* for August regarding the utilisation of "Baudot" apparatus in New Zealand, which he thinks due credit has not been accorded the Murray inventions incorporated in the installation working between Wellington and Christchurch. It appears that phonic wheel-drive should have been included in the description.

Knowledge.—"The proper use of knowledge is in man's keeping, and it is his plain duty to use it for the benefit of mankind.

"Knowledge was never intended to be used merely as a form of mental adornment or for the external equipment of what might be called the mental fop. Much of it has been used for that purpose, and there has been too much mental snobbery in the ranks of those who should have shown to all the world that education gives to man that sweet reasonableness, balance, judgment and kindly indulgence which go to make the relationship between one man and another more nearly in accord with *the* great commandment."—*The President of Technical Teachers.*

J. J. T.

THE BAUDOT—XXXVI.

By J. J. T.

FIG. LXXXVII shows the method of connecting up a re-transmitter at an intermediate office between the two distributors A and B, representing UP and Down offices. The signals pass in from Line 1 in the usual manner *via* Rings 5 and 2 actuating the line relay R^2 which repeats, *via* Rings 4 and 1 into the Baudot receiver fitted as already described with a re-transmitter RT which we will call type one. The seven connexions shown on left hand side of RT are the five segments 1 to 5 Ring 4, the brake current lead from Ring 3, and the necessary "earth." On the right of RT the seven connexions shown are joined to a seven-point two-way switch S. The inner five are connected to the respective re-transmitting levers and the outer two serve the positive and negative power to the contact stops of the levers. The centre of the switch S is similarly joined, the five inner connexions being led to five segments of Ring 5 of distributor B, which serves the Down line. The outer two connexions are joined up direct to suitable main line voltages. This switch provides alternatively facilities for the intermediate station to speak to the Down station by means of the keyboard shown on right or for "through" working by means of the re-transmitter RT. It will be noted that the re-transmitter RT records the signals as *received* from the UP station. When the switch S, is at "through," the *outgoing* signals from RT are leaked off at R^1 by a Baudot receiver, giving control by Rings 4 and 1 of distributor B, the main portion of the current passing out to the Down station by Line 2. With switch S in reverse position the keyboard takes the position of RT.

As far back as 1909 the writer was privileged to see while still in its trial stages a remarkable mechanical development of the Baudot receiver at the Experimental and Testing Workshops of the French Government in the Boulevard Brune, Paris. The principle evolved in this particular receiver, sometimes known as the Rapid, is shown in Fig. LXXXVIII, which is all but self-explanatory. The new arrangement has also been applied to Baudot re-transmitters. In place of the brass extensions, as in

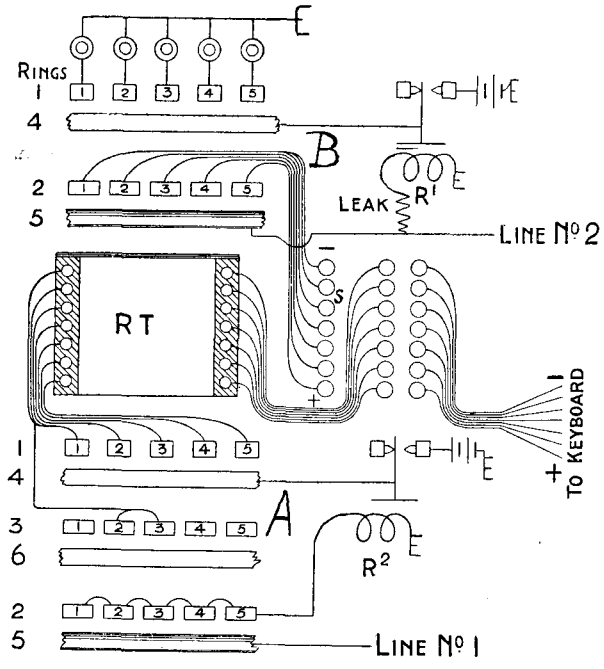

FIG. LXXXVII.

the old pattern, fitted to each of the electro-magnet armatures, which terminates with a lip, extending beyond the under-cut *a*, and protruding over the polepiece of E is an extending arm *c*, the electro-magnet E being turned completely round. When A is attracted by the passage of a current, *a* tilts down releasing a finely balanced lever *l* which partly by its own weight and partly by the impulse of the spring S falls to the left against the combiner wheel and performs the usual functions, the replacing cam of the combiner wheel restoring *l* under the extension *c* against the pressure of the spring S. The mechanical sensitiveness of this type is actually quite double that of the older model and permits of the use of distributor segments half the usual size.

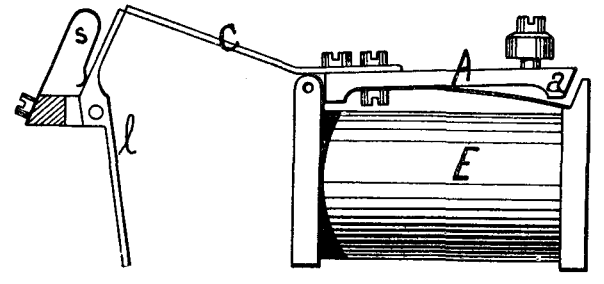

FIG. LXXXVIII.

Type two re-transmitter is known by the name of the Robichon, after its designer. There are certain disabilities attendant on re-transmitter type one, due to possible variations of the speed of

the receiver to which the re-transmitter is attached, which variations result in mutilations of the re-transmitted signals. In the Robichon the receiver is abolished. Fig. LXXXIX gives the new design: The older type of electro-magnet E, armature A and brass extension lip L are retained. Each of these electro-magnets E by means of their respective extensions L controls a re-transmitting lever consisting of two parts l, l^1, solidly fixed together but electrically insulated by an ebonite plate. All five levers are pivoted on the same axle at x. The portion l of the two-part lever terminates in a forked piece at its free end, in between which is fitted a roller cam g supported by the flat spring S. The tension of this spring is adjustable by means of two small screws T^1, T^2, together with a small double inclined plane M. The limiting piece F, forms the smaller of two prongs of the forked end of l and is locked into a slot (not shown, Fig. LXXXIX) in the spring S and limits the upward and downward movement of the roller-cam g at the axle of the latter and thus l itself. Portion l^1 of the two part lever plays between two contact stops + — to which are led the main positive and negative batteries serving the Down station.

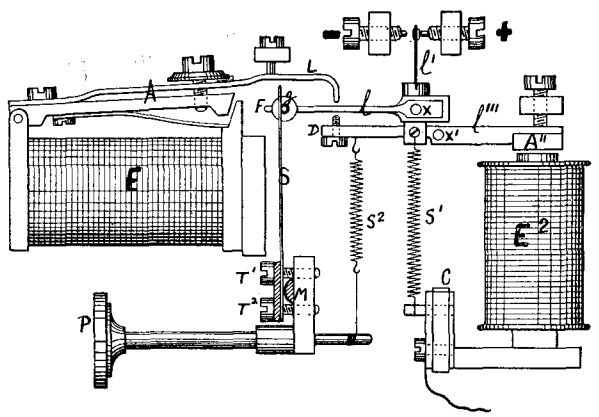

FIG. LXXXIX.

The light spring S^1 serves as an electrical connexion with the insulated metal column C, of which there are five corresponding to the number of re-transmitter levers and are severally joined with the appropriate segments of Ring 2 of the second distributor B. The action is simple. When E is energised A is attracted, the lip L strikes the lever l and a knife edge of the forked portion of l presses against the roller cam g causing the spring S to bend backwards the roller cam following, and l with it, the downward motion continues until F limits any further movement. This movement of l carries l^1 from the spacing stop, + to the marking stop —. Whatever combination of currents is received is conveyed to the respective segments of the second distributor and held there until a local current from Ring 3 of the *first* distributor energises electro-magnet E^2 which attracting A^{11} and its lever l^{111} (which latter moves on the axle x^1), throws up the reverse end of a cross-bar D, fitted with five screws, each screw being placed under one of the five re-transmitting levers. Thus, at the appropriate moment, the first distributor automatically replaces any re-transmitting lever, which may have become depressed, back into its position of rest against the spacing stop. The armature A^{11} is replaced by the pull of the spiral spring S^2, the tension being adjustable by means of the milled-edge screw P.

Type three re-transmitter, or the 1909 model, adopts the action of the receiver described in Fig. LXXXVIII. Fig. XC shows that the lettering A, a, C, and l correspond. A spring lever S plays between the spacing and marking stops, + and —. The lever l forms a solid though insulated part of S which itself is insulated by means of a small ebonite base-plate, but maintains electrical connexion with the second distributor by means of an eyeletted spiral spring S^1 hooked at the ends H, H^1. An insulated column C^1 forms the exterior connexion. When E is energised the end a of A is attracted and throwing C upwards ceases to support the lever l which now gives way to the pull of the spiral spring S^1 causing S to move from the spacing to the marking stop. The replacement of the various displaced levers of each re-transmitter in this as in the Robichon is by means of a second electro-magnet E^1 common in

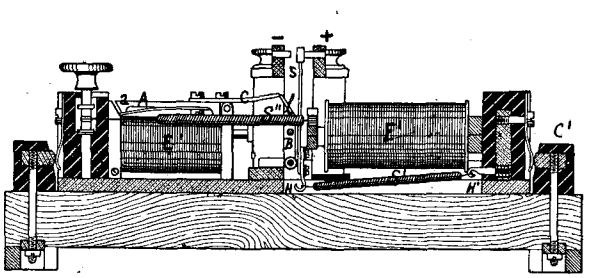

FIG. XC.

action to all five re-transmitter levers. In this case the attraction of the armature E^1 draws with it a rod B placed on the left-hand side of the levers. The movement of B *collects* all levers thrown on to the marking contacts and replaces them against the spacing contacts ready for the next series.

With re-transmitter type one, the re-transmission of the received signals happens exactly at the end of an entire revolution of the brushes. With types two and three the received signals are practically *stored* immediately on receipt and are re-transmitted generally at the termination of half a brush revolution. The exact moment will of course depend upon the necessities of the special case.

Finis.

ROCHDALE TELEPHONE DISTRICT.

An interesting Cricket Match was played between the Engineering Office staffs and the District Manager's staffs on July 13, 1922. The Engineers, captained by the Sectional Engineer, Mr. Best, proved too strong for the District Manager's team, led by Mr. Whitelaw, District Manager, the former gaining an easy victory. The exchange and out-door staffs later defeated a combined team of the Engineering and District Manager's people.

