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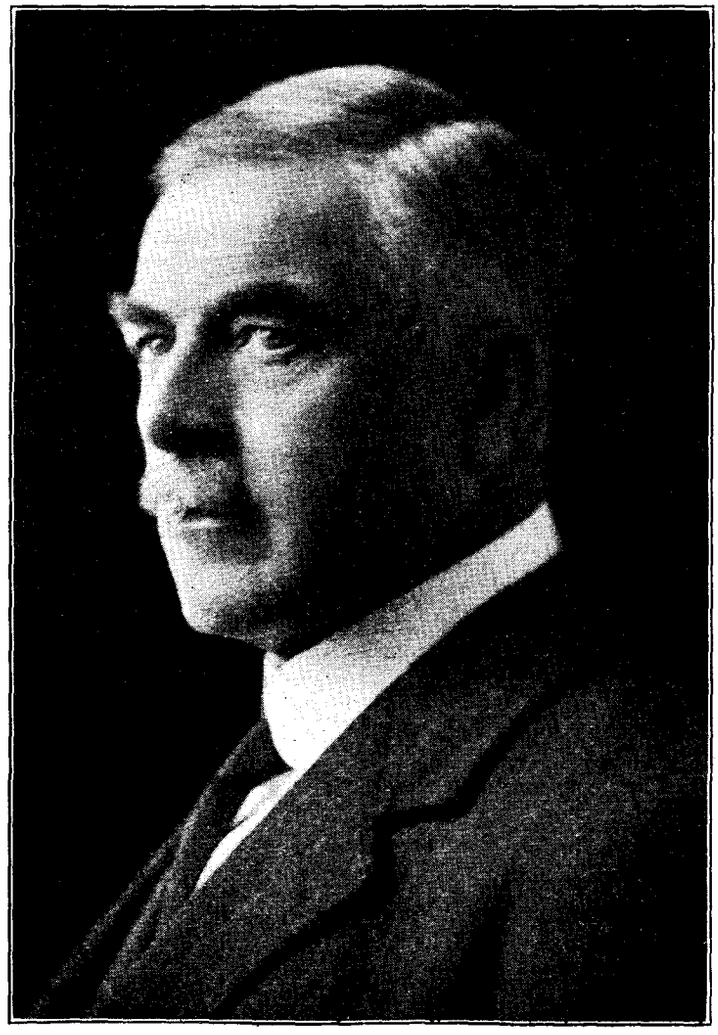
TELEGRAPH AND TELEPHONE MEN AND WOMEN.

XLIV.— MR. HENRY SPARKES, C.B.E.

LIKE many other officers who have risen to distinction in the Post Office service, Mr. Henry Sparkes, the Controller of the Post Office Stores Department, commenced his official career as a telegraphist. He began at an unusually early age, for he was not quite 15 years old when, in February, 1886, he joined the manipulative ranks in the Central Telegraph Office. He was a telegraphist for six years, and it is noteworthy that that period was the longest on which he has remained in any grade, though we hope it will be considerably exceeded in his present grade. In 1892 he applied for a clerical position and, by a stroke of luck, as he himself recounts, he was given a post in the old department of Telegraph Stores. The establishment records suggest that the year 1892 was a period of revolution in Telegraph Stores for, inside of four months, Mr. Sparkes found himself transformed from a Junior Clerk to a Second Class Clerk, and then to a Second Class Examiner, and must have been a little breathless at the end of it. He had, however, found his *métier*, and his rise was rapid. He was a Staff Officer at the time when he became a notable figure on the Post Office side in the proceedings concerning the valuation of the plant of the National Telephone Company, his services to the State on that occasion being beyond measure.



[*Photo by Hana, London.*

Mr. Sparkes had the honour of being made an Officer of the British Empire at the termination of the War, and was made a C.B.E. in the last Birthday Honours. In 1924 he became Controller of his Department, to the joy of his subordinates, for there never was a more popular Head of a Department.

THE TELEGRAPH SERVICE—PAST AND PRESENT.*

BY A. W. EDWARDS, O.B.E.,
Late Deputy Controller, Central Telegraph Office.

AT luncheon in a little restaurant in Soho a grey-haired, benevolent, be-spatted old gentleman sat down agitatedly at a table and observed to his *vis-a-vis*, "So sorry, I've a telegram I simply must send to the North of England. I'm stuck for a shilling. *Can* you help me out. Here's my card." On it was printed the name of a famous club in Pall Mall. Somehow it seemed all wrong to the man appealed to and he declined to hand out the required shilling, whereupon the benevolent-looking old gentleman dashed out of the restaurant. "Same old telegram," breathed the waitress.

Ladies and Gentlemen, the same old telegram is the subject of my paper to-night. It is the same old telegram to-day as it was in 1835, when Messrs. Cooke and Wheatstone collaborated and presented to an astonished world their five-needle telegraph system, the result of which was the establishment a few years later of various telegraph companies, opening up yet another profession for the men and women of Great Britain. Telegraph clerks, as the operators were then named, as against the later title of telegraphists, together with engineers and many and various clerical officials required for accounts keeping, &c.

Under the régime of the various telegraph companies which were established the minimum charge for an inland telegram of 20 words in the text and 10 in the address ranged from 1*s.* to 6*s.*, according to distance or to whether the telegram had to be handed over from one company to another, or to a railway company, the average cost of a telegram to the sender being 2*s.* 2*d.* An additional fee of 1*s.* was charged for telegrams sent on Sundays and for those sent to and from race meetings and other special events. In the companies' time the free delivery of a telegram extended only to a distance of half a mile, as against the present distance of 3 miles. For distances beyond and within a mile, a porterage fee of 6*d.* was charged, with 6*d.* for every additional mile and with increased rates for the express delivery of telegrams. It must be assumed that in these times telegraphs were required to show a profit and that the companies paid some kind of dividend to their shareholders, for we find that in the year 1868 an Act was passed empowering Her Majesty's Postmaster-General to acquire, work and maintain electric telegraphs, and that two years later the business and interests of the several telegraph companies, viz., the Electric and International, the British, Irish and Magnetic, the United Kingdom and the London District were taken over by the State at a cost of some eleven million pounds, which sum included, I believe, the cost of numerous extensions during the first three years.

I do not propose to weary my listeners to-night with particulars of the evolution of telegraphy, because I do not doubt that the vast majority present have from time to time heard papers on this interesting subject and are *au fait* with the various phases of telegraphic instruments, from five-needle, double and single needle, to the present high-speed automatic and multiplex machine apparatus. Recently I read with some grief and a little asperity the following Press paragraph: "The Post Office Accounts for 1926 disclose the usual loss on the telegraphs. If they only cost us a million and a quarter more than they bring in every year I suppose we should think ourselves lucky. But this deficit has been going on ever since the Government entered the telegraph business and it was because the Government had entered it that it obstructed for many pertinacious years the development of the telephone. That particular fight is now pretty well over, but it has cost the nation incalculable sums in the past.

"The relative utility of the telegraph grows less with every year. Two or three decades hence it may have become virtually obsolete. Meanwhile we shall have been mulcted in another 50 millions or so."

To telegraph men and women such Press comments do not make happy reading, particularly as apart from his satire the writer endeavours to be prophetic. It is the more unhappy to the telegraph men and women of the present decade to whom has been left the legacy of an indifferent initial bargain, and I suggest, therefore, that our time would be more usefully employed to-night in retrospection and in an endeavour to ascertain whether any errors of omission and commission in the past have aided these yearly losses of telegraph revenue and whether it is possible in the light of past experience to do anything which will serve as a guide to the future prosperity of the Telegraph Service.

At the transfer the Government, following, possibly, the example of the penny post, established a uniform rate of 1*s.* for 20 words in the text and a free address to any part of the British Isles, while on Oct. 1, 1885, a further reduction to a minimum charge of 6*d* for 12 words, with a ½*d.* for each additional word, was made, the average cost to the public being about 7¾*d.* per inland telegram, as against 2*s.* 2*d.* in the companies' time. The rates were increased during the war to 9*d.* instead of 6*d* for 12 words, and later to 1*s.* for 12 words. The transfer, too, was responsible for a considerable reduction in the Press rates, 1*s.* being charged for every 100 words transmitted between 6 p.m. and 9 a.m., and 1*s.* for every 75 words between 9 a.m. and 6 p.m., with 2*d* per 100 or 75 words for each additional address.

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

There can be no doubt that these much reduced rates were directly responsible for the vast increase of telegraph traffic which year by year accrued and that as a result our telegraph service made rapid strides in this connection. But the expense incurred in the laying down of lines everywhere, consequent upon the continual extension and development of the system even to villages, together with the scrapping of apparatus as newer inventions were discovered, must have been enormous, and expense in the latter direction still continues and will continue as new methods are invented.

All this was no doubt justifiable while telegraphs had no rival in the field, but it naturally followed that with the introduction of its telephone competitor, which year by year made its influence felt, particularly upon local telegraph traffic, the uniform rate for any distance by telegraph could no longer be justified as a commercial proposition and that, in effect, the public was being subsidised to a much larger extent than ever. For it must, I think, be contended that the establishment of a uniform rate for telegrams has never been a sound commercial proposition, and that since the Government took over the business of the several telegraph companies the telegraphing public has always been to an extent subsidised in regard to its telegraph service. I may be wrong, but during the whole of my 44 years' telegraph service I do not remember telegraphs as a revenue-earning machine, and when one reads such annual deficits of 1½ to 3½ million pounds since the year 1913 it tends to show conclusively that our charges for telegrams are not altogether sound. What would be the case of telephones to-day had the Government when taking them over introduced a cheap uniform rate of charge? Would they be in any different case to that of telegraphs? I suggest not. And yet, notwithstanding the losses shown on telegraphs, it is suggested in the Press that a cheaper and more popular service is wanted. If telegraphs cannot pay at the present rate of charge how is it possible to give a cheaper service? There is, I think, only one method of making telegraphs pay, and that is by the abolition of the present uniform rate of charge and reverting in some degree to the pre-transfer system of charging according to distance. It might then be even possible to win back some of the local traffic lost because the rates for local telegrams might, under such a scheme, be lessened. Why is it that we are to-day maintaining our telegraph traffic loads between London and the large provincial offices and losing local traffic? Simply, I think, because we are giving a splendid service between London and the Provinces and between the large provincial towns at infinitely cheaper rates than by telephone, whereas the local charges for telephones are not only infinitely cheaper than telegraphs, but in the matter of service telegraphs cannot live with telephones. It may, of course, be argued that under such a scheme we should run the risk of losing much of our provincial traffic to telephones, but I suggest that in the matter of long-distance inland telegraphy there will always be considerable business.

Recently one of our daily newspapers would appear to have suddenly discovered that our Press rates are altogether too low and that the Government was subsidising the Press in regard to its telegrams. It is certainly somewhat extraordinary that this fact has only now been discovered by this enterprising newspaper, and that it has taken some 56 years for this to be acknowledged by the Press. Press telegrams never have paid since the transfer of telegraphs to the State, and the Press of this country has been receiving a State subsidy ever since the establishment of Press rates. The low rate of 2*d.* per 100 or 75 words, according to whether at night or day rate, for each additional address no matter whether in the same town or to any town throughout the British Isles, killed any possible chance of making revenue out of the Press traffic for the obvious reason that while such a rate might be justified for additional addresses *in the same town*, it could not for one moment be justified in regard to addresses in other towns. The rate of 2*d.* was increased to 3*d.* after the war, while the number of words at day and night rate was lessened, but even this I submit is altogether insufficient. Whenever any suggestion was made for increasing the Press rates it was for one reason or another stifled at its inception, but the fact remains that there has always been a recognised heavy loss each year on Press telegrams, and that each successive Government has wittingly, if unwillingly, subsidised the British Press. If, therefore, telegrams are required to become a revenue-earning concern it behoves a careful revision of the present Press rates, a revision which I feel sure we must all agree is justified. The loss on Press telegrams has certainly lessened during the past few years, consequent upon the rental of private lines by Press agencies and newspapers, and the working of such lines by their own telegraph staffs, but on Feb. 15 last, the Postmaster-General acknowledged that the loss on Press telegrams had been between £200,000 and £250,000 a year during the last three years but that the existing rates could only be altered by legislation, which he was not prepared to introduce. I am, of course, not in a position to give reasons why such legislation should not be introduced, but it was pleasant to read, some three days later, in the leading article of the newspaper which was doubtless directly responsible for the question being raised in the House of Commons, that "no newspaper wants a secret subsidy from the Government, and that such undercharging of newspaper telegrams is in effect a subsidy of the worst kind." If the newspaper in question speaks for the remainder of the British Press, we ought not, I suggest, to be backward in taking them at their word and in putting our Press rates on a commercial basis after a period of 57 years.

The subject of my paper would not be complete without a comparison of the output or working rates of hand-worked Morse, with its attendant Wheatstone and the modern machine multiplex apparatus. Morse telegraphy with Wheatstone and Wheatstone-Creed working is still with us to a considerable extent, and cannot yet be relegated to the past; indeed, old-timers still retain a big place in their hearts for this fine old example of their craft. Modern machine telegraphy has done much to replace it, particularly

between towns with telegraph loads sufficient to justify its installation. This class of telegraphy has enabled considerable economy in the matter of lines and their maintenance, although this saving has to some extent been off-set by the necessity for the employment of many additional mechanics for the upkeep, repair, &c., of the machines. With stable conditions it has evidenced splendid results, and notwithstanding that it requires the special services of such experts as Dirigeurs to maintain stable working conditions, whose services have to be included in operator averages, it has proved its capacity on good working days of an average output per circuit of some 40 messages an hour inwards and outwards per working day of 12 hours. To obtain this daily average it, of course, follows that a higher rate is required to be, and is, obtained during the peak hours of traffic. This, therefore, may be said to be the general average obtained by multiplex machine telegraphy on circuits working between London and the more important provincial towns and between certain provincial towns. On circuits where machine or multiplex telegraphy is not justified, Morse working in the main continues, with the exception, perhaps, to certain towns or offices to which that wonderful little machine known as the Teletype, with its typewriter keyboard and direct type printing, has been installed, a machine which will in time replace quadruplex Morse working and bids fair to compete with and supersede hand-manipulated Morse where traffic loads justify, dealing a further blow to the old-time craft of Morse telegraphy. Morse telegraphy has been the mainstay of the service for so many years that it would be deplorable if, as a craft, its supersession became necessary. Before the introduction of the more modern methods of telegraphy it was capable of and showed fine results, particularly where the traffic was within the compass of one operator, and in my young days such was the esprit de corps of a telegraphist that it was no infrequent occurrence for an operator during the peak traffic hours to transmit 50 messages an hour and even more. I do not desire to suggest that there are not as good exponents of Morse telegraphy now as in past days, but I do not think we obtain such good results by Morse as formerly. Possibly this is partly due to the more modern telegraphist being required to be expert in the other methods, such as Baudot, Western Electric, Type Keyboard, &c., and again that where the traffic of a circuit is slightly beyond the present capacity of one Morse wire, it is superseded by the newer methods. There is still much to be said for old-time Morse, and telegraphy as a craft would lose considerably were it altogether superseded. The modern methods are easier to learn, as was shown during the war, when temporary hands were engaged for Baudot and keyboard working, and if telegraphists are at all jealous of their calling it behoves them not to despise the old-time Morse sounder and its attendants.