The outcome of these encounters resulted in an invitation being extended by the Rochdale Telephone District to the Halifax Telephone staffs to visit Rochdale and play a match on August Bank Holiday, but the treacherous weather prevented the game from taking place. Efforts will be made to play the game at a later date.

RETIREMENT OF MISS SADLER, O.B.E.

(*Superintendent of the Women's Staff, Accountant-General's Department, G.P.O.*).

An interesting reception was held by the senior women of the Accountant-General's Department, General Post Office, on Friday, Aug. 18, on the occasion of the retirement of Miss Sadler, O.B.E., Superintendent of the Women's Staff, after 41 years' service. A large proportion of the staff attended. Amongst the visitors present were: Miss Loch, the recently appointed Woman Establishment Officer, G.P.O., Dr. Madgshon, Principal Woman Medical Officer, G.P.O., Sir Henry Bunbury, K.C.B., Comptroller and Accountant-General, Mr. Harrington, Deputy Comptroller and Accountant-General, Mr. Slater, Controller of the Money Order Department, &c., &c.

Miss Barrett, Senior Deputy Superintendent and Miss Boyd, on behalf of the staff, spoke in eloquent terms of Miss Sadler's work, after which Sir Henry Bunbury made the presentation—a gramophone and cabinet of records, also a moonstone pendant. In the course of Sir Henry's speech, he said "Miss Sadler was one of the first women associated with the development of the women's work in the Accountant-General's Department and she had not only seen history, but had made it. When she joined the Accountant-General's Department the women numbered 78, when she became Superintendent in 1907 they had reached 323, while to-day they are not far short of 1,000." In reply, Miss Sadler expressed her thanks for the gifts and good wishes and gave a brief sketch of the progress made by the women since her early days, in the direction of increased responsibility and variety of work.

Miss Webster, Deputy Superintendent, passed a vote of thanks to the visitors and Mr. Harrington replied. The proceedings then terminated with the singing of "Auld Lang Syne."

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 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. VIII. SEPTEMBER, 1922. No. 90.

A LIGHT—AND LEADING—ARTICLE.

IN the holiday season we turn gladly to lighter themes than those which occupy our more strenuous hours, and amongst others which may claim a vagrant attention is the fascinating one of ready-made humour. The vigorous and creative mind has a proper contempt for anything ready-made and the artistic conscience is revolted by it, but yet, we repeat, there is something fascinating, something in tune with the holiday mood in anything effortless or ready to hand, such, for instance, as an easy variation on a well-worn jest or in the reiteration of a well-known gibe.

You think of the Civil Servant. You add many imaginary failings, deduct all his good works, then take away the Civil Servant you first thought of and you find that he is like the fountains in Trafalgar Square and plays from 10 till 4. You murmur the words "Tite Barnacle" and the "Circumlocution Office," and they work like a charm. You have your theme and can develop it, decorated with these borrowed plumes, for half a column or more, and your readers, if any, will never grow restive. They, it may be, hate to be bothered with new ideas, and then there is something soothing in the repetition of the friendly, familiar joke. What the Civil Servant was in 1820 he is, of course, or at least ought to be, in 1920. Or, sounding a sterner note you can raise the bogey of State Socialism and do a good turn for the Individualist at a small cost of thought. There is a note of modernity in the touch and it will give you a hearing in those powerful sheets which interestingly endeavour to combine democratic with capitalistic ideals.

The telephone is so inexhaustible a theme that every humorist may draw from this well and go away refreshed. The mere mention of this indispensable and much misunderstood device calls up facile jests on the subject of wrong numbers and operators reading and knitting jumpers. The comic press of the whole world delights in the theme, which they treasure more than the mother-in-law, the inebriate, or the *enfant terrible*. During the last three or four years we should say that *Punch* has had a telephone joke in almost every number and almost all to the same effect. Is it propaganda work in the interest of the long-suffering subscriber, or is it that the humorist is taking the line of least resistance? *Punch's* prototype on his tiny stage always favoured the humour of the stick. Cudgelling his wife or the beadle and throwing the baby out of the window are unsophisticated, simple forms of humour, which have a wide appeal, and possibly *Mr. Punch's* humorist is only carrying on the unsophisticated tradition. The dawdling telegraph boy is not to be despised as a subject for witticism, nor the letter which takes 5 or 6 years to get itself delivered. The latter is unfortunately so rare and forms such an infinitesimal proportion of the letters correctly delivered that it cannot often be utilised, and it would be interesting to hazard a guess at the proportion of actual cases to paragraphs on the subject.

What of the effect of scolding and sarcasm and even wilful misunderstanding on Civil Servants? Do they encourage and inspire them, the telephonists especially, to give of their best in their arduous daily task. Well, well; we are not a thin-skinned section of society and, moreover, though we whisper it with bated breath, we have a horrid suspicion that these humorous efforts and portentous paragraphs are neither of them always read by those whom they are meant, as we may charitably suppose, to "ginger up." The Civil Service goes on, and we may say of the services of which we have personal knowledge: *eppur si muove*. The Civil Servant plays from 9 till 4 or 10 till 5 and longer, but he usually plays the game. The telegraph and telephone systems expand and improve, new exchanges are opened, new trunk lines are provided, new improvements are adopted. Pre-war conditions were resumed far sooner than they were on the great railway systems, for instance, and certainly at a smaller increased cost to the public.

Far-reaching schemes of development and reconstruction are in hand, which have been inaugurated and will be carried out by Civil Servants with a zeal and thoroughness which are really the cream of the whole ponderous jest. At least, we leave it to such of our readers on vacation as love holiday problems to discover if there be any other latent humour in the theme which has escaped us.

HIC ET UBIQUE.

As our readers will have learned from the daily press, telephonic communication was opened with one circuit between London, The Hague, Rotterdam, and Amsterdam, on Aug. 15. When the other circuits are ready communication will be extended to other towns in both England and the Netherlands. On Aug. 11 a direct line was opened from London to Paris Plage, chiefly for the benefit of English visitors to the French coast resorts.

WE propose next month to begin a series of articles on the elementary principles of telephony which we think will be both useful and interesting to our non-technical readers. They will be written by Mr. A. Crotch, of the Engineer-in-Chief's Office, and will be well illustrated by explanatory diagrams.

MR. V. M. BERTHOLD, official statistician of the American Telephone & Telegraph Co., has kindly sent us an interesting bulletin of statistics of South and Central America as at Jan. 1, 1921. At that date there were 116,553 telephones in the Argentine, 85,091 in Brazil, 44,784 in Mexico, 34,376 in Cuba, 29,867 in Chili, and 22,381 in Uruguay. Buenos Aires had 65,387 telephones, Rio de Janeiro 30,522, Habana 24,936, Mexico City 23,503, and Monte Video 13,420.

A PROVINCIAL subscriber complained that he did not get good service. On being informed that his telephone had been tested and found to be in good working order, he sent the following instructive advice :—

I am obliged by your letter. There should be no trouble in getting in touch with the exchange seeing that it is not much above 300 yards distant. The fault is not the *personal* service, but it is probably due to atmospheric, mechanical and structural defects. I have reason to suspect that the salinity of the air, due to proximity to the sea, affects the contacts on the switchboard. Might I suggest a hygrometric test to be made on the subject.

A drying tube containing chloride of calcium or pumice saturated with sulphuric acid will give you the desired information, or apply a condensation hygrometer, or a Daniell's hygrometer or a psythrometer. You will then be able to determine the Glasbiers factors. These tests will be far more efficacious than my standing for half-an-hour in bare feet on cold linoleum trying to prevent a man taking extreme action due to grief and damning everything and everybody generally. You have a go at it and then have a go at—

Yours sincerely.

WITH reference to the "Extracts from Letters Home of a Young Telephone Engineer sent out to India to Instal the First Automatic Switchboard" appearing in these columns, the Automatic Telephone Manufacturing Co., of Liverpool, write pointing out that considerable progress in automatics has already been made in India. They say :—

As far back as 1913 this company installed the first public Automatic Telephone Exchange at Simla and it then consisted initially of 800 lines with an ultimate capacity of 2,000 lines. Since then there have been seven extensions to this exchange, and the present capacity now totals 2,100 lines.

Lahore also boasts an Automatic Exchange of 700 lines which has been working for four years, whilst Amritzar has had a 400-line exchange in operation for upwards of two years.

We do not think it is necessary to refer to any further exchanges of a private character to make it clear that India is much more advanced in Automatic Telephone facilities than your correspondent and possibly some of your readers are aware.

We may further add that we shall shortly be commencing the manufacture of equipment for two Automatic Telephone Exchanges in Bombay, totalling 11,000 lines—a further indication of the enlightened policy of India's Telephone Administrations.

ACCORDING to the *Daily Chronicle* "there are 16 telephone sub-stations in Tokyo with 7,000 moshi-moshi girls or operators." If our contemporary's rendering of moshi-moshi be correct, this would mean that there is in Tokio about one operator to every 7 subscribers, which approximates the ideal of that sort of subscriber known to all telephone administrations who thinks he ought to have an operator to attend to his exclusive wants.

NORTH WALSHAM TELEGRAPH REPEATER STATION (NWV).

BY A. C. BOOTH.

(Reprinted by the courtesy of the *Post Office Electrical Engineers' Journal*).

THE Repeater Station at this small country town in the north-east portion of Norfolk was established in 1891 for use in connexion with the 4-wire submarine telegraph cable laid during that year between Bacton and Borkum. Bacton is a small village on the Norfolk coast, some five miles distant from North Walsham, and Borkum is an island on the other side of the North Sea off the coast of Germany.

The cable was connected by open aerial lines from Bacton to the repeaters at North Walsham, whilst on the other side the cable was extended across the island of Borkum, a distance of some 3 miles, across the 20-mile section of shallow water to the mainland at Greetseil, and on to the town of Emden, about 13 miles, where the repeaters for the continental side are situated. The extension was made by the same type of cable as that across the North Sea, viz., 107 lbs. copper and 150 lbs. G.P., and is taken direct to the Emden Telegraph Office. At the cable huts the wires are not passed through

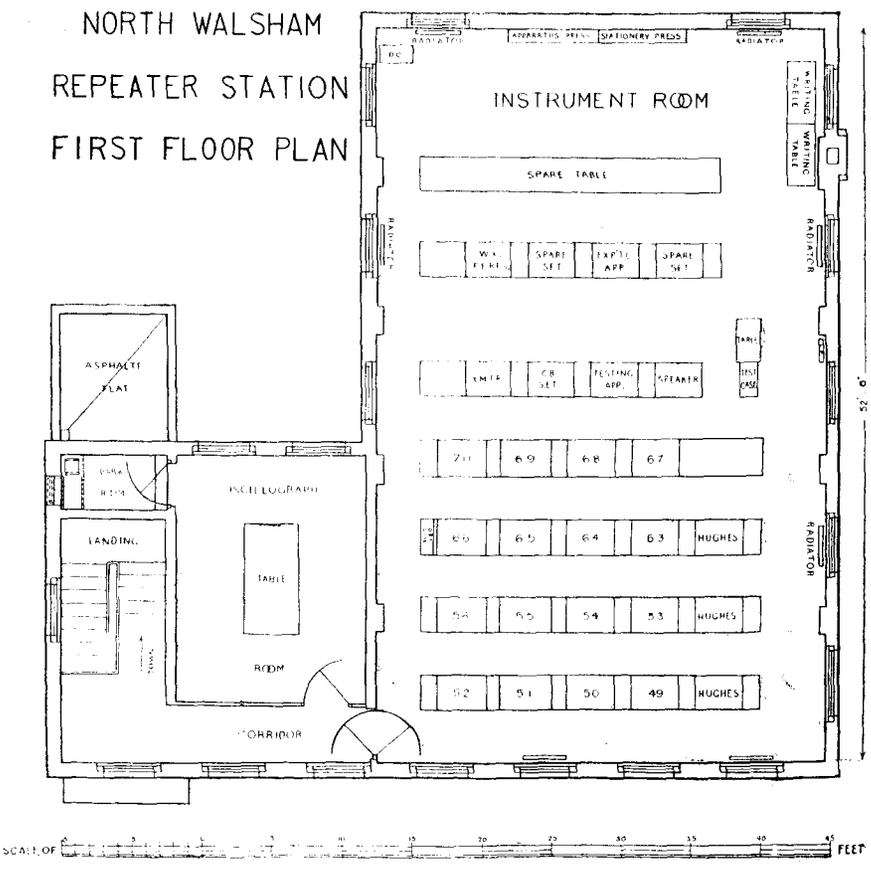


FIG. 1.—PLAN OF INSTRUMENT ROOM FLOOR.

connectors, because of the loss of insulation that would result in this rather exposed and damp locality, but are directly connected and insulated with gutta-percha in an exactly similar manner to an ordinary cable joint. It follows therefore that the cable is practically Bacton to Emden.

This first cable from Bacton formed the third 4-wire direct cable to Germany. The other two 4-wire cables were laid many years previously from Lowestoft.

In 1896 a second 4-wire cable was laid from Bacton to Borkum and extended in a similar way to Emden by submarine type of cable and to North Walsham by aerial line. The additional cable resulted in an increase

of repeaters from 4 to 8, all of which were of the type known as Simplex Hughes Repeaters, providing for the repetition of the single-current impulses that actuate the Hughes printing telegraph instrument. The office at North Walsham was not large enough to accommodate the additional apparatus and batteries required and had to be increased in size and considerably altered in consequence.

In 1897, Mr. John Chapman, of the Engineer-in-Chief's office, commenced the duplexing of these circuits to meet the rapidly increasing telegraph traffic between England and Germany. Even with this improvement in the carrying capacity of the cables a further increase soon became necessary.

In 1901 a third 4-wire cable was laid between Bacton and Borkum and was extended in a similar way to the other two. This addition necessitated a second enlargement of the North Walsham Station, and the opportunity was taken to replace the Bichromate batteries, then numbering some 1,000 cells, by secondary cells charged by a dynamo driven by a gas-engine.

The increased carrying capacity provided by the laying of this third cable, which was also worked duplex on all four wires, had by 1912 become insufficient to carry the ever-growing traffic.

In 1913 a fourth 4-wire cable was laid, but in this case from Mundesley, a small village 2 miles north-west of Bacton on the English side, to Norderney, an island situated some 40 miles east of Borkum on the German side. The extension to North Walsham was again made by aerial line and to Emden by cable, as in the other cases.

During 1914 the aerial routes from North Walsham to Bacton and Mundesley were replaced by an underground paper-insulated cable to avoid the variation of insulation and other troubles incidental to aerial lines, which adversely affected the Duplex balances.

With the provision of the fourth cable the congestion in the North Walsham office necessitated the installation of two repeaters in a separate room. This was not a convenient arrangement, and as the additional demand for current was approaching the limit of the charging equipment it was decided in 1913 to seek for, or build, more suitable accommodation. The old building had not been intended for housing such a number of repeaters; whilst its successive enlargements, although giving the required space, were not altogether satisfactory.

As no other suitable building was available in the neighbourhood, ground was purchased and plans prepared for the erection of a building that would accommodate the 16 working repeaters and in addition would provide for an increase of 12 more without any structural alterations; the ground space obtained was of sufficient size to permit the building being extended to double the size of the new office whenever that requirement became necessary. The work was about to be commenced when the war postponed any further action. The old office was dismantled and the repeaters were sent to other parts of the country; later on, several of them were sent to France.

On the resumption of telegraphic communication with Germany, in 1919, the old office was re-opened and the repeaters re-installed. As soon as conditions permitted, the erection of the new office was commenced, but progress was slow and the building was not completed until the autumn of 1921, enabling the working circuits to be transferred at the week-end in the following December.

A plan of the instrument room, which is situated on the upper floor of the new office is shown in Fig. 1, with the positions of the repeaters numbered according to the land lines they serve.

Strictly speaking, the repeaters are proper to the cable circuits, rather than to the land lines, as the latter are changed to meet requirements, whereas the cables are not changed unless a fault occurs in the repeater, thus rendering a change necessary. There is also another and very important reason why the cables should not be changed and that is due to the presence of the "Anti-induction Condensers," which are connected between the four conductors of any one cable. These condensers serve to neutralise the greater portion, about 60 per cent., of the inductive disturbance from neighbouring conductors. The length of these Anglo-German cables approximates to 300 miles, and as there are four wires in each cable it follows that each wire is disturbed by the combined effect of the other three. The disturbance is so great that in effect it reduces the working speed by about 50 per cent. The use of the anti-induction condensers enables a greater effective speed to be obtained. The crossing of a cable circuit to another repeater involves also the crossing of the 4 wires of the anti-induction arrangement; otherwise the disturbance is not only not neutralised but additional disturbance is brought into all four circuits and the balances are also disturbed.

A schedule of the cable circuits with the lines and apparatus in use is given below :—

ANGLO-GERMAN CABLES (*via* NORTH WALSHAM).

No. of English Land Line.	No. of Cable Wire.	Towns served.	Apparatus used.
		Bacton—Borkum 1.	
49	9	London—Bremen	Hughes Simplex or Duplex
50	10	„ —Emden	„ „ „
51	11	„ —Dusseldorf	„ „ „
52	12	Interrupted	„ „ „
		Bacton—Borkum 2.	
53	13	Interrupted	Baudot Double Duplex
54	14	London—Berlin	Siemens Duplex
55	15	„ „	„ „
56	16	„ „	Baudot Double Duplex
		Bacton—Borkum 3.	
63	17	London—Frankfort	Hughes Simplex or Duplex
64	18	„ —Cologne	„ „ „
65	19	„ —Leipzig	„ „ „
66	20	„ —Prague	„ „ „
		Mundesley—Norderney.	
67	21	London—Hamburg	Baudot Double Duplex
68	22	„ „	„ „ „
69	23	„ „	„ „ „
70	24	„ —Berlin	„ „ „

Two of the cable circuits happen for the moment to be interrupted, but are expected to be repaired during this summer. The Vienna circuit has not been restored, nor are the two circuits which Liverpool worked to Hamburg and Bremen respectively.

It will be seen from the plan that each cable is arranged to accommodate the four circuits of one cable with space at one end for a Hughes instrument to check the passing signals when required. As, however, the tendency is to replace the Hughes instrument by apparatus giving a much larger output, such as the Baudot Duplex or Siemens, this space may be liberated in the near future to be occupied by additional apparatus required for increasing the working speed of the cables, such as relays of the Gulstad type with their additional condensers.

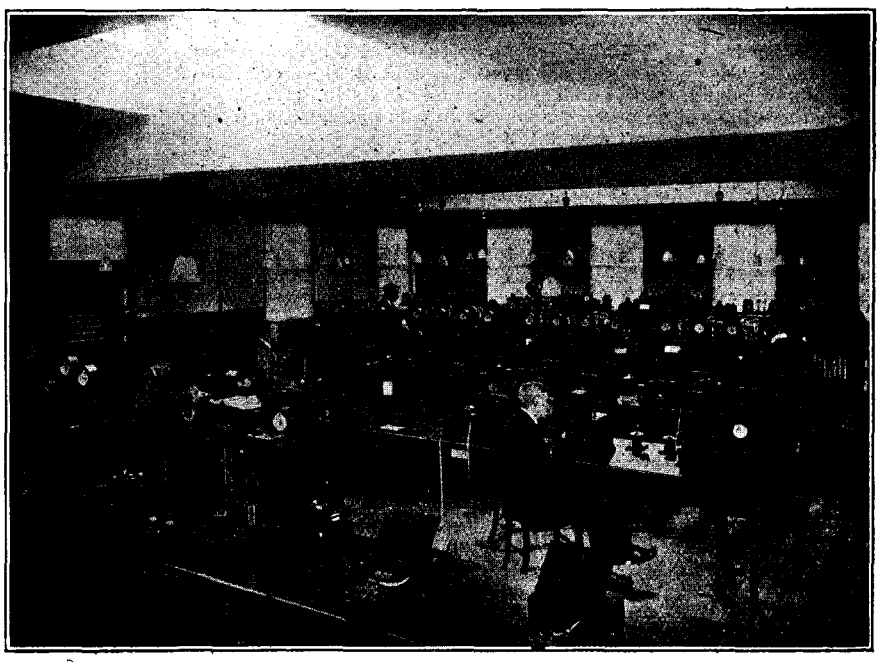


FIG. 2.—INSTRUMENT ROOM.

It will be noticed that there is a separate room for Oscillograph purposes, with a smaller room for photographic work.