Well, Ladies and Gentlemen, you are doubtless wondering what all this is leading up to. It is this, and it is much to do, I think, with another of the reasons why telegraphs fail to show a profit. With all our modern plant and its costly installation, are we to-day getting any better or as good a result per operator (taking the establishment of each large telegraph office as a whole) than when Morse telegraphy was supreme? As individual operating goes, possibly we may, but having regard to the fact that when Morse telegraphy prevailed almost every officer of operating rank was utilised for such work and that whatever operator average was obtained it stood as something near that figure, we have been required in more recent years to divide the operator output by two. In other words, for every telegraph operator's output he is required to carry another officer engaged in the multifarious duties of his office, and his daily average of, say, 24 messages per hour is thus reduced to 12. It is along this line that I suggest something should be done if we want to reduce the telegraph deficit. Too many duties other than operative telegraphy have crept into telegraph offices, particularly in recent years, while the more complicated machinery for the arrangement of duties, time-keeping, &c., are considerably greater than in the more simple days under Morse. Compare, too (and here I am aware that I am treading on delicate ground), the present considerable number of officers required for supervision and the many duties carrying supervising appointments with the number engaged on such duties in the 80's and 90's. In my early days the divisions of the Central Telegraph Office, then, perhaps, smaller than those of to-day, were self-contained with two Supervising Officers to cover the 12 hours, one for early and one for late duty. One telegraphist served as a Book-Clerk and performed all the staff allocation, arrangement of duties and preparation of the Time Book. These self-contained divisions were sometimes accused of being overstaffed, making for wastage of staff during certain hours, but more often than not, in times of pressure, staff was loaned from one Division to another, as happens now, and any overplus of staff in any one Division was neutralised. Then someone thought that economy would result by throwing the whole of the staff into one common pool, to be allocated to the Divisions from one common centre. Splendid in theory, maybe, but where did it lead? It certainly did not prevent wastage of force during certain hours and certain months of the year, as it is practically impossible to utilise every working hour of the day by reason of the requirement of a full staff during the pressure hours and the non-necessity for so much staff immediately following such period. And in this connexion there would be a still larger wastage but for the introduction many years ago of the system of long and short duties. It was, however, one of the largest factors to the lessening of that esprit de corps of the operator which had hitherto been so fine, as whereas a telegraphist under the old régime was posted to one particular circuit for the whole of his duty taking in his stride the peak hours of pressure with the slacker periods and having a direct and personal interest in the working of his circuit, he was under the new arrangement placed a couple of hours at one circuit, a couple of hours at another, and oftentimes was required to be at busy circuits throughout the whole of his duty. As a result dissatisfaction was engendered and working rates lowered. What has it developed into at the present time? The services of assistant superintendents, overseers and telegraphists are utilised in the Staff Superintendents' Office for the distribution of staff hours as required, not always in whole duties but more often in hourly periods, while in addition overseers or assistant supervisors and telegraphists are required in each Division for the arrangement of the duties according to the charts and allocation of the staff oddments as supplied. Again, overseers and assistant supervisors are necessary in each Division for the preparation of the time book, signing-on of staff, &c. Furthermore, there are overseers or assistant supervisors and telegraphists for other clerical work, such as that dealing with staff irregularities, preparation of returns and the many other matters of a clerical nature which seem to have grown up with the office by the introduction of the more modern system of telegraphy. For the actual supervision in the Divisions there are overseers and assistant supervisors and assistant superintendents and supervisors according to whether the Division is designated a Man or Woman's Division.

The old-time simplicity of management of a Division has departed, and although it must be admitted that with the mixed forms of apparatus now in use some disturbance of that straightforward régime under Morse only must have come about, yet I venture to assert it was never estimated that the present complicated machinery would have grown up when the self-contained smaller Divisions were departed from.

In support of my statement I venture this comparison:—

In 1884 there were 13 Superintendents and 37 Assistant Superintendents, 8 Supervisors, 14 Assistant Supervisors Higher Grade, and 14 Assistant Supervisors Lower Grade, a total of 86 Supervising Officers. This number included those employed in the old Foreign Gallery (the Cable Room had not then been instituted) and in the Controller's Office, in which the services of several Superintendents and Assistant Superintendents were utilised. The operating force was 1,696, the ratio of supervising force to operators being 19.7, or 21 if the Supervising Officers engaged on clerical duties in the Controller's Office are excluded.

To-day (excluding the Cable Room establishment and the Controller's clerical staff) there are 2 Higher Grade Superintendents, 11 Lower Grade Superintendents, 56 Assistant Superintendents, 197 Overseers, 3 Supervisors Higher Grade, 24 Supervisors and 104 Assistant Supervisors, in all 397. The number of men and women telegraphists is 2,290, to which should be added 214 telephonists and 250 girl probationers, a total of 2,754—the ratio of supervising force to rank and file being 6.7. I am, of course, quoting the Central Telegraph Office as an example in this connexion, but it is very possible that similar ratios obtain in the large provincial offices; for it usually follows that where a certain ratio of supervising appointments to rank and file is established at one large office others are not backward in their claims for similar privileges.

I am ignorant of the ratio of supervising officials to rank and file in cable companies' establishments, but I should be surprised if it is in any way comparable.

The Department itself must, I think, share responsibility for the considerable increase in the higher positions which have accrued from time to time. Whenever agitation for increased salaries and wages obtained, and throughout my service these occasions were many and periodic, the usual *via media* was adopted in the earlier days by the giving of additional supervising appointments, which only served as a partial amelioration but did not really satisfy the claim, which was for improved scales of pay to the rank and file. The Service became from time to time more or less loaded with supervising officials and the climax was reached when still another class of Supervisors was added by converting (in 1908) the class of Senior Telegraphists into Overseers. It would, I venture with all deference to suggest, have been better had the salaries, later wages, of the operators, which up to the time of the Tweedmouth Revision in 1897 (when classification was abolished) had been very poor in comparison with existing scales, been improved, thus making them more satisfied and contented with the conditions of their service and by such means have obtained from them the best possible results of their craftmanship. For a contented rank and file should require less supervision.

(To be continued.)

OBITUARY.

WE much regret to hear of the death recently, in Berlin, at the ripe age of 71 years, of Herr BRUNO KOHLEN, the former Chief of the Telegraph and Telephone Department of the German Post Office.

Deceased was well known in this country and was recognised as no mere figure head but a sound practical administrator.

Herr Kohlen took a leading part in the development of both the Telegraph and Telephone systems of Germany, in addition to which he was instrumental in developing telegraph communication between Great Britain, the U.S.A. and other foreign countries.

J. J. T.

AUTOMATIC TELEPHONY.

BY C. W. BROWN.

(V—*Continued from page* 223.)

Scheme 2.

THE limitations of the level capacity are overcome in this scheme by using a selector having an additional line bank and a long shaft with an additional pair of wipers. A reference to Fig. 8 will make the arrangement clear. By this means the capacity of the final selector levels is doubled but the standard mechanical system retained. From a consideration of Fig. 9 it will be seen that for the 100 numbers allocated, 200 circuits are obtained. There will thus be 100 numbers auxiliary to the normal numbering scheme. The numbers allocated to those lines are outside the regular numbers for the exchange. Fig. 10 will probably satisfy the reader on the point, the fig. shows the disposition of a typical level of a P.B.X. group of 20 lines. This type of selector is frequently referred to as a 20-contact switch, as the number of contacts per level is 20.

It will be observed that in the example given the auxiliary numbers are in the 10,000 series, the highest regular number being 9999.

Each level of 20 lines is individual to a P.B.X., and a hunting action is given to the selector. The dialling of the tens digit causes the shaft and wipers to rise to the levels containing the P.B.X. lines, the wipers enter the levels and if necessary hunt in the level. If all lines are engaged, the shaft steps to the 11th position and busy signal is transmitted to the caller as the result of the operation of cam springs which function in the manner indicated earlier for group selectors.

The selection of a line is effected in the following manner :— When the wipers come to rest after entering the level they are standing upon two lines to the P.B.X. ; the line associated with bank No. 1 is taken if both lines are free, the necessary discrimination being afforded by rendering one of two controlling relays slow to operate. Fig. 11 is an endeavour to represent the principle of such selection. If both lines are engaged, the wipers step to the next contacts and the process is repeated. If all lines to the P.B.X. are engaged the shaft steps to the 11th position and busy signal is transmitted to the caller. The bank contacts to which lines are not connected—when the full number of lines (20) is not in use—are artificially engaged, so that the wipers will pass over them.

Although when the wipers come to rest the contacts of two lines to the P.B.X. are occupied by the wipers, only the contacts of one of the lines are engaged, the wipers standing upon the contacts of the other line remain disconnected ; that line is thus unaffected although wipers are standing upon its contacts.

As the rotary operation of this type of selector is not dial controlled, special night service requirements necessitate the use of non-P.B.X. numbers, to which the lines selected for night service are "teed." The special numbers are called during the time that night service conditions prevail. It will no doubt have been observed that the units digit does not play any part in the selection of a line. The digit is dialled for uniformity, but is rendered ineffective. In order to reduce operating and holding times, the units digit should preferably be a small one, but, of course, any digit may be used.

The number of P.B.X. groups actually associated with each block of 100 numbers in practice is dependent upon the traffic passing to the P.B.X.'s ; it is seldom that the full number of groups (ten) is provided, owing to the large number of switches that would be necessary ; but when the number of 20-line groups is limited, the remaining levels may be used for 10-line groups if it is not economical to leave the levels spare.

Scheme 3.

In this case the final selector consists of a single motion switch (rotary line switch) with an associated relay set. If the number of lines to the P.B.X. is not likely to exceed 23, a standard

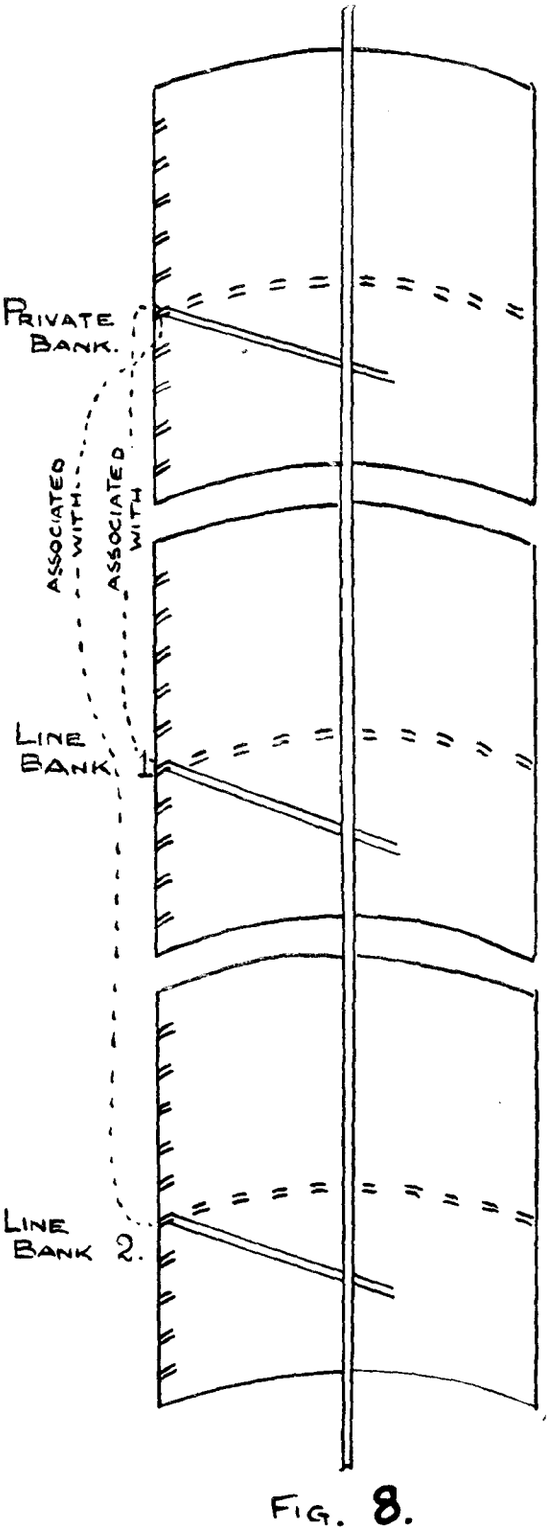


FIG. 8.

line switch may be used. When the number of lines exceeds that figure the 50-point (contact) line switch previously described meets requirements ; actually 48 lines may be accommodated by such a switch, the last contact being used for group busy purposes. By joining two such switches in tandem, access is given to 96 lines.

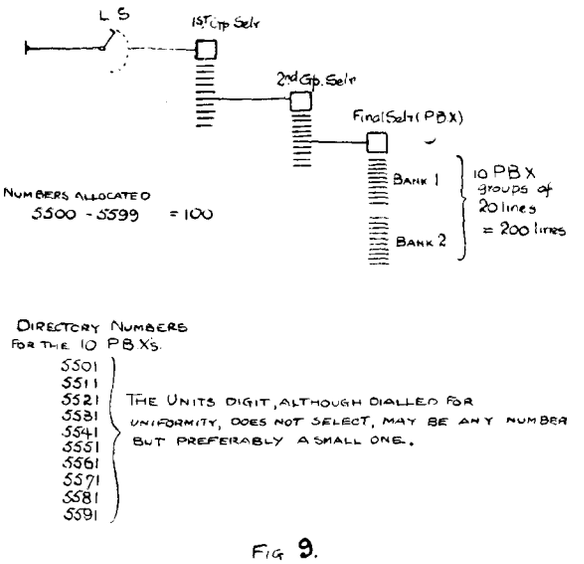


FIG 9.