It is expected that telegraph traffic with Germany will increase in the course of a few years and that there will be need for further additional facilities. Possibly the loop method of working, with its freedom from inductive disturbance, may provide better output results. This method was under trial with Germany at week-ends in 1914, at the suggestion of the British Post Office, but was not completed before war put a stop to any further work. It is possible that the trial may be resumed later.

Fig. 2 gives a view of the interior of the instrument room, showing in the left foreground two spare repeaters, and on the next table a syphon recorder in use for experimental purposes. On the third table can be seen the four repeaters of the Mundesley cable.

The following tables give the full details of the submarine cables :—

DETAILS OF SUBMARINE TELEGRAPH CABLES BETWEEN NORTH WALSHAM AND EMDEN.

	Bacton—Emden.			Mundesley—Emden.
	I.	II.	III.	
Date laid	1891	1896	1901	1913
Conductor... ...	107	180	130	180
G.P.	150	150	130	150
Length in Knots ...	242	255	269	278
Resistance ...	2726	1625	2641	1783
Capacity	72.5	95.5	96	95

Between North Walsham and the coast the length of five miles of paper insulated cable increases the length, resistance and capacity to the following values :—

Length in miles ...	283	299	315	326
Resistance ...	2756	1685	2671	1813
Capacity	73	96	96.5	95.5
K.R.	0.201	0.163	0.257	0.173

FIG. 3.—STAFF.—Reading from left to right :

Back row :—C. F. Wilson, H. C. Whybrow, W. H. Nobbs, W. H. Mortimore, E. Missen, J. Mansford, E. Annible.

Front row :—J. Lockhart, S. Farrow, E. Lack, M.B.E., T. T. Parker, R. P. Smith.

Fig. 3 shows the staff at the station and includes two from the Engineer-in-Chief's office, Messrs Lack and Lockhart, who were carrying out experimental work on the cables during the week-end on which the photograph was taken.

LONDON ENGINEERING DISTRICT NOTES.

Knowledge is Power.

ONE of the activities of the Institution of Post Office Engineers is to arrange for visits of its members to manufacturers' works and other places of technical interest. It is not always necessary, however, to go beyond the boundaries of the Department to find a suitable field for widening the knowledge of the majority of the members in matters affecting their daily activities. The Department has long recognised the need for a specially-trained staff of engineers to give their whole time to scientific investigation in connexion with the business of electrical communications. Hitherto the men engaged on research work in the Post Office have been handicapped by inadequate accommodation. With the growth of the business the necessity for more commodious quarters became very evident, and it was decided to erect a special building for the purpose. Dollis Hill was selected as a suitable position, but owing to the financial stringency, the permanent building has had to be deferred and in order to enable the good work to be carried on a cluster of army huts has been erected and equipped as a temporary measure.

It was for the purpose of inspecting the Research Section in their new quarters and to learn something about the way in which this very important branch of the Engineering Department's activities is being conducted, that some of the London members of the Institution visited Dollis Hill last month. The block includes the necessary offices and a series of buildings, each equipped for some particular branch of research work. In addition to laboratories reserved for transmission studies, measurements, and tests, is a chemical laboratory, a metallurgical laboratory, a photographic laboratory, and a fully equipped workshop, which contains some very fine precision tools. Space will not permit of a description of the many interesting appliances in use. The visitors were very much impressed by the admirable facilities now available for research. Under the far-seeing direction of the Staff Engineer, Mr. Pollock, great progress in this branch of the Engineering Department's work is certain.

On the same site is the Engineer-in-Chief's Wireless laboratory, with transmitting and receiving aerials, and this proved a great attraction, particularly to those who have experimental stations of their own.

Telephone Cables.

How many of those idle lookers-on who always foregather to watch any operations in the streets of a City where the labour of others is involved, realise what is contained within the lead sheath that they see being slowly transferred from a drum to the bowels of the earth. If it is an electric light or power cable the hidden portion is not much to wonder at, but if it happens to be, say, a 1,000-pair telephone cable, each wire weighing $6\frac{1}{2}$ lbs. per mile, then the looker-on, if he understood, might well marvel. Individual wires to the number of 2,000, each wrapped with insulated paper and a distinguishing thread, and the whole contained within a lead covering with an external diameter of 2.62 inches ! The thickness of the sheath itself is .134 inches, so that the diameter of the stranded wires is only 2.35 inches, about the size of the average person's wrist. Even the 800-pair 10 lb. conductor cable does not exceed $2\frac{3}{4}$ inches diameter. The smaller gauge wire, viz., $6\frac{1}{2}$ lb. has a maximum diameter of .0205 inches and a maximum resistance of 135 ohms per mile. It will readily be realised what a delicate operation the jointing together of two lengths of such cable is. The finished joint must fit into a sleeve of 4 inches external diameter. The operation would be no easy task if carried out on a bench in good light, but actually the work has to be done in a jointing chamber where space is often very restricted, and where it is difficult to arrange for light to be directed upon the joint.

Telephone cable jointers acquire from long practice that nimbleness of fingers usually attributed to women. When the joint has been completed and the sleeve placed in position, there is still another highly important operation to perform. This is the sealing of the joint by plumbing the sleeve at each end to the cable sheath without damaging the delicate contents. Before the introduction of the Torch Blowlamp, plumbing was carried out with the aid of a Plumber's stick which consisted of a rod with an egg-shaped knob at the end. The knob was heated in a fire and then used to melt and mould the plumber's metal. A plumber's wipe on a cable can be made under favourable conditions without the aid of a torch, but the conditions in manholes are rarely favourable. In the case of a multiple joint the torch is a *sine qua non*, as without it, it is impossible to work the metal in between the forks at the junction of the branches. The soundness of a plumber's wipe is tested by passing air into the joint under pressure and observing whether any bubbles are formed in a film of soap suds which is spread over it. Defective plumbing, if left, may not give rise to trouble for a considerable time ; perhaps not until exceptionally heavy rains cause flooding of the manhole—then the result may be disastrous. Fortunately, trouble due to such a cause is rare, and this can be attributed to the pride the jointing staff take in their work.

If any readers are sufficiently interested and wish to see some splendid examples of the plumber jointer's craft, they should inspect the joints between the external cables and the main frame cables in some of the recently built exchanges.

Arterial Roads.

Under the Development and Road Improvement Act, 1909, the Ministry of Transport (as successors to the Road Board) is empowered, with the approval of the Treasury, to

(*a*) Make advances to local authorities towards the construction and maintenance of new roads and improvements to existing roads, and

(*b*) to construct and maintain new roads.

Since the termination of the War the Ministry has approved a large number of schemes for new arterial roads, by pass roads, widenings of existing roads, &c., in and around the Metropolis, and in many cases the work has been commenced.

As will readily be understood operations of this nature involve at an early stage the consideration of the Post Office engineering staff as regards both the alterations necessary to the existing telegraph plant and the possibility of using the new roads for development and new routes.

Whilst many comparatively minor widenings involving in some cases considerable alterations to both overhead and underground plant have already been carried out, the progress of the construction of the arterial roads has not yet greatly affected the telegraph and telephone services. The sections of these arterial roads now under construction are mostly in semi-rural areas, and, while the utility of such a road for main line purposes is easily settled, the problem of providing for local telephone development is somewhat difficult. It is probable that the frontages of these main roads will be taken up by important business premises, whilst the property in the rear may develop on the dormitory lines so well known to Londoners.

In each case the opportunity is being taken to place sufficient underground plant along the route of the new arterial road to provide for development for an extended period of years in order to prevent disturbance to the carriageway and footway surfaces as much as possible. In this connexion, it may be mentioned that in the case of the Great West Road subways are being constructed at each of the important road crossings to contain not only the telegraphs, but the services of other undertakers, such as water, gas, electricity, &c.

Buried London.

In the February number reference was made in these notes to the finding of some Roman remains in Gracechurch Street during trenching operations in connexion with the provision of plant for the new telephone exchange in Great Tower Street. On July 25 an article appeared in the *Daily Telegraph* by the eminent archaeologist, Walter E. Bell. No one knows more about old London than Mr. Bell, and the burrowing propensities of the P.O. have from time to time disclosed remnants of "Londinium" which have assisted Mr. Bell in giving us a mental picture of the City through whose streets the Roman Conquerors strutted, and which formed such a contrast to the rude dwelling places of the indigenous and barbarian British. Mr. Bell examined the remains referred to above and suggests that the painted plaster was a device to assist the owner to recall the marble glories of his native "Eternal City." Londoners who are proud of their City but who are notoriously ignorant of its historic treasures, owe a debt of gratitude to Mr. Bell for his several books in which he unfolds in such pleasing style the past and tells his readers where the historic remains can be found and all about them. Comparatively few Roman remains have been found South of the Thames, but quite an interesting collection was unearthed during the excavations made in 1913 for the foundation of the present H.Q. Offices of the London Engineering District.

Safety First.

In view of the large number of motor vehicles now in use by the Department, and the consequent necessity for storing petroleum spirit for use with the vehicles, it is interesting to note that the British Fire Prevention Committee favour the use of sawdust as a means of smothering the fire in the event of the petrol becoming ignited. The sawdust will float for some time on the liquid thus excluding the oxygen of the air and smothering the fire. Some advantage accrues by adding bi-carbonate of soda to the sawdust, as under the action of heat carbonic acid gas is formed, which slightly assists in extinguishing the fire. The mixture to be thoroughly effective must be applied not only in bulk, but rapidly and systematically, the object being to produce what may be termed a "lateral curtain" effect.

Removal.

Mr. P. T. Wood and the office staff of the Centre Internal Section, have now taken up their quarters at 39, Charing Cross Road. This building was purchased by the Post Office before the war. During the war and since the Armistice it has been in the possession of the Admiralty Hydrographic Department, who still occupy the lower portion, which, when vacated by them, will be converted into a P.O. Fitting Office Stores and linemen's centre.

The present offices at 15, Gerrard Street will then be given up.

Obituary.

It is with regret we have to record the death at the early age of 51, of Mr. P. A. Roberts, Assistant Engineer, which occurred on July 26. Mr. Roberts had been associated with the West External Section of the London Engineering District since 1907, and for many years he had the supervision of the Maintenance Staff of that Section.

Since a serious illness in 1913, Mr. Roberts had not enjoyed the best of health, but in spite of an ever present weakness he always maintained a cheerful disposition and lost no opportunity of contributing to the welfare of others. With such a disposition he was naturally on very friendly terms with the staff, and the news of his death caused quite a gloom throughout the Section. The funeral took place at the West Norwood Crematorium, on July 31, and was attended by a number of his colleagues in London. A large and beautiful wreath from the staff in the Section and from colleagues in the district was the symbol of affection in which the deceased was held.