Fig. 12 shows the arrangement. The particular rank (by rank is meant 1st, 2nd, 3rd group) of selector from which the final selectors are served, will depend upon the number of P.B.X's concerned and the extent to which the regular numbers may be encroached upon.

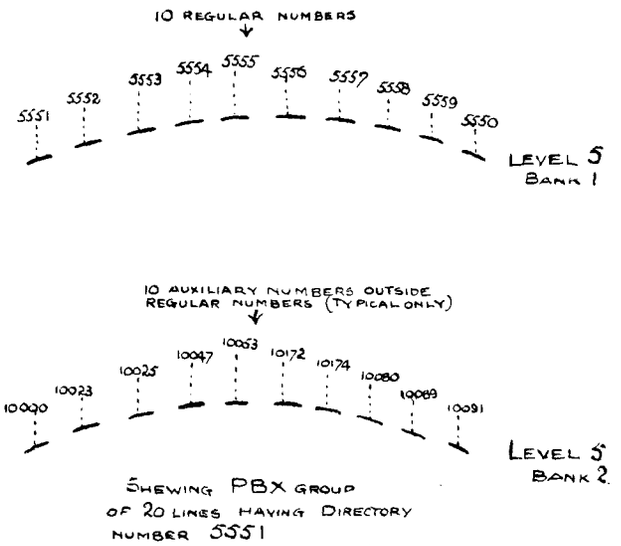


FIG 10.

Referring to Fig. 12 it will be seen that if scheme A is adopted, 100 regular numbers are given up for each P.B.X., if the number of P.B.X.'s is small and the ultimate capacity of the exchange will not be seriously affected, the arrangement is quite satisfactory. If, however, a large number of P.B.X.'s is involved (a very unlikely event, generally), it is doubtful if the large sacrifice of numbers (100 per P.B.X.) would be economically justifiable and Scheme B would

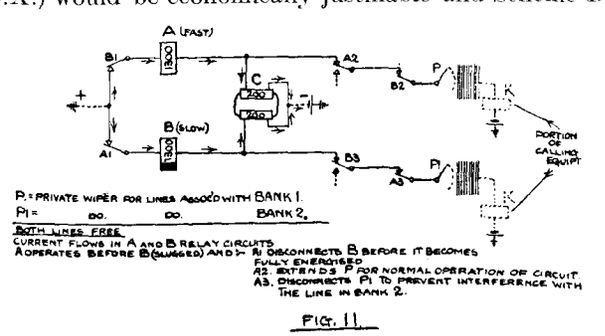


FIG. 11.

then be necessary; this gives access to 10 separate P.B.X. groups per 100 numbers, the numbers in excess of 100 being auxiliary to the normal numbers as indicated for Scheme 2, but an additional rank of selectors is necessary, the number of such switches depending upon the traffic to the P.B.X.'s and is consequently bound to be large.

The relay sets are, of course, necessary to preserve signalling, metering, &c. conditions as provided from a final selector.

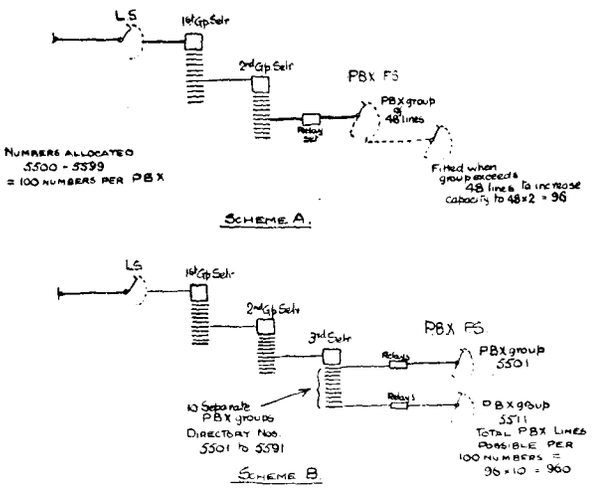


FIG 12.

The absence of dial control over the movement of the final selector wipers makes it necessary to allot non-P.B.X. numbers for special night service lines, as explained for Scheme 2.

The selection of a line to the P.B.X. is as follows:—When the wipers of the group selector reach a free contact, the dialling of the next digit causes the wipers of the final selector (line switch) to step into the bank, and, if necessary, to hunt for a free line to the P.B.X. Actually only the first impulse of the train of

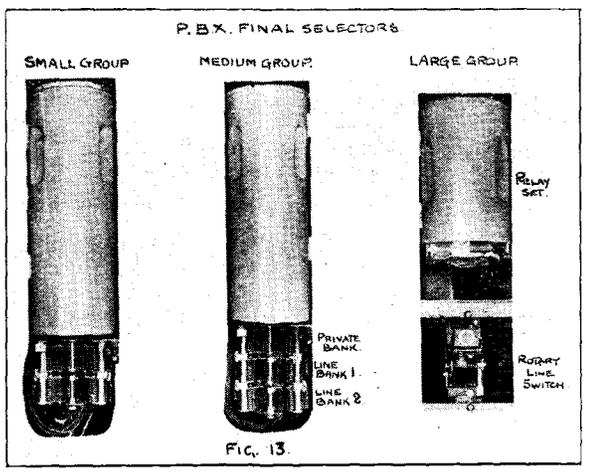


FIG. 13.

impulses representing the dialled digit is necessary for this, the rest of the train being ineffective, thus the value of a small digit is apparent.

Fig. 13 shows the three types of final selector.

VI.

IT will be obvious that a scheme of switching on the lines discussed, is capable of being so arranged that subscribers located on different exchanges may intercommunicate direct.

In discussing the ways and means, it is necessary to consider a unit fee area containing a number of separate exchanges. In view

of the proviso that under automatic conditions numbers and levels of switches are associated, a common numbering scheme will be applied to the whole area, separate blocks of numbers being allocated to each of the exchanges ; such an area is known as a multi-office or multi-exchange area. An alternative to the introduction of separate exchanges is, of course, the provision of one exchange, to which all subscribers in the unit fee area are connected. An arrangement such as this is clearly impracticable. Heavy gauge subscribers' lines would be required for signalling purposes and "loading" of cables would be necessary for transmission requirements to meet such a condition. As is also well known, telephone plant suffers from the economic disadvantage that it is idle for long periods, hence the plant costs must be regulated as far as possible to offset that disadvantage.

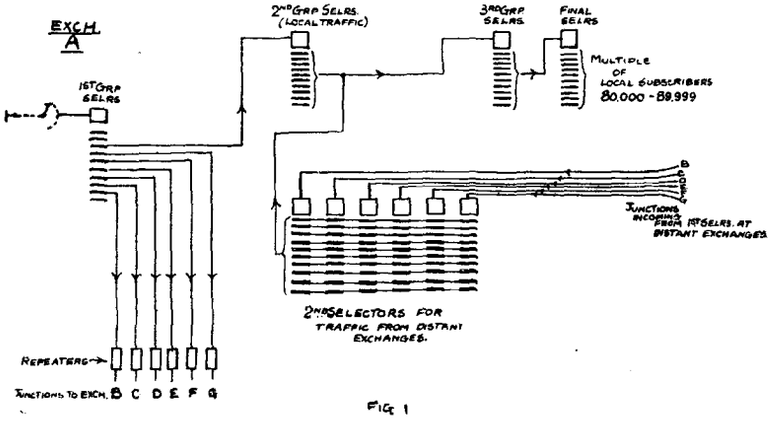


FIG. 1

If it be assumed that a particular area, with which we shall concern ourselves, has been designed for an ultimate capacity of 100,000 lines, the numbering scheme will contain 5 digits and allowing for the restrictions already indicated, the practical capacity will be 70,000 lines.

Further, let it also be assumed that the area contains only large exchanges, then it can be arranged to accommodate seven 10,000 line exchanges, each of which will require the use of a complete first selector level.

Each level, other than the local level (the level via which local numbers are reached) will have junction circuits to the respective exchanges connected to the bank contacts, the junctions will terminate upon second selectors at the distant end. Fig. 1 is a schematic representation of one of the exchanges. For convenience, the separate exchanges have been referred to as A, B, C, D, E, F and G. The numbers allocated to the exchanges are :—

Exchange	A	...	...	80,000 to 89,999
,,	B	...	...	20,000 to 29,999
,,	C	...	...	30,000 to 39,999
,,	D	...	...	40,000 to 49,999
,,	E	...	...	50,000 to 59,999
,,	F	...	...	60,000 to 69,999
,,	G	...	...	70,000 to 79,999

The figure shows the allocation of the levels in exchange A ; the allocation of the levels at exchange B will be :—

Level 2.	Local second selectors in exchange B.	
,, 3.	Junctions to second selectors in exchange	C.
,, 4.	,, ,, ,, ,, ,, ,,	D.
,, 5.	,, ,, ,, ,, ,, ,,	E.
,, 6.	,, ,, ,, ,, ,, ,,	F.
,, 7.	,, ,, ,, ,, ,, ,,	G.
,, 8.	,, ,, ,, ,, ,, ,,	A.

The reader will probably find it interesting to construct for himself the level allocation in exchanges C, D, E, F and G.

Levels 9 and 10 (0) of first selectors at each exchange will be connected to circuits to manual positions, either centralised or local, for the special services provided via those levels.

Traffic from manual boards to the automatic exchanges is routed over junction circuits from the jack field to selectors in the auto-exchanges. It is usual for these circuits to terminate upon selectors in the penultimate rank ; in the case referred to, on third selectors. A calling device is necessary on the manual positions concerned, from which the required digits are dialled.

Fig. 2 shows a typical distribution, from which the services mentioned will be seen.

The rigid association of numbering and routing is clearly exemplified in the foregoing. It follows that each subscriber in the area has a different number and the generally accepted significance of exchange names disappears. It is also clear that in the event of the replacement of a manual system by an automatic system, changing of subscribers' numbers is unavoidable.

Having established that in a 100,000 line area, each first selector level gives access to 10,000 lines, the manipulation of numbers and exchanges does not present difficulty. For example, Fig. 3 shows that ten different 1,000-line exchanges can be reached from a first selector level, the second level has been chosen, thus the numbers available are 20,000 to 29,999. The bank contacts of the level are connected to a separate group of second selectors, from the levels of which junctions to the ten exchanges are connected. The junctions terminate at the distant exchanges on third selectors. It will be clear that by interposing a third selector between the second selector levels and the junctions, one hundred 100-line exchanges can be reached from the first selector level, in which case the junctions will terminate on final selectors at the distant exchange, but in order to provide full intercommunication with such an arrangement, direct junctions between, and 1st, 2nd and 3rd selectors at, each exchange will be necessary.

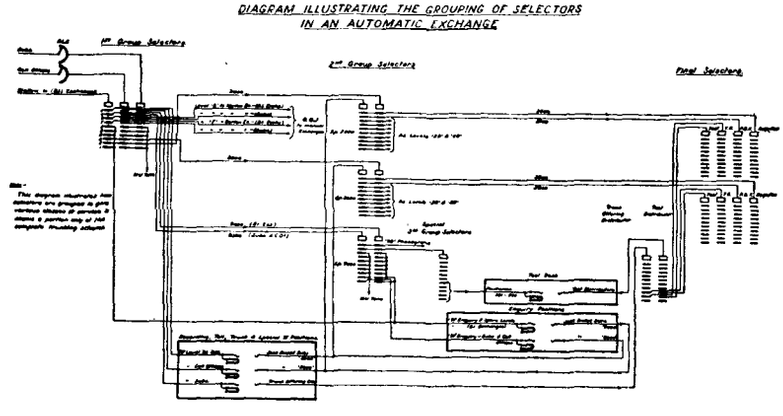


FIG. 2.

It is at once obvious that such a scheme is impracticable and would not be tolerated. Before passing to the practical methods adopted, attention is again directed to Fig. 1 and Fig. 3 from which it will be seen that "repeaters" are associated with junction circuits connected to bank contacts. It will be recalled that in the switching scheme standardised by the Post Office, the private wire of switch circuits is extended at each switching point in the connecting chain and the control of *all* switches is finally vested in the final selector, which passes back the necessary earth (positive) connexion. This feature is frequently referred to as "forward holding." The expression "repeaters" will probably be replaced by "junction relay set."

When the chain of switches is completed via a junction, different conditions prevail, because the private wire is *not* extended when the

junction is reached, as the junction consists of two wires only, hence the switches preceding the junction must be "held" by special means provided in the "repeater." Other facilities normally provided from the final selector must also be given from the repeater such as :—preservation of signalling conditions (lamp flash, metering, &c.) and the provision of a transmission bridge (talking current) for the calling party ; in addition the repetition of impulses over the junction takes place at the repeater.

In the development of a multi-exchange area, the question of the economic provision of small exchanges on an automatic basis is of the first importance.

Under practical conditions, the small exchange is made dependent upon a larger exchange for routing of calls, thus making unnecessary, direct junctions to the remainder of the exchanges in the fee area (it is extremely unlikely that direct junctions would be justifiable on the score of traffic). A reduction in the number of ranks of selectors is possible, while full intercommunication is given in the standard manner. An exchange that is dependent upon a dominating exchange becomes a satellite*, and it will depend in the main, upon the ratio of local to junction traffic as to the particular scheme of grouping that is applied.

Fig. 4 shows two schemes of satellite working. In the simple case, the satellite forms part of a four digit area, but only line switches (marked JF—junction finder) and final selectors are necessary. Junctions from the banks of the line switch are terminated on first selectors in the main exchange, (the main exchange is often referred to as the "parent") junctions incoming to the satellite exchange are associated with second selector levels at the main exchange and terminate on final selectors at the satellite, repeaters will be necessary in both outgoing and incoming junctions for the reasons already given. With this scheme, local calls on the satellite exchange require the use of two junctions, but other calls are routed via the main exchange and thus make use of the junction circuits provided for the main exchange. Therefore as an offset to the saving of 1st and 2nd selectors at the satellite, there is the use of two junctions for every local conversation. If the number of local calls is few, the arrangement is quite satisfactory and provided the conditions are not likely to alter, the scheme is a sound practical solution.