Earlier in his career Mr. Roberts was a telegraphist at the C.T.O., and later a Sub-Engineer in the London District. For some years he was a member of the Civil Service Orchestra, and also a member of 24th Middlesex Regiment (now P.O. Rifles).

He leaves two daughters, aged 12 and 13 respectively, and as these are now motherless as well as fatherless, very much sympathy is felt towards them, as well as for the aged mother, and the brother and sister left behind.

THE LONDON TRUNK EXCHANGE.

THE NEW RECORD TABLES.

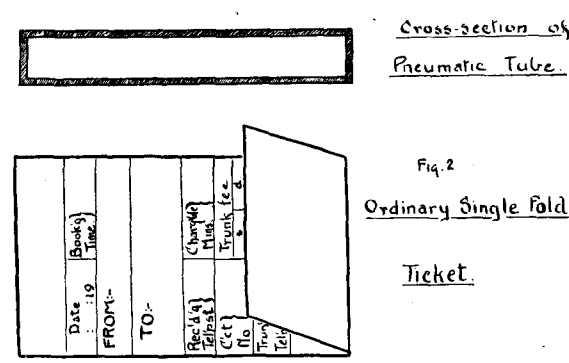
BY J. W. G. KENNEDY.

THE work of building new Record tables in a room on the first floor of the G.P.O. (South) building is now in progress. Since the opening of the Trunk Exchange the Record tables have always formed part of the equipment of the exchange itself, and their removal from the switchroom, the steps which have preceded it, and the factors which make the removal possible, form a new departure in this work which is not without interest.

In order to allow even those who do not understand the present system to appreciate the change, I will briefly explain the sequence of operations in the recording and completing of a Trunk call, of which the work of the Record Table forms an important part.

When a local subscriber calls for "Trunks" he is connected by the telephonist in the local exchange with an outgoing line to the Trunk Exchange. The lines from the exchanges are connected at the Trunk Exchange to the "Record Distribution" positions, where the call from the local exchange causes a signal lamp to glow. The Trunk Record positions are also connected with the Record Distribution positions, each Record position being represented by a plug and cord at a Distribution position. The work of the Distribution telephonist is merely to connect the plug representing a disengaged Record telephonist with the connecting jack corresponding with the lamp signal on which she receives a call.

The Record telephonist, whose circuit has been connected, receives a call on a lamp signal associated with her position, "throws" her speaking key to answer and is immediately in touch with the calling subscriber. Having prepared a ticket with particulars of the subscriber's exchange and number and the exchange and number of the subscriber required, together with the booking-time of the call, the ticket is placed in an opening, the cover of which is raised to allow of this, and despatched to the Ticket Distribution Centre by means of a special form of pneumatic tube (of which I shall have more



FIGS. 1 AND 2.

to say). From this centre it is sent through one of a series of tubes of the same type as the Record table tube, which connect this centre with each Trunk position in the exchange. Arrived at the Trunk position where the call will be controlled and completed, the ticket is placed in booking-time order in the rack allocated to waiting work, and finally completed by way of a Trunk line on the one side, and one of the Trunk outgoing junctions to the calling exchange on the other.

The most important factor in the distribution is the pneumatic tube system. Prior to the existence of the present system a revolving band was

in use at the Record table, which carried the tickets from the Record telephonists to the Distribution centre, and at this point they were sorted into a series of pigeon-holes and circulated by hand to the various positions.

No statistics are available, but with the old system of belt and hand circulation, many minutes must have elapsed from the time the Record telephonist placed the ticket on the belt until it reached the position. With the present system it is not unusual where there is no delay at the positions for a call to be completed within one minute of the time booked by the Record telephonist. The actual tube times from the Records to the Distribution centre and from the centre to the position average 3 seconds in the first case, and 6 seconds in the second.

The main feature of the pneumatic tubes used is that no carriers are necessary.

The tube is of oblong cross-section, and in lieu of a carrier, one end of the ticket is folded back to form a "sail." A sketch of the form of ticket used and a side elevation showing a ticket in the tube is shown in Figs. 2 and 3.

Fig 3
Side Elevation showing Ticket in Tube

It has always been realised that a busy Trunk Exchange where the telephonists' work is continually affected by transmission difficulties is not the right place for a Record table owing to the additional noise of the Record operating, but the prime necessity of having the ticket prepared where it can quickly be transmitted to the operating positions has always previously outweighed other considerations in fixing the location of the Record work.

It will be realised that the form of pneumatic tube explained here, is subject to very delicate adjustment. With an ordinary pneumatic tube in which carriers are used, no difficulty of adjustment exists, but with the present form of tube where the motive power must be adjusted to work with the flap of the ticket as a "sail," the margin of adjustment is very fine.

When the suggestion for removing the Record tables out of the Trunk Exchange was made it was doubtful whether the present form of tube could be made to work from the first floor to the third floor, a distance of 50, and a lift of over 30 feet. The Western Electric Company could not guarantee that the tube would work under such conditions, no tube of this form having previously been tried with so great a lift or in which so many bends were necessary. An experiment was, however, carried out.

The first trials were somewhat favourable, but damp weather, which has always made the working of these tubes difficult, caused stoppage, and the whole experiment was for a time regarded as inconclusive.

A method of clearing a tube of this type which is blocked by only one or two tickets is to fasten two tickets back to back thus providing a ticket with a "sail" on each side, and this is often effective when the passing of another ticket would only add to the blockage. Based on this idea a modification of the form of ticket was suggested which consisted of pasting another piece of paper at the back of the ticket to form a second "sail."

The effect of the additional "sail" making what was called the arrow-head ticket was at once evident in the acceleration of the speed of travel and in the elimination of stoppages.

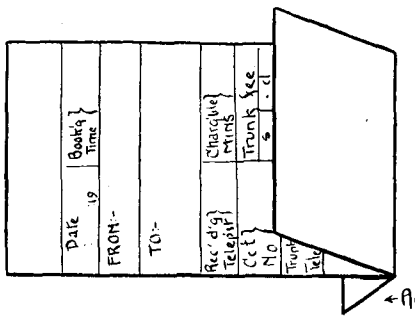


Fig 4
Arrowhead Ticket

The above side elevation shows an arrow-head ticket in the tube, the additional power would seem to be obtained partly by the provision of a better resistance to the air force, but more by the eliminating of resistance caused by the form of the ticket. It will be seen that with the single fold ticket the whole of the length of the ticket lies flat on the bottom of the tube, whereas with the arrow-head ticket only the edge of the bottom "sail" and the extreme edge of the ticket touches the bottom. Although the arrow-head was a distinct improvement it had very great disadvantages, the additional sail was found to be inconvenient in use and liable to become detached. The experiment was still inconclusive. At this point a suggestion was made that an experiment should be tried with the original ticket by giving it an additional fold which would have the effect of providing a sail on each side without the expedient of affixing an additional piece of paper to the ordinary ticket.

This simple expedient was at once found to be an improvement on anything which had preceded it. It was quicker than the ordinary and quicker and more certain even than the arrow-head ticket and was free from many of its disadvantages.

I have said that the adjustment of the tubes under ordinary conditions was a delicate one, and that they were affected by damp weather. For this reason a special quality of very expensive porcelain paper was in use on account of its being almost impervious to moisture, and an electrical oven had also to be installed to remove the moisture out of the tickets before use.

Fig 5
Arrowhead Ticket in the Tube.

Mr. H. P. Brown, who suggested the use of the arrow-head ticket, claimed that with the additional impetus given to the ticket by the extra sail, a less expensive quality of paper could be used and as a matter of fact the arrow-head tickets with which the experiments were made were of relatively cheap paper. The same advantage is found in the use of the double-fold ticket, and it is evident that a considerable saving will be made in the cost of the paper used for tickets by the use of the double-fold ticket.

The new Record tables are expected to be completed in about three months. The removal of the Record tables will not only allow of better conditions for long-distance Trunk working, but will allow of the important work of recording the calls being carried on in a relatively quiet room.

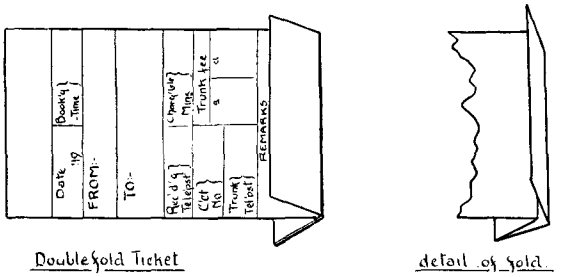


Fig 6.

RECORD TABLE OBSERVATIONS AT THE LONDON TRUNK EXCHANGE.

It may be interesting to give some statistics of the results obtained by the observations on the London Trunk Exchange Record Tables during recent years.

The results of the observations for the last six months are an improvement on any records in our possession.

RECORD.	1919.	1920.	1921.	1922. ½ year.
Average time from glow to challenge ...	3.3	3.1	2.6	2.4
" " to record call or enquiry ...	22.0	21.4	22.1	20.7
" " to give delay information...	5.2	3.4	3.2	3.3
" " to clear to Distribution Board	7.9	5.2	3.3	2.6
" " in total operation	35.8	33.1	31.2	29.1
Percentage of calls in which operator failed to challenge in 10 seconds ...	5.6	4.2	2.8	2.5
Percentage of calls in which operator failed to clear in 10 seconds... ...	29.9	16.7	6.7	5.0

DEATH OF MR. J. H. ANDERSON.

NEWS of the death of Mr. J. H. Anderson was received in the Controller's office with genuine sorrow. Mr. Anderson, who had been away from duty for some months, passed away at Brighton on June 30, in his forty-third year. The funeral was attended, at the request of the L.T.S. Supplementary Clerks' Association, by Mr. Willis, who was the bearer of a wreath from the Controller and staff. Mr. J. H. Anderson, senior, has expressed his warm appreciation of these expressions of sympathy from his late son's Chief and colleagues.

Mr. Anderson joined the staff of the General Manager in June, 1902, when its members could be counted on the fingers of two hands. He was thus on the staff for 20 years, during which time he saw tremendous changes. Widely read, and possessed of a keen intellect and remarkably retentive memory, Mr. Anderson's undoubted abilities earned for him establishment as a Third Class Supplementary Clerk in 1909, and promotion to a Second Class Clerkship in 1913. He was attached to the Accounts Branch during the whole of his service.