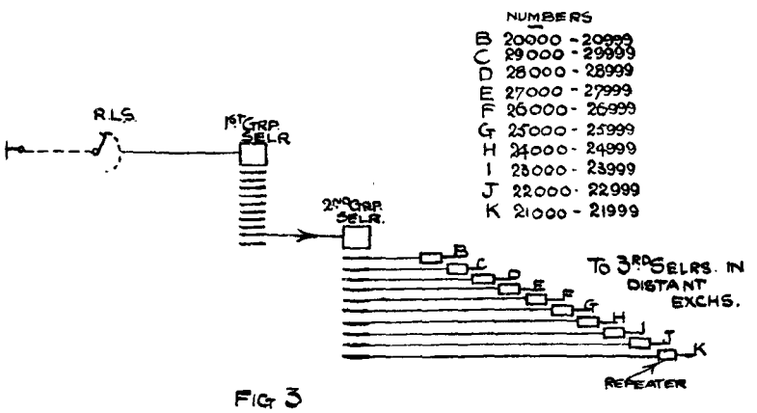


FIG 3

If, on the other hand, the number of local calls is such to prevent the economic application of the foregoing arrangement, a modification is introduced at the satellite exchange. A special type of selector is fitted, known as a switching selector repeater ; this apparatus functions either as a selector or a repeater dependent upon the destination of a call. If a call is local, the repeater function is dispensed with early in the setting up of the call. If a junction call is involved, the selector function is dispensed with at an early stage. Thus discrimination between two classes of call is made possible. In one well-known system the same features are provided by means of two separate units—a repeater and a selector—which may be combined or separated according to the destination of the call, and in a later scheme suggested as a standard, features of both are incorporated. In each case, however, the principle of discrimination is substantially the same.

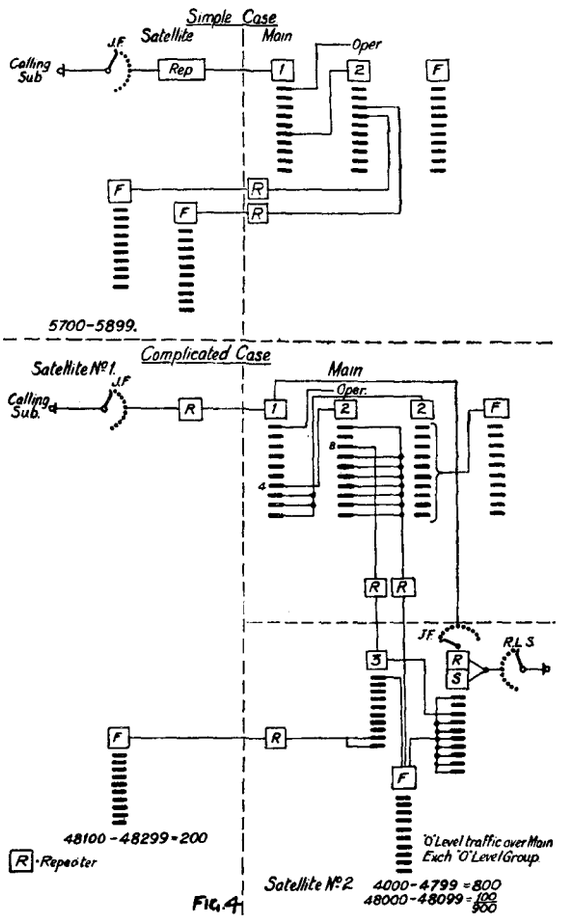


FIG. 4

The application of the discriminating scheme may be seen from Fig. 4 which shows two satellite exchanges and a main exchange. Traffic from satellite No. 1 is routed via the main exchange direct and local calls pass through satellite No. 2 to final selectors in satellite No. 1. Although the main numbering scheme is on a four figure basis, the numbers allocated to satellite No. 1 are on a five figure basis, thus 3rd selectors are necessary at satellite No. 2. As, however, satellite No. 1 is a very small exchange, the amount of local traffic will not be large, and consequently a few 3rd selectors only will be required, with the result that the use of four digit numbers is not restricted and may be fully used where the traffic is heaviest. In the scheme shown, three junctions are involved per local call on satellite No. 1. Satellite No. 2 is a comparatively large exchange, and in order to cater for ultimate requirements 100 of the numbers are on a five figure basis, but as 3rd selectors are required for the purpose already mentioned, special rack provision is unnecessary. Switching selector repeaters are provided at satellite No. 2, and the digit individual to both satellite exchanges is 4. This digit is thus the discriminating digit. The general operating scheme is as follows :—

Assume that a local call on satellite exchange No. 2 is concerned, the calling subscriber upon removing the receiver will seize both a switching selector repeater and a junction (via the junction finder

* The B.E.S.A. definition of a satellite exchange is "An automatic exchange where the lifting of the receiver by a subscriber takes possession of an outgoing junction to another automatic exchange. The incoming traffic may be received from one or more exchanges."

JF) to the main exchange, the junction terminates on a first selector. Dialling the digit 4 will cause *both* switches to respond and the wipers will rise to the 4th level in each case. The switching selector repeater releases but is still held, the main exchange selector extends to a second selector. The switching selector repeater has therefore functioned as a first selector, and as discrimination is arranged on the 4th level, the circuit has been prepared so that the switch will function as a second selector with the dialling of the next digit. Thus when the next digit is dialled, the wipers of the switching selector repeater again rise. Also the wipers of the second selector in the main exchange rise, but immediately the wipers of the switching selector repeater enter the level and extend either to a 3rd selector or final selector, the junction to and the switches in the main exchange are released, having been held only for the short period of time up to the dialling of the second digit. If the second digit is 8, the call will be extended to a 3rd selector, the third digit will then determine the destination of the call, i.e. third digit 0 the call will be routed to final selectors in satellite exchange No. 2, third digit 1 or 2, the call will be routed to final selectors in satellite exchange No. 1. If the second digit be 0, 1, 2, 3, 4, 5, 6, or 7, the call will be extended to final selectors in satellite exchange No. 2.

In the event of the first digit being other than 4, the switching selector repeater and the main exchange first selector both respond to the digit dialled, the switching selector repeater releases, and as discrimination is not arranged on the level reached, the circuit is prepared for extension to the main exchange, and when the second digit is dialled, the switching selector repeater again responds, but the wipers remain disconnected and the apparatus functions as a repeater only.

If the transmission standard of the junctions to the main exchange is unsuitable for outer area and toll traffic and cannot therefore be extended to the main exchange 0 level circuits, junctions of the required standard are accommodated on the 0 level of the local switching selector repeaters and terminate direct on the manual board. In such cases, the use of 0 as the second digit for subscribers' numbers is precluded.

The routing of local calls on satellite exchange No. 1 will be clear from the fig., also calls from satellite No. 1 to satellite No. 2.

Calls from satellite No. 2 to satellite No. 1 will be routed in the manner indicated previously.

(To be continued).

REVIEWS.

"*Navigational Wireless.*" *By S. H. Long, D.Sc., M.I.E.E. (Published by Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2. xi + 164 pp. Price 12s. 6d. net.)*

The application of the directive properties of certain aerial systems to navigation is, in its practicable form, one of the latest developments of wireless telegraphy, but it is by no means the least important. Up-to-date information on the subject, however, has to be sought in the proceedings of the various wireless societies or in the technical press, and for those who go down to the sea in ships, whether on the bridge or in the wireless cabin, these sources of information are practically closed. The present book is an attempt to remedy this state of affairs, as far as single-frame direction-finding apparatus is concerned.

After two introductory chapters dealing with general electrical principles and the use of valves, a chapter is given dealing with the principles of direction finding which are applicable to any system. This is followed by a chapter containing a résumé of the various systems in use, but with special attention paid to the Siemens' single-frame system. The fifth chapter deals with the installation of a single frame system on shipboard, with instructions for operating the Siemens' direction finder.

In the next chapter are discussed the various causes of error in the bearings given by directional apparatus, with methods for checking and allowing for such errors.

The seventh chapter deals with maps, and the eighth and ninth with the application of direction finding to practical navigation.

In the tenth chapter certain causes of error not dealt with in Chapter VI are considered, and the concluding chapter deals with beacon stations, sound signalling and echo-sounding devices.

Appendices are given dealing with the care and maintenance of accumulators, a graphical method of determining the "half-convergency" to be applied in given circumstances to adjust an observed great circle bearing for use on a Mercator chart, some useful notes on plane and spherical trigonometry and a graphical method of determining and allowing for the parallax errors which may occur when a direction-finding station is being calibrated by visual observations.

The book is well printed, the diagrams are clear, and the reproductions of photographs of apparatus are excellent. It should be of great assistance to all those concerned with the type of direction-finding apparatus with which it particularly deals.

"*Electrical Engineering Practice*": *Volume II. Meares and Neale. 4th Edition. (Chapman & Hall, Ltd. 25s. net.)*

The second volume of this book, which has now reached its fourth edition, has been brought up to date, rewritten and enlarged, deals with the transformation, conversion and storage of electricity systems of supply, wiring systems, lighting, heating, welding and cutting.

The aim of the authors has been not to provide a highly technical book but a good general book for the practising electrical engineer. With this end in view the simplest methods of treating various problems have been followed and copious illustrations with full descriptions have been provided, while useful information is given as to the relative efficiencies and costs of various types of plant.

The chapters on transformation and conversion deal fully with all types of converting and transforming plant from the motor converter, static transformer, thermionic valve, down to the crystal; a useful chapter is provided dealing with the installation and maintenance of secondary cells.

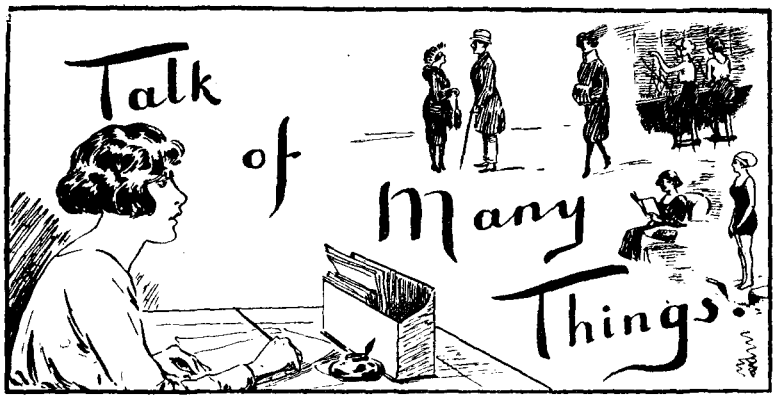
Useful information is given for the mains engineer and in connexion with the wiring of buildings for lighting and power, and the design of illuminating systems, while the chapter on heating deals with domestic heating and with furnaces for electro-metallurgical and other industrial processes, the information on these and on welding, &c., being essentially practical.

A bibliography is appended to each chapter which includes references to official regulations and standardisation reports. Extracts from the I.E.E. Rules are included conveniently in the various chapters on the plant to which they refer.

The volume can be recommended as a good and practical reference book, the information given on the subject included being very much fuller than that given in the usual pocket or year books but at the same time it is so arranged as to be as easily accessible.

J. McG.

WE TELEPHONISTS



A Moth-Eaten Fragment.

BERTIE is one of the best. There are, of course, Berties and Berties, but none quite like *the* Bertie. It is difficult to explain what there is about my friend Bertie which makes him different from and better than any and all the other Berties, but there it is and there you are. He and I have known each other since our rattle and bottle days. We ran neck and neck in school and shoulder to shoulder out of school. From our dawn we have played and worked, eaten and drunk, lodged and tramped, sighed and laughed together. I helped him to write his first (and unavailing) love-letter. He has a heart like a crock of gold and a hand-grip like that of a dentist. By-the-way, have you ever shaken hands with a dentist? If not, don't—they're quite good fellows, of course, but—well, don't! To return to Bertie—you probably wonder (with a yawn) why I ever started to tell you about him. I know it's always frightfully boring to hear about paragons and to be treated to copious extracts from the lives of the saints. It is necessary, however, in order that you may appreciate our relationship—a regular right-down David and Jonathan partnership in which the concerns of each are common property.

Recently I dropped in to see Bertie. He was shelling the winkles for Sunday's tea, but I perceived at once that "something was up." He was distinctly blue and full of gloom. He was not shelling with his customary gay abandon; his sparkle of wit was absent and no quip fell from his lips. There was no graceful flourish of the nut-crackers as he evicted the succulent mollusc. He was performing his task in a joyless manner and his distraction was such that ever and anon he would drop a nude winkle amongst the spent shells, or vice versa. You know what it's like when you drop a pea amongst the empty pods—how you dive and how the elusive little pellet burrows to the very bottom of the basin. Well, to capture a missorted winkle is even more tiresome. "Hullo," I said, "how do; have a good holiday?" He looked at me with the air of a man who thinks to-morrow is pay-day and then finds that his calendar is fast. "So so," he said, "but things have occurred which have taken the sun out of life. I have had a bitter blow." He paused and then said fiercely "Look at me, and tell me what I look like." "Bertie," I said gently, "even between friends that's not a fair question. Unburden your soul to me." "Yes," he said, "I will, but it's a sad tale"; and fingering a shell nervously and absently he told me.

It appears that while on leave he met a man and they struck up a holiday acquaintance. They sought each other's company and walked and talked together. "He seemed to be quite a decent sort," said Bertie. Then one day conversation turned citywards and the fellow said to Bertie: "Are you a civil servant?" "Yes," said Bertie, modestly, "how did you guess?" "Oh, I don't know, er—well, you just looked like one." Here Bertie groaned. "Ye gods," he said to me, "has it come to that? Do I look the part? Has the machine left its mark upon me? What does a typical civil servant look like—is he fat and ponderous, solemn and precise, dignified and pedantic? Does he look like a cabbage or a caterpillar? Is the mark of the beast upon me. Do I—he shouted—really look like a civil servant?"

I stole away silently, for the tears of a strong man—and that man your friend—are harder to bear than a drop in the bonus. For once I could not comfort him, because in truth, he must, to the unseeing and unsympathetic eye, appear portly and respectable. Even I have lamented his adoption of tortoiseshell and spats and a tail-coat, but I know what is behind his ample shirt-front—just Bertie, frayed but unafraid.

PERCY FLAGE.

Left over from "The Eclipse."

1.

If you're waking, call me early,
Call me early, Mother dear:
For I must go to view the show,
From the roof or somewhere near.
I have a piece of coloured glass,
So at the break of day,
If you'll call me early, Mother,
To the roof I'll wend my way.

2.

And all the neighbours, Mother,
Perchance will rise as well
To see a sight unequalled quite,
Or so I have heard tell.
And some will hie to Hampstead Heath
To see it there, they say:
So call me early, Mother,
Upon this joyous day. . . .

3.

I rose at four, dear Mother,
To have an early view,
I seized my mack and foot mitts
And my goloshes, too.
And with my piece of coloured glass
I went out in the rain
To see that wonderful eclipse
That I won't see again.

4.

For two hours, Mother, in the damp
I gazed with anxious eyes.
And every minute hoped to see
That wonder in the skies.
I tarried still, dear Mother,
Long past the break of day,
But nothing did I see, Mother,
No gleam, no cheering ray.

5.

And now to-day, dear Mother,
I suffer grief and pain.
An awful cough came on at dawn,
Caused by the mist and rain.
My voice is weak, dear Mother,
My temp. is ninety-nine ——
In 1997, Mother
I hope we'll have it fine!

D. D., Central.

To Mr. Flage:

An Appreciation.

Dear Mr. Flage, your words so sage
We follow on the ladies' page.
They always fill us with delight,
And make us feel so gay and bright.
There's such a tonic in your tone,
We cease to grumble and to moan;
And when the journal first comes out
We fly to you without a doubt,
For not a moment do we lose
Your cheery message to peruse.
Now, Mr. Flage, just tell us this—
Are you a "Sir" or just a "Miss,"
For we with safety can assume
You write beneath a *nom-de-plume*.
And now we'll have a score of guesses—
Do you deal with T.O.S.'s?
Or do you just deal with accounts
And total up the Subs' amounts?
An awful thought has just struck *me*
Perhaps you are the P.M.G.!
And now we'll try a new direction
Perchance you're in the Service Section—
Whate'er your office, Mr. Flage
You're welcome on the ladies' page!

D. D., Central.

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

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 the G.P.O. North, London, E.C.*1. *The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.*

VOL. XIII. SEPTEMBER, 1927. No. 150.

THE "LATE LAMENTED."

OUR contemporary *Electricity*, in the course of some criticisms of telephone rates, advocates a return to the flat rate system of payment for residence connexions and makes the following singular remark: "Whilst the telephones are out of use they are simply eating their heads off, representing so much idle plant. It is the interest on this capital outlay which we are paying, without having the benefit of unlimited use of the means provided. The nimble penny we are charged up every time we use the phone goes towards operators' services, &c." This last sentence rather understates the case. The penny not only "goes towards" but represents the cost of operating the call, and this charge is based upon the very careful investigations of a departmental enquiry. A similar conclusion as to operating costs was arrived at in a thoroughgoing enquiry into the basis of the telephone rates to be adopted recently undertaken by the German Post Office. If, therefore, the subscriber "does not think twice before using the telephone, knowing full well that it will cost him no more whether he uses it once or 100 times," and if he is paying, say, 4*d*. a day for calls which it will cost the Administration anything between a penny and eight shillings to effectuate in operating charges alone, the economic beauties of the scheme will be obvious—especially to the subscriber. (We instance 4*d*. because it is about one day's proportion of the present quarterly London residence rate, but we gather that even this must be considered as high !) The writer certainly goes on to say that operators' services will be largely replaced by mechanism in the near future. But it must be remembered that it will be long before automatic working actually preponderates in any large telephone system in the world, and in any case it is unlikely that a heavily loaded automatic system will be as cheap to maintain as one on which the calling rate is moderate. For one thing, since the number of line units is based on traffic, a greater number of selectors would be necessary; but, apart from this consideration, the human element is not altogether eliminated from the automatic system, and must needs enter more largely into the working costs the more the calling rate at the exchange is increased.

But still another objection to the flat rate has to be considered. The reckless making of calls because they involve no additional cost to the subscriber was the most fruitful source of engaged lines—of calls, that is to say, set up by the Administration with no advantage to themselves or to the subscriber, involving needless exasperation and waste of time and money. All Administrations which have abolished the flat rate bear witness to the resultant decrease of the "line engaged" trouble.

"Radical reforms are necessary," says our critic, "if we are not to become the most backward nation in the use of the telephone." Whatever reforms are in store, we venture to prophesy that they will not be in the direction of a reintroduction of the flat rate. It has been practically abolished in the largest and most efficiently telephoned American cities. Chicago, Cleveland and Detroit are 100% message rate; New York, Baltimore, Los Angeles, Washington and Pittsburgh about 99%; Philadelphia, San Francisco and Buffalo 97-98 and Boston 96. Germany, Switzerland, Belgium, and Australia have abolished the flat rate entirely, France has abolished it in all the large cities. Telephone Administrations which have once got rid of the bugbear of the unlimited rate, with its inequity of favouring the large user at the expense of the small user, are little likely to revert to it. It has been universally condemned by administrative experts as economically unsound.

HIC ET UBIQUE.

MR. W. T. LEECH has been appointed Director of Telegraphs and Telephones, in place of Mr. R. A. Dalzell, retired, and Mr. F. H. S. GRANT has been appointed Assistant Secretary. We offer both of them our sincere congratulations.

New York has now 33 of its exchanges converted to automatic working, and more than 380,000, or about a quarter, of its 1,500,000 telephones are now operated by machine switching.

At a recent meeting, presided over by Signor Marinetti, the futurist poet, Signor Azari referred to such inventions as calculagraphs and automatic telephones which could almost think with brains of steel. He predicted a future where all animal labour would be performed by machinery, and looked forward to cities adorned by no "useless garbage of trees and flowers, or defiled by the loathsome promiscuity of animals, "but where there would be geometrical buildings of glass and armed cement, and above all, machines, machines, machines!" He also asserted

that machines possessed sensibility and susceptibility in a marked degree. Although it cannot be denied that all machines possess a rudimentary soul, there are brutes who ignore the fact and treat the poor things in a most heartless manner. "Some exceptionally bad cases," exclaims Signor Azari, "have often made my heart bleed!" Hence the necessity of a society for the protection of these ill-treated machines. They must be treated with kindness, for they often refused to respond to the handling of the antipathetic.

KINDNESS TO MACHINES.

Be kind to dumb machines; in marked degree
They have susceptibilities unheard of.
An over-driven bicycle may be
Distraught by woes you never hear a word of.

Engines, automatic, are found to be
Amenable to kindness—never hoax them.
Calculagraphs will multiply by three,
Or even more, with gusto, if you coax them.

Treat, then, with suave consideration gear
Of every sort—valve, cylinder and piston.
Nay, is the dropping of a kindly tear
On a hot bearing too much to insist on?

Kick not a locomotive in the boiler.
You should not thus *disipere in loco.*
Honour the iron horse, that willing toiler
Who needs no spurring but runs *con fuoco.*

Think of your wireless set. Perchance it has
Leanings towards Scarlatti, Bach or Schumann.
Burden it not with floods of senseless jazz,
Do as *it* would be done by, and be human.

The automatic telephone, which thinks
With brains of steel almost and knows not slumber,
Treat it as kindly as you would the minx
Who gives you (so the legend goes) wrong number.

If you give *her* wrong numbers, you may curse
Yourself, or the telephonist, at leisure;
But if you dial wrongly, and fare worse,
Vent not on the dumb robot your displeasure.

Feelings it has, and in your hour of need
Kindness alone, not cursing, will avail you.
If you're unsympathetic, ah! take heed
Lest an insulted *pre-selector fail you!*

W. H. G.

TELEPHONES AT THE END OF 1926.

INFORMATION is now to hand of the telephone development at the end of 1926 of the principal telephone-using countries—with the exception of Canada. It is as follows:—

	No. of Telephones.	*Inhabitants per Telephone.*
United States	17,746,252	6.4
Germany	2,685,495	22
Great Britain	1,510,775	29
Canada (end of 1925) ...	1,144,095	8
France	822,870	47.5
Japan	636,727	94
Sweden	450,646	13.4
Australia	424,442	14
Denmark	315,894	10.4

No other country has over 300,000 telephones.

THE ELIMINATION OF THE EFFECTS OF ATMOSPHERICS IN WIRELESS TELEGRAPHY BY THE SYSTEM "BAUDOT-VERDAN."

BY E. PHILLIPS (CABLE ROOM).

ONE of the greatest obstacles to high-speed wireless telegraphy is the presence of atmospherics. These cause errors, render repetitions necessary, and frequently bring about a complete cessation of work. As it is not possible to remove the cause of these phenomena, means have been sought to overcome their effects. None, however, had met with much success until the genius of a French telegraph engineer, M. Ch. Verdan, of Strasbourg, evolved an apparatus, the trial of which has certainly shown very good results. The inventor has adapted his apparatus to work in conjunction with the Baudot, thus utilising the advantages provided by that system for speedy, secret, long-distance wireless telegraphy throughout the world.

M. Verdan has been working at the perfection of his system for some years, the first distance trials being made between Nice and Ajaccio (Corsica), in 1925. These proved the practicability of the system. The next tests were made between the Eiffel Tower and Toulon, and after the apparatus had been modified in the light of the experience thus gained, long-distance trials were made between the wireless stations at Croix-d-hins (Bordeaux) and Tananarive (Madagascar). The results of these were such as to further demonstrate the soundness of the system, and M. Verdan is at present engaged on the installation of further improvements. The "Verdan" apparatus has been described by M. Lucien Fournier in the February number of *La Science et la Vie*, and I am much indebted to that journal for the illustrations. A detailed description of the principle and the earlier trials was given by M. Edouard Montoriol, in the *Annales des Postes, Télégraphs et Téléphones* of July, 1925.

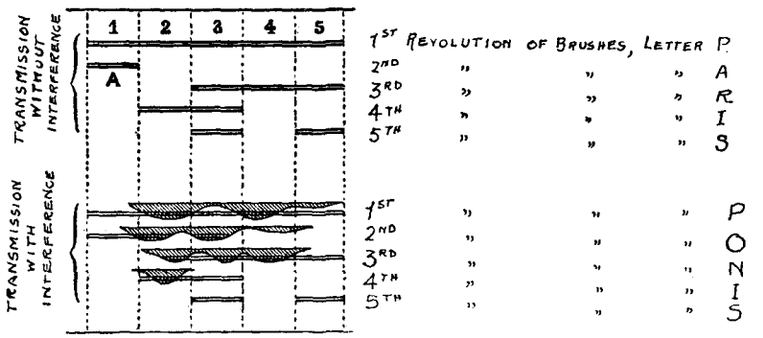

FIG. 1—SHOWING HOW THE WORD "PARIS" MAY BE MUTILATED IN TRANSMISSION BY ATMOSPHERICS.

The Baudot apparatus itself is now so well known that a description of that system is unnecessary. When trials showed that the application of the ordinary Baudot apparatus to wireless telegraphy was unsafe and uncertain, M. Verdan conceived the idea of a method whereby a signal could at will be automatically transmitted three times and received three times, yet only the last transmission would reach the printing portion of the apparatus, any interference by atmospherics being eliminated during the repetitions. Fig. 1 shows the effect of atmospherics on a plain transmission. Atmospherics will not, of course, affect a transmission if a marking signal is being sent at the moment it appears, but if such atmospheric appears as the brush of the distributor is passing over a segment on which no marking current is being received, it will act as a marking current, and cause a false series of signals to be stored, and, if not eliminated, a false letter would be printed.

It is not always necessary to repeat the signals sent. When atmospherics are absent, or in so small quantity as to be negligible, the signals are sent only once, and the apparatus can then function as an ordinary Triple Baudot installation (three channels). When atmospherics are more numerous, one repetition may suffice; while, when they become so numerous as to stop any other method of working, the two repetitions can be given, and a "clean" slip ensured. The change-over is made by means of a switch.

We will now consider the means whereby the process of elimination is carried out. The apparatus is shown in Fig. 2. It is disposed in four groups, and driven by a motor. Two of these groups compose the "control," providing means whereby the sending telegraphist may check the signals he is sending out; the other two form the receptive agents, and act only under the influence of the currents received from the distant station. The two groups are independent of each other, and the "control" sets may therefore be used merely for local transmission, practice, or regulating.

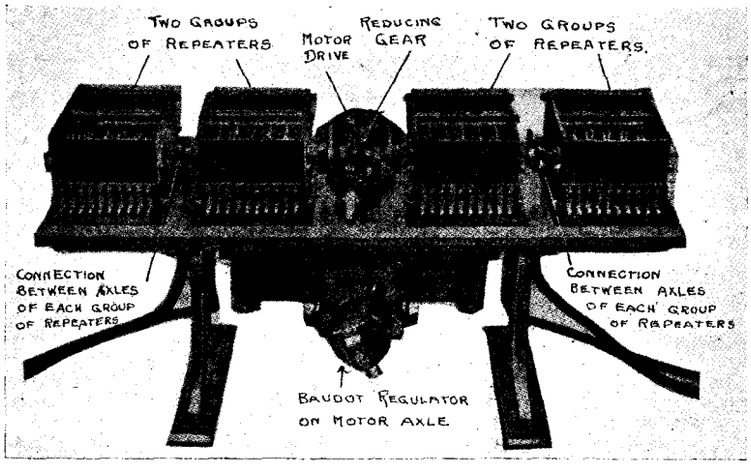

FIG. 2.—VIEW OF A "VERDAN" INSTALLATION FOR THE ELIMINATION OF ATMOSPHERICS.

It is to be emphasised that the repetitions are only of *currents* and not the letters themselves. Neither the first emission of the signals composing the letter T, for instance, nor its first repetition, reach the electro-magnets of the printing apparatus. It is only the final repetition which reaches the electro-magnets of the traducteur and actuates them in such a manner as to cause the printing of the letter on the paper band. A *letter*, or a *word*, or a *message* is therefore received only once, and that may be as much as four seconds after it has left the transmitting key of the distant station.

Atmospherics, therefore, however numerous they may be, are unable to affect the receiving apparatus. In order to have any effect, they must have a duration of four seconds, or they must appear twice at two-second intervals, at the time when the brushes are passing over a segment on which there is no marking current. The probability of such a happening, calculated on the experience of the trials, is only once in a hundred thousand. Thus it may be said that the actual Baudot receiving apparatus is all but perfectly protected from their influence.

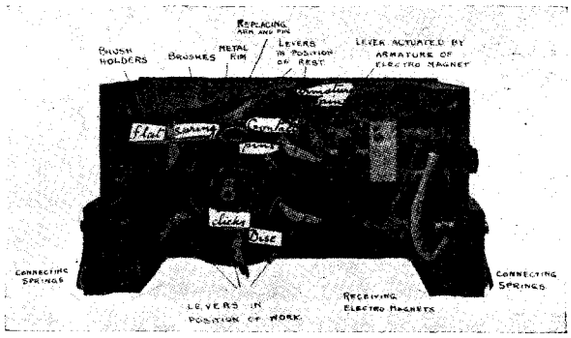

FIG. 3.—INTERIOR OF CASE OF "VERDAN" REPEATER.