THE TELEPHONISTS' COLUMN.

"TALK OF MANY THINGS."

NEXT month we hope to have a design at the head of this column drawn specially for us by Mr. Niblock, of Regent Exchange. Mr. Niblock's work has been reproduced on many occasions in the pages of this JOURNAL, and we are very grateful to him for his help. As one of our contributors aptly remarks :—

> "I cannot help smiling. We have vowed this shall be a truly feminine column, and that man shall be rigidly excluded; when, lo! the first thing we do is to call upon man for his aid. Which, of course, if one ponders on it, is the best proof that this column is really, truly feminine!"

As further proof of our femininity, we have approached Mr. John Lee with a view to his writing for this column from time to time, and we are glad to say that he has consented to do so. We have a very happy remembrance of Mr. Lee's delightful play, "The Transformers," and of his paper read at the Telephonists' Society, "Hints to Telephonists on Writing Poetry," and look forward with the keenest pleasure to Mr. Lee's contributions.

Referring to the Postmaster-General's assertion that Aberdeen's "speed of answer" is 2.1 seconds better than London's, the *Bystander* breaks forth :—

"The girls who live in Aberdeen,
Are quite the best he's ever seen;
And those who work at Edin-borough
Are just as splendid, smart and thorough—
While England, I need not explain,
Just gets it in the neck again."

To which we retort :—

"The girls who work in London town
Are innocent of pout or frown;
They each possess the 'smiling voice,'
That makes subscribers' hearts rejoice;
While Scotland's brogue forbids, 'alas,
Poor country!' any smile to pass!"

Or, as a subscriber might have put it—but didn't :—

"The voices heard at my Exchange,
So sweet, so musical their range,
That I could wait an hour with ease
To hear their tuneful 'Number please?'
'Two *seconds* more!'—not *half* enough;
No 'granite' I—but softer stuff!"

TO-DAY'S GREAT THOUGHT.

"Women are not such fools as men."—
Sir James *Cantlie.*

We know he can't!

A suggestion has been made that it would be of interest, as nearly every exchange has its library, to ascertain the favourite authors and favourite books of readers of this column. At Gerrard, Zane Grey, William J. Locke, Ridgwell Cullum, and E. M. Dell are still very popular. Gerrard would like to know what books are in special favour at other exchanges. This should provoke a good discussion, and we shall be glad to have some names and titles for insertion next month.

We hope shortly to give particulars of a competition, for which it is hoped that there will be a large number of entries. Tom Webster, in one of his inimitable cartoons, tells of a race where a silver-plated jam dish was the fourth prize. "Fancy," he says, "a man who doesn't like jam running 26 miles only to be told he has won the fourth prize!" We hope *our* prizes will not come under this category, and that they will be acceptable to "jam" and "anti-jam" entrants alike.

A Rhyme "In Season."

"ANNUAL LEAVE."

Seven months of weary waiting,
Seven months anticipating;
Seven months that seemed unending
To the wondrous time impending.

Just one week of haste and hustle,
Just one week all brisk and bustle;
Just one week of desperation
Spent in earnest preparation,
Sorting garments old and new,
Getting in an awful stew,
When you find a doting mother
Lent your suit-case to your brother.

One night more, too tired for sleeping,
Woeful to the point of weeping;
Thinking shall you live the morrow
That shall banish all your sorrow.

Then the joy of rising, dressing,
Leaving with parental blessing.
Train is packed to suffocation
Till you reach your destination.

Just two weeks of life ecstatic,
Just two weeks of joys emphatic;
Just two weeks in which you live
Every minute God doth give.

Then—— but 'tis not my intention
To be cruel enough to mention
In the midst of all the laughter
Telephones must follow after!

DOROTHY TURNER.

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

LONDON TELEPHONE SERVICE NOTES.

London Telephone Society.

THIS Society will commence its 14th Session on Oct. 13, when Mr. G. Buckeridge will read his Presidential Address. The Meetings are being held at the Y.M.C.A. Lecture Hall, 186, Aldersgate Street. This is so near to Headquarters that it is hoped a greater proportion than usual of the male staff will be induced to attend.

The remainder of the programme for the Session will be as follows :—

Date.	*Subject.*
Nov. 3, 1922.	"The Opening of New Exchanges." Mr. H. L. Pountney.
Dec. 1, 1922.	"Wireless Electrophone" (with Demonstrations). Mr. Gibbons.
„ 30, 1922.	Annual Dance.
Feb. 2, 1923.	Annual Competitions.
Mar. 2, 1923.	Essays and Letters.

The Meetings commence at 6.30 p.m.

* * * *

"Five" and "Nine."

Much prominence has been given lately to the confusion which occasionally occurs between the spoken numbers, 5 and 9. Many suggestions to remove the difficulty have been made in letters to the Press, but the most useful preventative of all, viz., clear and careful articulation and enunciation, seems to have been overlooked. This is not the place to repeat the rules relating to the repetition of numbers which are well known and practised by the staff, but one may be permitted to remark that if subscribers would give close attention to the numbers repeated by the telephonists and acknowledge that the repetition is correct, much trouble would be prevented.

Many rules could be given which would assist in eradicating the trouble, but unfortunately, the average caller is in a desperate hurry and gives no time to niceties of expression. The most important thing to remember when using the telephone is that the listener is deprived of the advantage of watching the speaker's lips and, therefore, all consonant sounds should be emphasised. There is too much slovenliness of speech over the telephone.

Most of the suggestions published in the Press propose calling the 5 or 9 by some other name. One writer says, "Why not substitute the letter 'M' for either the 'five' or 'nine'? It would be quite easy to ask for 'M8M2' instead of '5852.'" We wonder if the writer thought what it would sound like to ask for "Museum M23M." Another writer applauds the idea but finds fault with the use of the letter "M" and suggests "V" in its place; "Battersea V3V3" does not sound easy. In these cases it is suggested that the letters should be printed in the *Directory* in place of the figures, leaving it to the telephonist to translate. Other writers suggest

re-christening the "nine," but it is almost certain that such a radical alteration would meet with the same fate as the recent "Keep to the Left" campaign; nobody would observe the new rule.

Another ingenious correspondent suggests the word "nap" instead of "five." Poor telephonist! Imagine a card enthusiast finding 1235 in the *Directory* asking for "Ace deuce trey nap."

No—there is no short cut towards the elimination of phonetic difficulties. What appears to be an easy solution is very often no solution at all. The only remedy is constant care—giving more and more attention to what may seem to the caller the least important part of the call, *i.e.*, asking for the number.

* * * *

Contract Branch Notes.

Automatic Working at Subscribers' Premises in London.

The introduction of Automatic Private Branch Exchange working in London has received considerable impetus by the decision of the London County Council to adopt automatic working at the County Hall, Westminster Bridge Road, S.E.1. Already several subscribers have decided to have this system of internal working installed in connexion with their exchange lines, but the size of these installations is small compared with that to be provided at the County Hall. An order from the Council has been received for the provision of 400 automatic extensions and an order for 200 to 300 additional extensions is anticipated almost immediately; it is expected that a maximum of 900 extensions will be required ultimately. With an installation of such magnitude and in a building so large as the County Hall—there are nearly 1,000 rooms—exceptional arrangements have had to be made to simplify the work of fixing the rental of the various extensions. To enable this to be done, a schedule of hypothetical distances from the switchboard to every other room in the building has been prepared, from which it is possible to tell at a glance the rental of any extension.

* * * *

Culled from the Exchanges.

Central Exchange.

The Eldorado Swimming Club held their second Annual Gala at the Pitfield Street Baths on July 28. There was a splendid attendance and as is usual at these affairs there was much excitement and enthusiasm.

In addition to open events there were the following confined to club members and to the L.T.S. :—

33 YARDS CLUB HANDICAP.

Miss I. Clements, 9 seconds	1
Miss R. Rawlings, 15 seconds	2
Miss F. E. Knight, scratch	3

Won by a touch.

33 YARDS SUPERVISORS' HANDICAP.

Miss Davis, 2 seconds	1
Miss Spalding, 10 seconds	2
Miss Drew, 11 seconds	3

A touch only, separated the first and second, and second and third.

133 YARDS INVITATION TEAM RACE.

Regent Exchange (Misses Williams, Phillips, Broomsgrove, Cole)	1
Central Exchange (Misses Izzard, Snowden, Knight, Milbank)	2
Gerrard Exchange (Misses Wilson, Burt, Smith, Davis) ...	3

Won by a touch.

100 YARDS CLUB CHAMPIONSHIP.

Miss F. E. Knight	1
Miss M. R. Milbank	2
Miss E. Snowden	3

Won by six yards.

PLUNGING.

Miss M. R. Milbank, 39 feet 2 ins.	1
Miss L. Izzard, 36 feet 1 in.	2
Miss D. M. Jones, 32 feet 11 ins.	3

67 YARDS HANDICAP (LOTOS S.C.).

Mr. G. Frier, 6 seconds	1
Mr. G. Feed, 16 seconds	2
Mr. J. North, 6 seconds	3

Won by half a yard.

* * * *

City Exchange.

The care of those disabled in the War is a matter of keen interest to the staff, and up to July £50 was forwarded to St. Dunstan's and £20 to the War Seals Foundation as a thank-offering.

A TROUBLESOME WHEATSTONE TRANSMITTER FAULT.

WHEN receiving Wheatstone Morse by slip or Creed a troublesome fault sometimes appears showing missing dots and dashes or running signals, or both missing. Running in otherwise perfectly shaped signals, the faults partly or entirely disappearing on the slip being re-run.

Commonly, the repeater station, if any, is called in to watch the re-run, which is then good and the fault is attributed to the receiving apparatus. The sending station if asked will usually report that the slip is apparently good and traffic is resumed only to show the same fault shortly after.

Perhaps a perforator whose slips give faults is identified and at request disused, but as its slips may cause no complaint on other circuits, it will probably be brought into use again shortly. The fault should be traced at once, if possible, and the following method is suggested :—

If signals at trial were good, but traffic shows occasional missing or running signals with certain slips, and if on re-run the faults disappear, or some of them do, the signalling station should be asked to examine the slip at certain specified signals that failed. If they appear good the transmitter should be suspected. The repeater station should be called in to watch *new* slip as it runs in traffic. If the faults are observed at the repeater station also and are partly or wholly absent on a re-run, and the sending station reports his slip apparently all right, the fault is almost certainly due to a transmitter selector, spacing or marking, as the case may be, or both selectors if the fault is both missing and running, being adjusted with unequal margin of clearance as they rise into the signal holes. Consequently, in some slips slightly imperfect the selector just strikes the edge of a hole and fails to reverse the current. The edge of the hole, however, will be lipped, and the selector probably pass up freely in a re-run.