Fig. 3 is an illustration of the apparatus by which this result is achieved, and Fig. 4 shows the plan. In Fig. 4, B is the electro-magnet, through the coils of which the transmitted or received current flows to earth. E is the armature, pivoted at one end, and provided with a catch at its centre. In the position of rest this catch engages with a notch at the end of the lever, L, which is pivoted at Z and has its movement limited by the screw, V. L is furnished with a pin at P. R is a disc of non-conductive material, mounted, with four others, on an axle driven by an electric motor—*see* Fig. 2. These discs turn in a clockwise direction, six times slower than the distributor, that is, they make 30 revolutions a minute, or one revolution in two seconds. The disc, R (Figs. 3 and 4), is fitted with a metal rim continuously in contact with a brush, A (Fig. 4), and electrically connected to the axles, O, of each of the levers, D. These levers are capable of turning from left to right about their axles, under the action of a spring placed on the reverse side of the disc, R, the movement being limited by the pin, G. The position of rest of the lever is as shown at D. This lever carries on its inner extremity a pin, H, the function of which is shown later. The outer extremity of the lever has a notch, T, into which the pin, P, of the lever, L, engages when the armature, E, is attracted and L is consequently released. Below each lever, D, is a click, F, held by a small spring. The interior extremity of the lever, D, engages in this click when the notch, T, engages with the pin, P, and the lever is forced to move in a reverse direction to that of the disc. The lever will then remain in the position D^1 during the rotation of the disc, but when it reaches the upper part again, the pin, H, makes contact with the upper surface of the flat spring, "S," which is terminated by a curved portion as shown. This flat spring is connected to the local battery (*see* Figs. 5 and 6), so a current is transmitted via the pin, the axle of the lever and the metal rim to the brush, and thence to another electro-magnet, B, in the neighbouring box, or to the electro-magnet of the printing apparatus, according to the stage of the repetition. At the transmitting station a current is also sent into the aerial. When this position has been reached by the lever, D, it is released from the working position by the action of the arm, M, which meets the arm, N, on the reverse face of the disc. This is mechanically connected with the click, F, and causes it to release the lever, which falls forward into the position of rest.

The connexions of the sending and receiving diagrams should now be studied (Figs. 5 and 6). The electro-magnets, B, are connected to segments 6 to 15 of Ring 1, which is connected by the brush arm to the continuous Ring 4. Segments 1 to 5 are connected to the electro-magnets of the receiver, or local record.

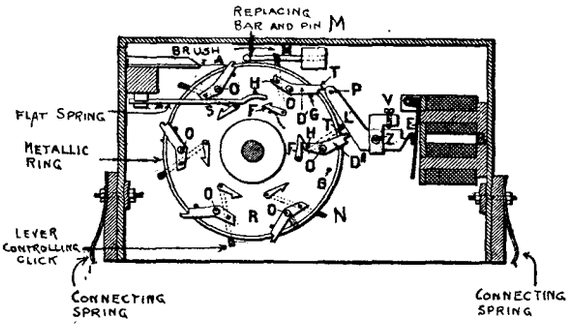

FIG. 4.—PLAN OF "VERDAN" REPEATER.

Ring 5, unsegmented, is connected, at the sending station, to two relays in parallel. The armature of one of these relays is connected with the aerial, and when it is attracted to the marking side, a path is provided for a current from a local battery into the aerial system. The armature of the second relay is connected to Ring 4, and makes connexion for the storage of the signals and their repetition and printing (Fig. 5).

In Fig. 6, Ring 5 at the receiving station is connected to the armature of the receiving relay. When this has been attracted to the marking position by the passage of a current, suitably magnified, from the aerial, a path is provided for a current from the local battery via the segmented Ring 2, and brushes, to unsegmented Ring 5, armature of relay, left-hand contact of relay, to Ring 4, by brush to segmented Ring 1, and so to the corresponding electro-magnet, B, either of the Retarder, or of the printing apparatus.

The manner in which a "parasite" is eliminated can now be seen.

Assume that the transmitting station (Fig. 5) is transmitting the letter G. For this letter keys 2 and 4 are depressed, marking currents being sent from segments 12 and 14, and spacing currents from segments 11, 13 and 15.

At the receiving station (Fig. 6) the relay should be actuated only as the brushes are passing over segments 12 and 14, on Rings 2 and 1, as the two stations are running in synchronism. The electro-magnets, B, corresponding to these segments, in the first group of retarders, are actuated, and the levers, D, are raised to the working position and held by the clicks, F (Fig. 4). Two

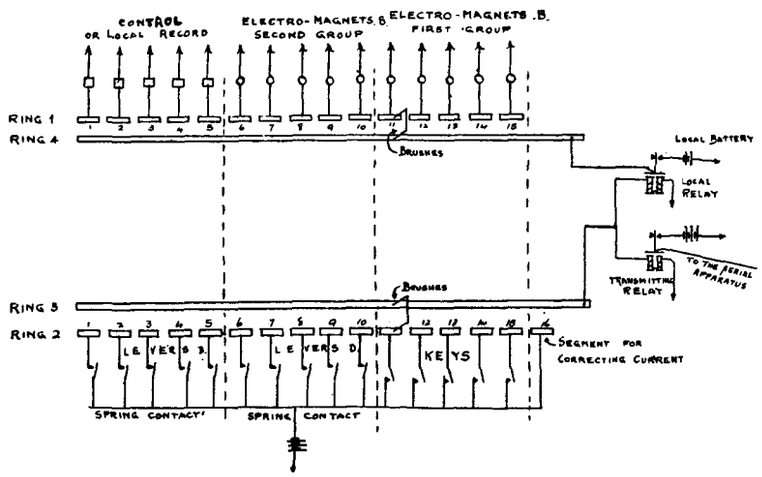

FIG 5 DIAGRAM OF TRANSMITTING ARRANGEMENT

FROM 'LA SCIENCE ET LA VIE'

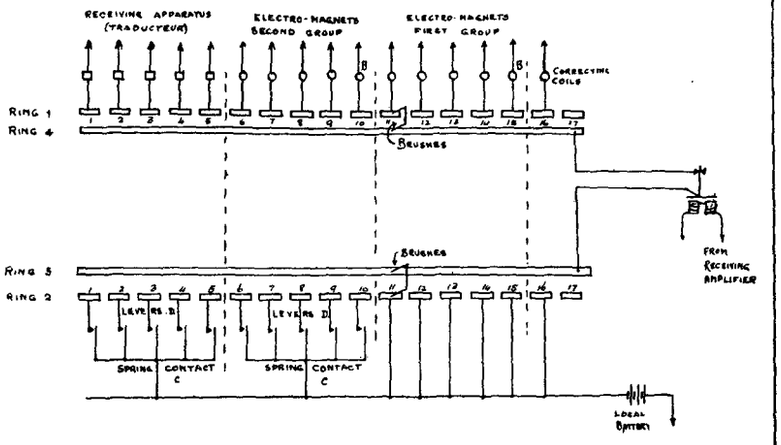

FIG. 6 DIAGRAM OF RECEIVING ARRANGEMENT

FROM 'LA SCIENCE ET LA VIE

seconds later the levers reach the upper portion of the discs, and their pins make contact with the flat spring, S, closing the contacts, C. A similar sequence of movements has taken place at the sending end, and the closing of the contacts coincides with the reception of a repeated current in the coils of the relay. A path is thus provided for a current from the local battery through the appropriate segments 7 and 9 of Ring 2 by the brushes to Ring 5, armature and stop of relay to Ring 4, brushes to Ring 1, and so to the electro-magnets of the second group of retarders. Two seconds later still a similar thing happens, except that the currents are repeated into the electro-magnets, 2 and 4, of the traducteur, causing the printing of the required letter.

If a "parasite," or atmospheric, makes its appearance, say, while the brush is passing over segment 1 at the first time of reception, it passes through the electro-magnet joined to this segment and causes it to bring a lever into the marking position, thus storing the letter H. But when the contact with the flat spring is made by means of this lever, the armature of the relay is still in the spacing position, as no marking current was sent from the distant station (unless another parasite has made its appearance at that moment), and consequently there is no path for the current. The lever is then replaced by the action of the instrument, and the signals from segments 12 and 14 only are passed to group 2. Even if it does happen that the atmospheric arrives at the moment when the brush is on segment 6, thus causing an extra to be stored in the second group, another atmospheric must appear as the brush is passing over segment 1, in order that a false letter may be printed. This contingency is extremely remote.

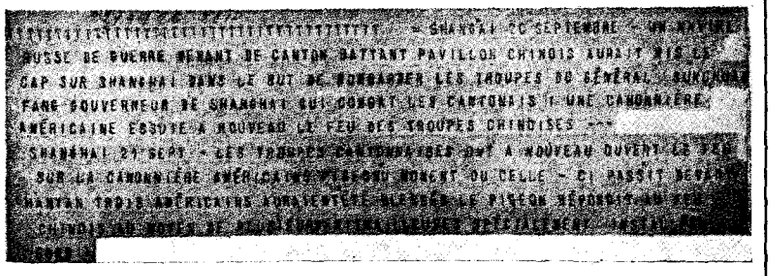

FIG. 7.—REPRODUCTION OF MESSAGE RECEIVED FROM MADAGASCAR BY "BAUDOT-VERDAN."

Fig. 7 is a reproduction of a message received in Madagascar from the Bordeaux station by means of the "Baudot-Verdan." The sequence of T's at the beginning shows that the instrument is correctly regulated. There are some errors, but none are due to "parasites." In line 1, "h" was omitted from "Shanghai" by the sending telegraphist. On the 7th line "Pigeonu" instead of "Pigeon au"; and later "Passit" for "Passait" are due to the non-functioning of the receiving relay owing to the weak currents received. A similar fault is found in the next line.

The wavelength used was 17,000 metres.

Two further examples of the working of this apparatus may be cited. M. Montoriol, in his description of the trials between Nice and Ajaccio, says that on one occasion Ajaccio was asked to send a long string of G's (this combination being made up of keys 2 and 4, leaving the first, third, and fifth contacts open to "parasites," which were numerous that day), and at the same time, in the "Baudot-Verdan," a series of automatic Morse signals were sent. The receiving "Baudot-Verdan" had thus to deal with two causes of interruption, but, out of 1,710 "G's" that were sent, only 13 were altered, or 0.76%.

In the Madagascar trials, M. Verdan states that telegrams have been safely received by this apparatus even at times when aural reception was impossible owing to atmospherics.

In view of these remarkable results, we may possibly agree with the optimistic conclusion reached by M. Fournier. "Henceforth," he says, "wireless telegraphy is completely sheltered from the influence of atmospherics. It can proceed, without hindrance, to the conquest of world communication. We are here in the presence of a system of mechanical telegraphy the possibilities of which are almost unlimited, since the retardation of two seconds may be extended to an hour, to a day, or even a year: the only requirement being that the rotation of the discs of the retarders shall be so arranged as to give the repetition when required, whether it be next day or next year."

[We are indebted to *La Science et la Vie* for the plans here reproduced.—*Editor.*]

TELEGRAPHIC MEMORABILIA.

ARGENTINA.—From Buenos Aires, Reuter's Trade Agency informs us that the market for radio equipment shows signs of development, the value of apparatus and parts imported having exceeded by several thousand pesos that of last season. The number of receiving sets in use is estimated at 159,000, a large proportion being crystal sets. The market is described as particularly promising for valve sets and parts.

AUSTRALIA.—The *Electrical Review* states that the transmitting station at Ballan and the receiving station at Rockbank for the "beam" wireless service between Australia and Canada have been completed by the Marconi Co., and the Australian transmitter has been adjusted for communication. Early completion of the Canadian stations is awaited.

It is also announced that the coming into force of the duties upon valves for wireless telegraphy and telephony imported into Australia has been again postponed—to Jan. 1, 1928.

AUSTRIA.—*World Radio* declares that after more than a year's negotiation between the Ravag and the Provincial Government of Lower Austria it has been decided to erect the new Linz station on the Freudenberg mountains. It will probably be finished early in the autumn. Of all the provinces of Austria, only Salzburg and Vorarlberg now require stations, and probably Vorarlberg is sufficiently well served by Innsbruck to make unnecessary a station of its own on any similar scale.

From the same source we also learn that at the last meeting of the Board of the Ravag, Dr. Schwaiger submitted a bold plan for the development of Vienna broadcasting and for building a relay station at Linz. Rosenhuegel is to be provided with new transmitting plant and its power raised to 60 kw. this summer, when the engine, accumulator, and power rooms will be considerably enlarged. A studio, 90 ft. by 39 ft., will be built, in addition to two studios of the size of the present one and a third of smaller dimensions for talks, as well as rooms for testing and technical equipment. This work will involve an outlay of 12 million schilling.

BOHEMIA.—As part of the celebrations in connexion with the 700th anniversary of the establishment of the town, a radio exhibition is to be held in Leitmeritz, Bohemia, from the 4th to 12th of the present month.

BULGARIA.—The Bulgarian "Telegraphia" Co., the constituent general meeting of which was recently held in Sofia, and which will manufacture telegraph and telephone apparatus, has a capital of 5,000,000 leva (about £8,000 at current exchange). Half of this has been subscribed by the Bulgarian Government, 10% by private shareholders, and the remaining 40% by the Czecho-Slovakian "Telegraphia" Co. of Prague.

CANADA.—The Canadian National Railways, reports the *Electrical Review*, recently placed in operation the first unit of a "carrier-current" telegraph system. The introduction of the system between Montreal and Toronto increased the capacity of the single wire between these two centres elevenfold, an improvement of service which, under the old system, would have been made possible only by eleven new wires between the two centres. "Carrier" waves, similar to those radiated from a radio broadcasting station, are sent forward along wires, instead of through the ether; the "carrier wave" itself is an alternating current of very small actual power, but of high frequency. By the use of oscillators in conjunction with condensers and coils, "carrier waves" of different frequencies are set up, the range most adapted to commercial purposes being between 3,300 and 10,000 cycles, which permits of ten different messages being transmitted over one set of wires at the same time; by the utilisation of still higher frequencies as many as thirty channels might be secured over one pair of telegraph wires. The generation of individual frequencies, which act as the carriers of the messages, is accomplished by the use of a vacuum tube in an electrically oscillating circuit, and it is necessary to impose the signals which correspond to the telegraph message on this carrier. This is done by connecting the contacts of a telegraph relay to the oscillating circuit in such a way that, when the telegraph relay contacts are opened and closed, the carrier frequency is interrupted for the duration of the telegraph signals. A number of waves of various frequencies, each with its telegraph message impressed on it, are transmitted over a single

pair of wires to the receiving station, where they are separated by means of selective circuits and passed through vacuum tube amplifiers. The "carrier" system of telegraphy is said to be virtually immune from electrical disturbances of all kinds, including ground currents. Experiments have shown that with the wire grounded uninterrupted service is possible, and even when the wire is broken the "carrier current" bridges the gap. On one occasion when the entire pole line, wires and all, were submerged for a considerable time the system worked without interruption.

It may be added that Mr. E. Yokoyama recently described the wired wireless system on the four principal e.h.p. lines in Japan, at the recent E.H.P. Congress in Paris, where Mr. L. Grant discussed the matter from the American point of view, showing the great economy even when fitting the necessary apparatus to lines of no more than 100 miles in length, and M. Dubois also described some of the latest improvements.

CZECHO-SLOVAKIA.—In order to prevent over production and undue competition in the country, the Czecho-Slovakian Ministry of Commerce recently resolved that the manufacture and sale of radio sets and apparatus in the country may only be carried on under official licence. So far 72 manufacturing and 1,030 selling licences have been issued, and it is considered that these numbers are at present sufficient to supply the demand. It is hoped, however, that the projected establishment of broadcasting stations in Karpathian Russia and Eastern Sloavkia will give rise to an increasing demand.

Under the recently-signed commercial treaty between Czecho-Slovakia and Hungary, the duties upon a number of classes of goods upon importation into Czecho-Slovakia have been reduced. Among the goods affected are telegraph and signalling apparatus, small switches and fuses, &c. The reductions apply to goods of United Kingdom origin.

DENMARK.—The number of radio listeners continues to increase. During June there was an increase of 2,638 listeners, and on July 1 the aggregate number had reached 146,997.

EAST AFRICA.—The Nairobi correspondent of *The Times* states that the British East African Broadcasting Company, with a capital of which 75% has been locally subscribed, has been formed after nine months' negotiations with the Government, culminating in the issue of a licence. The chairman is Lord Delamere. It is intended to use a short wave to relay programmes from world stations. The company is also starting an "Empiradio" telegraph direct service from Nairobi to London at 30% below the Cable Company's rates.

FRANCE.—Reuter's Paris agency states that the wireless-telephone station at Lille, which is to serve Northern France, has been formally inaugurated by the Ministry of Posts and Telegraphs in the presence of the local authorities. Hitherto, although Southern France has been well provided with wireless centres at Bordeaux, Toulouse, Marseilles, Lyons, &c., the north has not.

A radio exhibition is to be held at Chambery (Savoy) from the 17th to 25th of the present month.

GERMANY.—A powerful wireless transmitting station is at present in course of installation in Zeesen by the Telefunken Gesellschaft, of Berlin, on behalf of the German postal authorities. It will work on a wavelength of 1,250 metres.

The Munich Postal Administration, with commendable enterprise, is to allow responsible firms to erect receiving sets for prospective customers during a week as a test without the licence fee being paid, in order to allow purchasers sufficient time to satisfy themselves about the set they desire to purchase.

The healthy state of the German broadcasting industry is indicated by the number of subscribers at the end of the second quarter of this year. On June 30 there were 1,713,899 subscribers, an increase, compared with last quarter, of 78,171. Reckoning three listeners to every set licensed, about 10% of the German population may be considered to be listeners, says *World Radio*. By the end of the year it is hoped to reach the 2,000,000 figure.

The first official attempt to speak by wireless telephone from Berlin to Buenos Aires, a distance of about 7,000 miles, was made during the evening of Aug. 3, says *The Times*. Speech passed in the outward direction only, as there was no transmitter in Buenos Aires, and was uniformly good. The messages were spoken into a microphone at the Voxhaus, whence they were transmitted over land telephone lines to the Nauen wireless station, 20 miles north-west of Berlin, which radiated them by a special short-wave transmitter, of which one example has been manufactured by the Telefunken Company. The receiving station was at Villa Eliza, not far from Buenos Aires, the final stage being accomplished over the ordinary telephone lines. If the favourable results are fully confirmed, it is intended to institute a public service after proper equipment has been installed near Buenos Aires.

GREAT BRITAIN.—The Financial Editor of the *Electrical Review*, in the middle of last month, wrote the following interesting paragraph, interesting, that is to say, to students of both cable and wireless developments as indicative of the closeness with which the old and the new means of communication are being watched by investors, and the newer wakefulness of submarine cable shareholders since the success of the Beam services.

"Cable stocks are steady," recorded the writer, "the only noticeable movement being a rise of a point in Anglo-American Telegraph preferred," and, as had been previously mentioned, "Great Northern Telegraphs by £2 on top of a gain the previous week.

"The Eastern Telegraph Company has announced reduced cable rates from this country to the Union of South Africa, to take effect at once. Week-end telegrams are to cost no more than *4d.* a word, that is, a fifth of the reduced ordinary telegram rate. The wireless group is quiet, with Canadian Marconis steady at 5*s.* 10½*d.* It is evident from official statements which have appeared that, although control of the Canadian Marconi is not to pass out of British hands, there has been a good deal of buying on behalf of the American Radio or other United States interests. It is announced that wireless telephony is to be established between Berlin and Buenos Aires."

In connexion with the last item regarding radio-telephonic communication between Berlin and Buenos Aires, this receives further confirmation in a *Times* paragraph. See above, under "Germany."

Committee of Inquiry into the Working of the British (Inland) Telegraphs.—On July 29 the Postmaster-General announced in the House of Commons that he was about to appoint a Committee to examine the possibility of effecting substantial economies in the working of the inland telegraph service. The Committee, accepting the scales of pay awarded by the Industrial Court, would report on what changes were necessary to extinguish or, substantially reduce, the continuing deficit on the service. The Committee would start work in the autumn and would consist of Sir Hardman Lever (chairman), Lord Ashfield, and Sir Harry McGowan. In the last four years the average loss has been £1,478,125; last year it was £1,299,214.

At the Annual Meeting of the Globe Telegraph & Trust Co., Ltd., Sir John Denison-Pender (chairman) said that the results had again been very satisfactory and they anticipated that if they obtained the same return from their investments for the current year their income would be increased by £5,000. They had accepted an offer for the purchase of their holding in the Cuba Submarine Telegraph Co. by the Direct West India Telegraph Co.; that involved a small capital loss. The Submarine Cables Trust terminated last year. The trust had paid 6%, free of tax, on its certificates; those certificates were redeemed by a yearly drawing at £20 premium; and each reversionary coupon now received £153 2*s.* 6*d.* Thus that investment had proved a very good one; the company had from time to time purchased reversionary coupons and had made a profit of £116,000 in that way. The profit made had been partly re-invested in cable stocks, and it had enabled them to widen their investments by the purchase of a few telephone stocks and shares. The lease of the American Telegraph Co.'s two cables to the Western Union Telegraph Co. would terminate in 1932 and there would then be a considerable depreciation in the value of the bonds.

Parliamentary Questions, &c.—On July 11 Captain Fraser asked the Secretary of State for the Colonies if any views were expressed at the recent Colonial Conference as to the desirability of establishing in this country a wireless transmitter capable of conveying to the Colonies for redistribution the programmes of the British Broadcasting Corporation; and if the representatives indicated that their Governments would be prepared sympathetically to consider contributing towards the expenses incidental to such a service after the initiative had been taken by Great Britain.

Mr. AMERY said that it was the general view of the representatives that the institution of such a service, if found to be practicable, would be very widely appreciated overseas. While it was considered premature to ask them for an undertaking to contribute until the necessary experimental work in this country was further advanced, he did not for a moment anticipate that the dependencies would show reluctance when the time came to share the expense involved in instituting and maintaining such a service.

On July 26 Sir W. Mitchell-Thomson, Postmaster-General, informed Mr. Day that the contractors hoped to be in a position soon to hand over the stations for the Anglo-Indian beam service for the official test, but they were unable yet to fix a date.

[*Memo.*:—As we go to press it is announced that the official tests have been satisfactorily carried out.—ED., *T. & T. Jnl.*]

Cable Telegraphy.—Rate Reduction.—Following on recent reductions in rates to Australia and New Zealand, and a request from the Postmaster-General of the Union of South Africa for corresponding reductions in South African rates, the Eastern Telegraph Co., Ltd., decided to reduce the telegraph rates between Britain and the Union of South Africa, from Aug. 1. Corresponding reductions will also be made for telegrams exchanged with South-West Africa, Southern and Northern Rhodesia and Nyasaland.

An all-round reduction in rates for telegrams to South America was announced on July 25 by the Commercial Cable Co. and also by the Eastern Telegraph Co., via Eastern Madeira, and the Western Union Co.

British Dominions Broadcasting Experiment.—Mr. Gerald Marcuse, the well-known amateur wireless transmitter, of Caterham, Surrey, has been given a licence by the General Post Office to enable him to broadcast regular radio programmes from this country to the Dominions. His programmes will be transmitted three nights each week from studios in the London area on a short wavelength. He expects to begin transmitting early this month.

The *Wireless Trader* states that owing to an increase in exports in June the total value of shipments of British radio apparatus for the first half of the year from these shores was only £7,784 lower than for the first half of 1926. The actual figures were: 1926, £664,304; 1927, £656,520 (including re-exports). Our principal foreign customer was Japan, which imported goods to the value of £103,181. Holland's share was valued at £35,055, while France was credited with £25,419, the United States with £25,041, Argentina with £14,402, Russia with £13,982, Portugal with £13,887, and Italy with £13,088. The largest share of all was taken by Australia (£124,950); other important Empire

customers were India (including Burma), £43,924; New Zealand, £33,022; Canada, £16,351; and the Irish Free State, £13,937.

GOLD COAST.—The Governor of the Gold Coast, in his annual address to the Legislative Council, had some interesting things to say on telegraph and telephone matters in that colony.

It would appear that about 1,710 miles of new telegraph line and 36 new telegraph offices have been inaugurated since 1919, and 1,700 miles of existing line have been entirely reconstructed, iron telegraph poles replacing tree trunks and wooden poles; 1,760 miles of trunk telephone line are now in use, compared with 189 miles in December, 1919, and practically all important centres are now connected by telegraph and telephone.

Commenting on these figures and the stress placed upon "the importance of wireless communication in connexion with the prevention of wild, disturbing, and baseless rumours and the value from a psychological point of view of the establishment of a radio-telephone broadcasting station at Accra in order that the English Daventry programme might be made available to Europeans and others living an isolated life up country" by Mr. Ormsby-Gore, Parliamentary Under-Secretary for the Colonies, a leading article in the *Electrical Review* remarks that: "The possibility that wireless broadcast telephony in this country (Great Britain) has passed its zenith of popularity is sufficient reason for enterprising firms to turn their attention to the possibilities of the more remote export markets."

HOLLAND.—The interest which was recently created by the successful transmission from the Eindhoven (PCJJ) station (wavelength 30.2 metres), which was received in India, Dutch East Indies, South America, Australia, &c., in addition, of course, to European countries, has induced the station to experiment further in order to ascertain the most suitable time for transmission to various countries throughout the world. For this purpose a special short-wave transmission commenced on July 26 at 10.40 G.m.t. and continued until July 27 at 10.40 G.m.t. Enthusiasts who were successful in hearing the station are asked to communicate direct with Philips experimental broadcasting station at Eindhoven, Holland, stating the results obtained.

INDIA.—The *Electrical Review* says that the statement telegraphed to England from Bombay that the England–India "beam" wireless service was officially inaugurated in Bombay on July 23 by the Viceroy, and published in certain quarters, was not correct. The Viceroy visited Bombay to open the broadcasting station, and while there he inspected the Central Telegraph Office of the Indian "beam" service and exchanged messages with the King. Before the monsoon season started, it was expected that the official Post Office tests would be completed in time for Lord Irwin to inaugurate the "beam" service officially on July 23. For some weeks past the English and Indian stations have been in daily communication at high speed, but when the monsoon began it unexpectedly caused trouble on the Indian land lines connecting the Central Telegraph Office with the wireless stations, which could not be officially opened until the Post Office test had been passed.

The Viceroy duly inaugurated the Bombay station of the Indian Broadcasting Co., Ltd., on July 23. Its call signal is 2BY and its present power is 3kw.; receiving licences are being issued at Rs. 10 (15*s.*) per annum.

The new programme of the Indian Wireless Department includes extensive reconstruction. At Karachi, the existing 30-kw. spark transmitter is being dismantled and replaced by a 6-kw. valve set for continuous-wave and interrupted continuous-wave signalling, and telephony, while a new receiving station will be erected in the neighbourhood of the aerodrome, including a direction-finding installation for ships and aircraft.

At Bombay the existing station at Butcher Island is being dismantled and a new coast station is being erected at Santa Cruz which will contain a 6-kw. valve transmitter, 5-kw. spark transmitter, and a direction-finding receiver. Seven of the inland stations, viz., those at Allahabad, Delhi, Lahore, Quetta, Peshawar, Mhow and Nagpur, are also being remodelled by the installation of modern continuous-wave transmitters and appropriate receivers. At Delhi a new transmitter has already been installed.

The Indian correspondent of the *Electrical Review* states that the Bengal Chamber of Commerce has addressed a communication to the Government of India expressing its view with regard to the agreement between the Secretary of State for India and the Indian Broadcasting Co., Ltd., and also the subsidiary agreement attached to it, so far as they relate to the importation of wireless apparatus. The Chamber states that the 10% tribute to be paid by member importers to the Broadcasting Co. under the subsidiary agreement (which will be added to the sale price) is, in point of fact, a payment which listeners will make to the Company. The Chamber contends that the agreement was primarily designed to compel importers and distributors of receiving apparatus to act gratuitously as debt-collectors for the Broadcasting Co., which may be justified on the ground that there is no reasonable alternative, but there can be no justification of compulsion to the gratuitous surrender of patent rights. It is certainly desirable, the Chamber considers, that the Broadcasting Co. should keep up-to-date, but not at the expense of the importing manufacturer simply because he is assisting the Company by importing and distributing apparatus and collecting for the Company, free of charge, contributions due to it from listeners. The provision would, in fact, heavily penalise the importer who is importing his own manufactures, as against the importer who is not also a manufacturer, for the latter, being only a middleman, invents and patents nothing. The Chamber finally takes objection to Clause 4 (c) of the subsidiary agreement, whereby a member is bound to accept and abide by any modifications of the provisions of the agreement that may be effected with the previous written approval of the Director-General of Posts and Telegraphs.

IRISH FREE STATE.—In Dail Eireann the Minister of Posts and Telegraphs was asked what special privileges, or rights, attached to an experimental licence, as compared with the ordinary receiving licence, and whether he was prepared to consider the reduction of the fee charged for an experimental licence from £1 to the rate charged for an ordinary licence. Mr. J. J. Walsh said that, from the technical point of view, the maintenance of a distinction between experimental and ordinary receiving stations was no longer a matter of much importance, and the question of regarding the ordinary licence, the fee for which was 10*s.* a year, as covering the use of any form of receiving set was under consideration.