The fault generally arises through a Gell or Kleinschmidt peculiarity not shared by the Wheatstone stick perforator. Each time a space or a character is punched all eleven centrehole punches act so that except after the figure nought some centreholes have been punched two or more times, and as the paper channel and the star wheel mechanism wear the position of the paper under the punches varies slightly, and the repunchings enlarge the centreholes or make them eggshaped, though the dies are as perfect as in the stick perforator.

The transmitters previous to issue are often apparently adjusted in the workshop with Wheatstone perforator slips, the centreholes of which being only punched once are therefore uniform in size, and unless obviously dragged on the starwheel through faulty paper feed are always circular and in perfect line with the signal holes, so that a transmitter adjusted with the selectors entering only just inside the signal holes will run without once catching the edge of a hole, while if the centre hole be eggshaped forward and the selector be biassed to the forward edge, the hole might not now be taken sufficiently far forward to allow the selector to rise clear and reverse the current. The blow on the edge, however, would lip the hole, and the selector would probably clear through if the slip is re-run.

The fault is rather elusive, and as the slips will look quite good at the sending end, and may run quite correctly on other circuits, the officers at that end are sometimes reluctant to make the necessary change, which, after the fault has been so proved, should be insisted on.

It occasionally happens that a series of transmitters will all show this same fault, and enquiry show that they were all set up by the same mechanic on one system, and proved with a slip from a Wheatstone perforator. Such a series has been encountered from more than one large station and individual transmitters from many places.

The fault described frequently gave trouble in the early days of Gell perforators in the C.T.O., and complaints especially on new wires of misfitting slips were raised and the Gells put out of action until the rule was adopted of changing any transmitter which misfitted such slips. The transmitters are now adjusted so that Creed slips, which often show very considerable deviation from perfection, are commonly signalled correctly. Both Gell and Kleinschmidt perforators also are now very accurately adjusted by the C.T.O. mechanic staff and show very little mutilation of centreholes.

There is plenty of difference between the size of the selectors and the size of the signal holes to allow considerable variation of position of the signal holes if the selectors are centrally placed, so that any slip which looks nearly right should run correctly.

Other faults in Wheatstone working are generally due to more obvious causes.

A.C.B.

AT A RADIO 'PHONE PARTY.

A TREMENDOUS boom in wireless telephony is proceeding in the United States. Ring W. Lardner, a humorist with his own brand of orthography, gives the following impressions of a radio party across the Atlantic :—

I don't suppose by this time that they's more than a few families left in the world that ain't got a little radio in their homes, though personly we are still without one as you halfto pay cash for same.

But my village has got its share of the machines, and I've been lucky enough to be invited to a couple homes where they had them and will admit

they are a great institution and libel to go a long ways towards keeping the men and boys in at nights though in a good many cases I would rather have them out if I was mother.

The places I have been to hear them, why they was connected with sending stations in Newark, Schenectady and Pittsburgh and if you didn't like the program that was going on one place why you could change plugs and switch to another which sounds like a grand scheme but the trouble with it is that you pretty near always seem to go from bad to worse.

Well we started out one night with Schenectady and heard a voice say that the program would open with the baseball scores for that P. M. and he says St. Louis or somebody had beat New York in the American league by a score of 6 to 4 and just as he said it the instrument let out a terrific blatt and I thought maybe it was the pitcher squawking to one of the umpires but our host said it was static.

Whatever it was we did not hear no more baseball scores but personly I didn't raise no howl about that as I figure that a person that has got any kind of self control can wait for the morning papers to tell how the games came out a specially in May.

Well the next number was a bed time story but it wasn't much more than 7 o'clock and while that may be bed time in Schenectady why most of we Great Neck folks don't hardly ever turn in till 8 and sometimes ½ past so we switched off of Schenectady and cut in on WYZ which is code for Newark.

* * * *

Well a gal started to sing I love you truly and I made the remark that no wonder they was so many murders in New Jersey and another of the boys said he didn't think they had been quite enough.

The next piece was a cornet solo which was mostly what they call triple tongue work and it would of drove me right to Pittsburgh if I had my say, but our host was a bug on cornet playing and set there beating time with his tongue till the last squawk.

When we finely got to Pittsburgh a man was just commencing a speech about a new expedition to the Pole but the next thing you know he was makeing a political speech about what a big mistake it would be to cut down the personal of our navy just at this time and here is his speech verbatim as near as I can remember same :

" With the far eastern question still unsettled in spite of the forward strides taken by the disarmament conference in Washington, now is surely not the time to reduce our static squawk blash ma-a-a-a.

" No country on the great green foot stool desires peace more earnestly than the U. S. but blah, biz-z-z-z-z, dot, dash, two dots, dash, ma-a-a-a-a."

The host informed me that these last few noises was a police station cutting in but I don't know if they got the fellow or not.

The closing number of the program from Pittsburgh or whereever we was switched to by that time was a reading from Shakespeare by one of these here gal elocutionists, and this seemed to be the real bed time story of the evening or at least I noticed pretty near everybody in our party acting kind of sleepy before she was half-way through with it.

* * * *

Well they tell me around here that the theatre managers and opera managers and &c. is kind of leery that the radio folks will sign up some of the star song birds and comedians and &c. and the next thing you know these people would be singing or springing their gags to a audience of 2 or 3 million people a night without the audience paying a penny to hear them and in the case of most of the divas and tenors why you could enjoy them a whole lot more if you didn't half to look at them while they was singing. This is what made grand opera gramophone records so popular.

Well the time may come when they will have entire radio programs and will keep you thrilled all evening but I ain't heard one yet that a person wouldn't run a few wave lengths to miss the most of it and the majority of the performers seem to be cornet players and readers and speech makers that wouldn't dare to do their stuff if they was where you could get at them.—*Dundee Courier.*

CORRESPONDENCE.

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

SIR,—In the *Post Office Engineers' Journal*, April, 1922, is an article on " Baudot Distributor, Correction of Speed by Control of Vibrating Reed." In this article are the following words :—" The system has been in service for some months on several Baudot duplex circuits in the C.T.O., and as the results have proved satisfactory, its use is being extended."

In April last the system had been tried on *four* duplex Baudot circuits. This is giving the word " several " a quite correct but very generous usage. The system was tried on T.S.-L.V.$_2$, and without being in a position to consult records, I think I may safely say that during a period of about three months it was never satisfactory from the traffic point of view. It was tried on T.S.-G.W. but with similar results, and it has never been successful on any Baudot duplex which needed to carry a full load. It has had some success where only two arms were required.

Despite these well-known facts, the device has been sent out for general use and with the results that could easily be foreseen by those who knew. It has been set up for use in places where a four-arm duplex Baudot is almost the only provision, and where four arms are needed to take the traffic. It works all right for two arms ; for three with great difficulty and careful nursing ; with four arms practically not at all.

It is not my purpose to waste your time with the discussion of the causes of this " unsatisfactoriness," but simply to focus attention upon it. As it stands, the thing is a nuisance to all who have to work it, and to those responsible for the traffic it ought to but cannot assist.

The above-mentioned article in the *Engineers' Journal* states : " It simplifies the construction of the distributor, as the epicyclic gearing . . . is dispensed with."

That is, it is cheaper—its one merit ; but against this saving must be set cost of the extra correcting relay and its appurtenances and—the main item—an enormous loss of efficiency as compared with the old mechanical correction.

" DIRIGEUR."

Aug. 15, 1922.

THE FIVE UNIT SYSTEM.

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

SIR,—Mr. Cousins is mistaken. I carefully read his notes on the " Principles of the Five-Unit System " and am under no delusion concerning the meaning he intended to convey.

I appreciate that portion of his notes in which the two alphabets are compared, but when Mr. Cousins follows up with the startling statement that a Wheatstone Duplex line, which will work at approximately 85 words per minute, should work 120 words per minute (normal speed) on Baudot Quadruple Duplex, it is only reasonable to expect that such a contention, having as it does, an important bearing upon some of the traffic-handling problems faced by telegraph administrations, should be supported by something concrete.

May I explain here, Sir, that my challenge is not borne of any spriit of animosity towards the Baudot System. It is an excellent system, and I like it very much ; and as an earnest student of mechanical devices for many years past, I can appreciate the wonderful ingenuity and admirable design of the working units of this system, but, however wonderful the Baudot, or any other system may be, the greatest care should be taken in advancing absolutely reliable data when making comparisons between them.

If Mr. Cousins can really convince me as to the possibility of obtaining a 30 per cent. traffic-handling increase by substituting Baudot for Wheatstone on an 85-words-per-minute line, then, Sir, I will humbly crave his pardon for doubting his statements, and yours for causing you to waste valuable space in your JOURNAL.

Mr. Cousins has made this very definite statement, and many telegraphists in Great Britain and abroad, as well as myself, will look to him for further enlightenment.

He has admitted that he was mistaken in stating that Multiplex Systems filled the line with working signals. Perhaps he will now go further and answer the queries raised in the latter part of my letter which you were kind enough to publish in the July number.—I am, Sir, Yours faithfully,

ARTHUR JAMES POLLEY.

Telegraph Works, Croydon,
Aug. 11, 1922.

PERSONALIA.

The following officers resigned for marriage during the month of July :—

Telephonists.

Miss K. M. STREETER, *Central.*
Miss K. N. SIBLEY, Central.
Miss R. COPPIN, Central.
Miss C. J. DAVIES, Central.
Miss W. A. F. ROBB, Central.
Miss I. WEMYSS, Supt's. Office, F.E.S.
Miss V. M. SMITH, Chiswick.
Miss W. A. FORD, Sydenham.
Miss F. M. PALMER, Hornsey.
Miss L. RUSHFORTH, London Wall.
Miss B. B. GORDOE, London Wall.
Miss H. A. MEAGER, London Wall.
Miss E. M. READ, Mayfair.
Miss S. J. WILLIAMS, Mayfair.
Miss M. E. DEMPSEY, Mayfair.
Miss H. K. FLOWERS, Mayfair.
Miss D. A. FROST, Barnet.
Miss B. HART, Paddington.
Miss I. ROBERTSON, Paddington.
Miss E. SHARP, Putney.
Miss E. M. HUNT, Putney.
Miss D. R. HUDSON, Putney.
Miss G. V. NASH, Streatham.
Miss A. M. FREEMAN, Gerrard.
Miss E. CHRISTMAS, Gerrard.
Miss G. M. HURST, Gerrard.
Miss G. BRISTOW, Trunk.
Miss G. CANNING, Trunk.
Miss M. O. SMITH, Holborn.
Miss P. L. TAYLOR, Victoria.
Miss M. O. BOWERBANK, Victoria.

EXTRACTS FROM LETTERS HOME OF A YOUNG TELEPHONE ENGINEER.

(SENT OUT TO INDIA TO INSTAL AUTOMATIC SWITCHBOARDS IN THAT COUNTRY.)

(*Continued from page* 180.)

Tuesday, Aug. 23.—My wireless telephone friends' stunt is over and they have, to use their beautiful expression, "dispersed." One of them has gone back to his headquarters in Peshawar (where he will doubtless be baked to cinders, poor chap) and the other I have just deposited in the local hospital with malaria. How a fellow can get malaria in a climate like this, I don't know—perhaps it's the mosquitoes, of which there are legions—all of the carnivorous species.

I miss them rather, though it's just as well that they're gone for it was a fearful tight squeeze, the three of us in one room. There were only two beds, too, and they, coming first, had collared them. Hackett (the engineer here) lent me a camp cot, a wonderful thing that folds up and goes into one's waistcoat pocket when not in use, so to speak. Unfortunately, the thing hadn't any frame for mosquito curtains so I had to rig one up with odd bits of telephone wire—I managed to make quite a decent job of it, I think. At least the contraption had the merit of being flexible—in fact, when the curtains were put on it, it resembled nothing more than a blanc mange. However, it served its purpose for the best part of a week and kept the man-eaters off me, so I felt quite satisfied with my handiwork. Unfortunately this beautiful example of my engineering skill did not meet with the approval of my worthy squire Abdul. From the very first he showed a marked distaste for anything appertaining to this monument to my ingenuity.

Friday, Aug. 26.—I am safely installed in the "Napier" Hotel now. It's not much of a place, though it's as good as any of the others in Poona—I suppose you can't expect too much in a country place like this. They call Poona "The City of the Marathas," though it's little more than a village. But for its racecourse I don't suppose it would ever have been heard of.

Everything up here seems to rejoice in the name of "Napier." There's the Napier Theatre just opposite. A pretty dud show I expect, I haven't bothered to go there yet. The turn this week is called the "Turnee Parisienne," and is advertised as having the attractions of "French Songs, French Dances, and French Artistes." The latter are living in the hotel here—they seem a weird lot. I can't understand their language at all now, I believe I could have done once, just a word here and there, enough to be able to make out what they were talking about. What I've learnt of Hindustani coming in seems to have driven all I knew of French out.

It's very easy to pick up Hindustani. That is, the sort of Pigeon-Hindustani that the coolies talk—the real high-flown language that the Rajas and people talk is pretty difficult—and very beautiful, I believe. The construction of the sentences is queer—they never say such a thing as "I don't know" (or, to cut out that terrible English verb "to do," I know not), they put it round the other way and say, "Me-to, knowledge not is." It sounds a bit funny, doesn't it? You'd be surprised how easy it is, though, to get into the way of speaking backwards, so to speak. I think, if a man didn't know any language at all, he would find it easier to learn to talk "backwards," as we call it, than to talk ordinary English. That, you will say, is absurd, but you ought to try swotting up Hindustani grammar for a few months, and see how much more easy it is than English.

Sunday, Aug. 28.—Most amusing thing happened this morning. Terrific argument between the three French gentlemen of the one part, and the native manager of the Napier of the other part. They started off in English—thick, guttural stuff from the throat of the manager, with a background of Hindustani floating down on the breeze from the native hotel servants in the compound. On the French side we had a rather high-pitched and nasal jabbering from the men, supported by their three maidens murmuring sweetly and continuously in their own language. The whole show was conducted on the veranda and in the compound just outside my door. As I sat in my room, complimentary remarks in the three languages concerned were wafted in to me. It sounded something like this: From the manager, "Hotel you will not leave until bill is paid man." Then, simultaneously, a string of Hindustani from the manager to his supporters, followed by a swelling of the approving murmurs in that quarter, and a string of French from the linguists of the concert party for the benefit of their females, which was also followed by an increase in the tone of the supporting murmurers. After the manager's remark was argued over by the French, the linguists took the field once more. "Ve vill geef to you fourrteen rruepais for day for ze rrom," followed again by some jabbering on both sides. Eventually they seemed to get fed up with the translating part of the business and everybody shrieked at the top of his voice in his mother tongue. The whole thing lasted for three hours, during which time all the most offensive language in English, French and Hindustani was used—I don't know how it ended up—if it did end up at all—I lost the sense of what was going on when they left off speaking in English.

Wednesday, Sept. 21.—In Poona, as by this time you probably know, we have two race days a week, usually. Also, in common with the remainder of the civilised part of the globe, we have one Sunday per week. If your maths. are strong you will be able to gather from this that there are four working days in every seven. If you are an inhabitant of Poona you apparently find this arrangement both ordinary and pleasant. As I haven't yet lived here sufficiently long to be able to feel like an inhabitant of the place, I find the arrangement both unpleasantly extraordinary and extraordinarily unpleasant.

There is, between my lineman and myself, a sort of unspoken and never-to-be-alluded-to understanding that he will not appear at the exchange, and must not be expected to appear there, on race days. If, on Tuesday, he tells me that to-morrow he will bring a new soldering iron down with him, then I must understand that he is speaking of Thursday. I have spent a long time, and undergone many painful experiences, in learning this. Now that I understand, I don't feel very comfortable about it. It's very annoying to have to work alone down at Ganeshkhind two days a week—more so, when the operators go for their afternoon sleep, and I find myself left to work one switchboard when I am installing another.

My lineman, who is, relatively, a pretty good worker, always looks pained on Thursday if I refer to anything I have done in his absence on Wednesday. He seems to think that for anybody to work on a race day is a wicked thing. I found him this evening hanging round Poona Main Exchange, waiting for the results of the races to come through from the racecourse. He held a paper in his hand—his receipt for RS.7/8, that he had put on some horses. Now that lineman, like the rest of his tribe, receives, I think, a wage of one Rupee a day—at any rate, it's thereabouts. So he was gambling in one day alone with the whole of his week's pay, and he told me quite cheerfully that half of his RS.7/8 was already lost. Curious, you know.

They're a queer lot, the linemen here. I have one attached to me at Ganeshkhind, and there's a lot more of them at Poona Main. They arrive on bicycles at about ten o'clock in the morning, and stand about in the compound, smoking native cigarettes and talking and laughing just as you would see English clerks in an English office doing an hour earlier. In their dress and their religion (they're mostly Hindus hereabouts), and their ideas they are purely native, yet they will "talk shop" in a mixture of Hindustani and very complicated technical English. They can even read and write technical phrases in English. An expression like "Order wire ringing key" is as much their language as it is ours. You have to understand a little Hindustani to follow them, of course. In English we might say of a particular wire, "Earth for the sleeve of the jack." They call it, "Earth, jack-ke sleeve-k'wusti"—either of which will be equally intelligible to *you*, no doubt.

They seem to know as much technology as an English telephone engineer—Heaven alone knows where or how they pick it up. They're all practically without any education as we understand it in England. All the natives seem to take very kindly to the telephone and treat it as being a perfectly natural thing for the Sahib to arrange, just as he has given them motor-cars, and railways and electric lights. You see the most low-caste native paying his Rs.1/4 to make a trunk call to Bombay to put some money on a horse in one of the "bucket-shops" down there. Listening in on the telephone, you may hear telephone conversations going on in umpteen different languages—Hindustani, Gujerati, Marathi, and as many more that I don't even know the names of. Oddly enough, the natives always start their conversations with "hello." Some of them will even not be able to give the number that they want in English, yet they must always say "hello" before they start to speak—perhaps they think it's a sort of "open sesame" without which the apparatus won't work.

The natives, in their absolute refusal to marvel at anything that the Sahib invents for their convenience or otherwise, are very disappointing. You would think that the spectacle of a train, with its smoke and steam and noise and speed and fire would be at least a thing to astonish them, even if it didn't scare them—especially as in many places a train only passes once a day. Yet they don't seem to be a bit impressed by it. They seem to enjoy railway travelling rather than to be afraid of it. The sight of a family on the move is a very common one. The man in front, and the women and children, with the babies on their backs and all their worldly goods and chattels on their heads obediently following in the rear. When they get to the station the man fumbles in the folds of his "dhoti" and produces a quantity of small change with which he buys their tickets. They travel about 50 miles for the rupee. If there happens to be a train just due to start, they won't trouble to hurry to catch that one, but will squat down on the station and wait till the morrow for the next one. In the evening they take out their cooking pots, make a great meal of curry and rice, if there happens to be another family there of the same caste they combine. When the meal is over the man smokes his hooka while the women scour out the pots with mud. At all the stations there are two great earthenware jars of water—one for Hindus and the other for Mohammedans. At the bigger stations small boys, not overburdened with clothes, walk round with trays of tea cups on their heads, crying "Cha-a-a, Gurrum Cha-a-a" in much the same tones that small boys walk about the Strand crying, "News, Evening News."

At many of the stations hawkers come around the trains trying to sell things to the Sahib. You can generally tell the industry of the district by the things they bring you. Round Asansol way, for example, they're obviously iron workers. Weird knives and such like get thrust through the carriage window at you. At Jubblepore they sell "curiosities" made in brass and in ivory—wonderful models of carts and elephants and temples and things some of them are. Extraordinarily fragile and delicate. At another place, whose name I can never remember (it starts with "A" and ends in "bad") they sell beautiful carpets, and most remarkably cheap. You can hardly expect a chap to lug a carpet about with him, though, can you? True to their practice of representing the industry of the place by the things that they would sell, in Poona the first and everlasting thing that you are asked to buy is "Race Boo-oo-ook." When I landed here first a little boy howled it at me. He, and the rest of his tribe have been howling it at me ever since. They jump out in front of my motor bike when I'm on my way to Ganeshkhind and wave it at me. They rouse me in the morning by shouting it in the compound. They prevent my going to sleep at night by doing the same thing.

I don't know who invented racing, but whoever it was—well, I dislike him.

C. C.