Replying to a question recently in Dail Eireann, Mr. J. J. Walsh, Minister for Posts and Telegraphs, said that a separate licence for portable wireless receiving apparatus was issued only to a person who already held an ordinary licence for the possession of apparatus at his permanent address. The owner's normal address was recorded on a portable licence, but the latter could be used in any part of the Irish Free State.

Progress is being made with the rebuilding of the General Post Office, Dublin, and a new studio for the Dublin broadcasting station is also being constructed in connection therewith. The old studio in Little Denmark Street will then be closed down, but the transmitting apparatus will be retained at the McKee Barracks.

ITALY.—The Department of Overseas Trade, London, has issued a report upon the commercial, industrial, and economic situation in Italy, dated March, 1927, by Messrs. E. C. Donaldson Rawlins and H. C. A. Carpenter, respectively Commercial Counsellor and Commercial Secretary to the British Embassy, Rome.

In dealing with telegraphic and telephonic communications in Italy a condensed report thus epitomises the present situation:—

"Although 1,538 telephone circuits, comprising 36,700 km. of line, have been handed over to private enterprise, the State still operates 266 interurban and international circuits (38,650 km.), and the operation during 1926 was successful.

A new cable has been laid between Anzio and Barcelona, passing through the Straits of Bonifacio. This cable will be continued by way of Malaga to join up with the existing Italian Atlantic cables. Telephone communication has been established between Rome and Zara, use being made of the submarine telegraph cable.

A committee has been set up for the control of the broadcasting services, and in addition to this control the committee is charged with examining and reporting on the most suitable methods to be adopted for the development of broadcasting from the technical, artistic, and educational points of view."

MALAYA.—*Eastern Engineering* states that a sum of $34,000 has been added to the Federal estimates of the Federated Malay States for the erection of wireless stations and quarters for operators and mechanics at Port Swettenham and Batu Pahat, Johore. In this connexion, Malayan Broadcasting Services, Ltd., has been floated to broadcast on a short wave and do relay work. Mr. Leslie Cant, who will be manager, has had several years' experience in Australia, while the company is to appoint an experienced programme director.

NEW ZEALAND.—Through the agency of the London *Times* we learn that the Prime Minister, in opening 2YA the Radio Broadcasting Company's new station at Wellington, at present the largest radio station in the Southern hemisphere, stated that the station was ten times as powerful as the existing stations at Auckland and Christchurch, and second only to Daventry (England) in the British Empire. Apart from the station's value from the point of view of entertainment it could communicate with all New Zealand by day and night and it could speak easily each night to the Pacific Islands and to Australia. The Government had assisted in its establishment because New Zealand was thus assured direct communication in the event of a national crisis.

PERSIA.—According to Reuter's Teheran agency two French wireless experts engaged by the Persian Government arrived in that city during the early days of last month.

PHILIPPINES.—Reuter's advise that a Transpacific radio service has been put into operation at Manila. The call signals range from KZAD to KIW, and normal wavelengths from 600 to 2,701 (t.w.). The service is strictly controlled by the Government and the United States Army.

RUSSIA.—It is reported from Leningrad that there are now 56 radio broadcasting stations in operation in Soviet Russia. Of that number, five are in Leningrad and nine in Moscow.

SWEDEN.—Under a new resolution of the Swedish Government, the Broadcasting Co. ("Radiotjänst," Ltd.) has obtained a two years' extension of its licence to the end of 1929, says *World Radio*. At the same time, however, the Radiotjänst's proportion of the licence income has been further reduced; at first the division between the company and the Telegraph Board was equal, but from the beginning of 1927 Radiotjänst was granted only 3.72 Swedish crowns from each licence fee of 10 cr., and now its share has been reduced to 3.30 cr. This division is to be revised yearly, and *World Radio* explains that in several other ways the Government has also strengthened its influence on the company.

SWITZERLAND.—The following numbers of listeners were licensed in Switzerland at the end of May, 1927, according to the Swiss Telegraphic Administration: Geneva, 4,682; Zurich, 30,629; Lausanne, 5,510; Basle, 2,706; Berne, 15,637; *total*, 59,164.

TURKEY.—Reuter's Trade Service at Stockholm informs us that the Swedish Aktiebolaget Baltic has concluded a contract for the monopoly of supplies of radio receiving apparatus to the whole of Turkey during a period of five years. Aktiebolaget Baltic is to deliver at once apparatus to the value of Kr.250,000, also material for 4,000 receiving sets, which will be assembled in Turkey.

U.S.A.—The Trade Service of the same agency in New York states that the Radio Corporation of America, the largest concern of its kind in the United States, recently placed on the market a complete line of new broadcast receivers featuring circuits which operate in connexion with either alternating or direct current supplied by the house lighting mains, thereby dispensing with all batteries. The new alternating-current receiver, said to be of unusual design, utilises three stages of radio-frequency amplification, a detector, and a two-stage audio amplifier.

The Department of State at Washington having invited the Union Internationale de Radiophonie to be represented in an advisory capacity at the forthcoming International Radio-Telegraph Conference at Washington in October, the Union has nominated as its delegate Capt. P. P. Eckersley, chief engineer of the British Broadcasting Corporation and a member of the Technical Commission of the Union. The principal purpose of the Conference is the revision of the International Radio-telegraph Convention signed at London in 1912 and the preparation of new articles which will be applicable to all the newer developments in wireless science, including broadcasting. The Union has accordingly submitted certain proposals to the International Radio-Telegraph Bureau at Berne for examination by the Washington Conference, including recommendations as to the wavebands to be reserved for broadcasting, which, as the outcome of recent experience and a systematic study of the trend of development in broadcasting technique, it considers to be essential for orderly expansion. The decisions regarding these proposals will rest with the official delegates from the several States members. The signatories to the London Convention of 1912, which regulates the Governmental and private use of wireless means of communication, were 43 States, apart from Colonies and Dependencies.

Plans are being developed by the Western Union Telegraph Company for a new fast-service cable to permit of the transmission of 250 words a minute (against the existing rate of 100 words) between the United States and the Far East. According to *The Times*, two routes are under consideration: one (10,000 miles long) following the existing commercial Pacific Cable Company's line, at an estimated cost of $16,000,000 (£3,200,000); the other (7,100 miles) from Seattle *via* the Aleutian Islands, Northern Japan, and Shanghai to Manila, costing $10,000,000 (£2,000,000). The shorter route offers advantages of greater speed and economy, but it involves negotiations with Japan for landing rights, which are now in progress. The new cable will be of the "Permalloy" type, allowing of the transmission of six messages simultaneously.

A form of loud-speaking device recently patented by Mr. Clinton R. Hanna and Dr. Joseph Slepian, both members of the Westinghouse Electric Company's research staff, has an exponential horn, the underlying principle being proper coupling between the diaphragm and the surrounding atmosphere, and it is claimed to make possible the reproduction, at full volume, of the deep bass of the organ and drum; moreover, the reproducing element is said to be of a radically new type, especially adapted for the horn. The device produces the sound effect of a horn 14 ft. long, but actually is only 48 in. in each dimension, and it is due to its peculiar internal curves that sound of all pitches, low as well as high, receive accurate rendition and correct volume. Although the apparatus radiates from 10 to 20 times more volume than the ordinary loud-speaker, the amount of electrical energy represented by all this sound is only about 2½ watts, says the *Electrical Review*, London. The apparatus was not especially designed for lightness, yet there is no part of it which cannot be carried by hand, with the exception of the great wooden horn, and even that can be replaced by a lighter one at some sacrifice of volume at the lower pitches.

Thanks to the unfailing kindness of telegraphist friends at home and abroad my table continues to be well supplied with news of *the* craft. I trust I shall not be charged with undue preference, however, if I mention one or two of the publications which at the moment have caught my attention, but I really must congratulate those responsible for the new and August issue of *The Overseas Telegraph*, which, with its arresting cover by Osborn of the Cable Room, its high-class paper and printing, most nearly approaches the standard of "The Zodiac," and would no doubt come still nearer to the level of that company-run magazine, did financial assistance prove as easily available.

Then there is the *C.T.O. Chronicle*, with its reminiscences of 1897. Could any committeeman of that period forget the strain and excitement of those days and hours? Of quite another type is the next production, viz., *L'echo des* P.T.T. *de l'Afrique du nord*, published in Algiers, which contains a deeply interesting article by M. Verdan on *L'Appareil Baudot-Verdan*, in which he claims that "the filtration of wireless parasites is to-day happily obtained, and it is to the Baudot that we owe this fact," that is to say, the Verdan-Baudot as now understood. M. Verdan adds the following few words, the full meaning of which will only be understood in our own country by those telegraphists who have come into close personal contact with French telegraphists, and their absolute affection for Baudot apparatus. Says the great inventor: "No French telegraphist will fail to rejoice at the fact —(that by means of the Baudot filtration scheme atmospherics may be eliminated)—and it is the fact of their pleasure that constitutes *my* joy."

According to *l'Echo*, radio working by means of this modification of the Baudot has all but replaced that of the submarine cable between Algeria and France.

The latter cable, however, it should be stated, is not only faulty but in a really parlous condition.

It will have been noted by our readers that an illustrated, descriptive article on this highly interesting and ingenious development of the Baudot system appears in the present issue, and is by a London telegraphist who has for some time specially interested himself in the arrangement.

Having read both Cable Room local journals and noted the eagerness with which the staff were looking forward to the Annual Sports, one can measure fairly well the deep disappointment which must have followed the regrettable but unavoidable decision to cancel that yearly event, to which so many of us—of all ages—look forward.

It is hoped that by next year the extreme pressure upon staff and supervision will have eased somewhat, but the advent of all four "Beam" services had simply made the meeting impossible.

In official language it may therefore be most truthfully said that, "the *circumstances were exceptional, &c., &c.,*" *but one fears that official language* was not the only lingo used! However, "the rain it raineth every day," and Aug. 19 was no exception, and maybe proved some solace to both *competitors and to would-have-been spectators.*

Let us, however, turn from *dis*appointments to new appointments—tendering hearty congratulations to Mr. F. S. O'Shaughnessy on appointment to the newly-authorised Superintendentship of the Cable Room and to Mr. F. Sleat and Mr. W. H. King, who follow him as Asst. Supt. and Overseer respectively. The two latter are provisional.

The long-drawn-out case of the India-Rubber and Gutta-Percha Telegraph Works Co. *versus* the Western Union Telegraph Co. was decided by Mr. Justice Bateson in the King's Bench Division in favour of the former company, who came to the conclusion that the c.s. *Silvergray* was "competent to do the work, well-equipped and had a thoroughly competent cable engineer" and that "there was no waste of time or cable" in carrying out the cable repairs. His Lordship also thought the captain of the vessel was right when he said that "all cable work was a matter of luck," and luck was required to make it go absolutely smoothly from start to finish. This rather sweeping expression of opinion regarding *all* submarine cable repair work, one would think, is not likely to go unchallenged, and the technical papers may possibly provide some entertaining correspondence on the matter. Of course, there *is* a certain amount of luck—good and bad—in this as in all enterprises. Twice in just over twenty years a cable steamer has found a dead whale mixed up with a cable fault as an additional strain upon her grappling gear!

Congratulations to the following officers of the C.T.O. (Inland Department). Mr. E. Cooper, to be Asst. Controller vice Mr. Ford, promoted; Mr. A. J. Jellie to Supt., Higher Grade, vice Mr. Cooper; Mr. H. W. Dunne, Asst. Inspector T. and T. Traffic, Class I, Sec.'s Office, to be Superintendent, Higher Grade, vice Mr. W. G. Hodgson, retired; and Mr. A. E. Bowden, to Supt., Lower Grade, vice Mr. Jellie, promoted.

In connexion with the above, the best of wishes for a restful and happy retirement to Mr. Hodgson, who leaves many a good friend and well-wisher *behind him in the C.T.O., and will also find not a few among the ranks of those* he now goes to join. Let him test this at the Kew meeting next year!

Gothic Architecture.—Gothic is not only the best but the only rational architecture, as being that which can fit itself most easily to all services, vulgar or noble. Undefined in its slope of roof, height of shaft, breadth of arch, or disposition of ground plan, it can shrink into a turret, expand into a hall, coil into a staircase, or spring into a spire, with undegraded grace, and unexhausted energy."—Ruskin.

J. J. T.

PROGRESS OF THE TELEPHONE SYSTEM.

THE total number of telephone stations in the Post Office system at June 30, 1927, was 1,542,270. The new stations added during June numbered 18,934 and the cessations 8,532, the net increase in stations being 10,402.

The growth for the month is summarised below:—

	London.	Provinces.
Telephone Stations—		
Total at 30th June	544,913	997,357
Net increase for month	3,966	6,436
Residence Rate Subscribers—		
Total	119,671	193,594
Net increase	1,316	1,729
Call Office Stations—		
Total	4,829	17,666
Net increase	38	127

Kiosks—		
Total	565	2,900
Net increase	53	76
Rural Party Line Stations—		
Total	—	10,072
Net increase	—	36
Rural Railway Stations connected with Exchange System—		
Total	—	783
Net increase	—	9

The number of inland trunk calls dealt with during May (the latest statistics available) was 8,602,351, a decrease of 39,542 compared with May of last year, when traffic was abnormally high owing to the general strike.

The number of outgoing calls to the Continent during May was 27,646, while the incoming calls numbered 28,649.

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

PROVINCES.—Colwyn Bay (automatic), Llandudno (automatic).

And among the more important exchanges extended were :—

LONDON—Hounslow, Mitcham, Purley.

PROVINCES—Anfield, Bradford, Denton, Radlett, Rochdale, Rock Ferry, Southport, Walton (Liverpool), Walton-on-Thames, Worcester, Wilmslow.

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

London—Westerham (section of the London—Orpington cable),

while 75 new overhead trunk circuits were completed, and 83 additional circuits were provided by means of spare wires in underground cables.

WHERE TO STAY.

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

LONDON TELEPHONE SERVICE NOTES.

Telephonists' Society.

THIS Society will commence its next Session on Oct. 7, under the presidency of Miss R. James, who has chosen as the title of her address "Notes from my diary." At the second meeting on Nov. 4, Capt. Reid, of the Royal Air Force, will give a lecture of psychological interest. On Dec. 2, Mr. Camp, of the Trunk Traffic Office, will read a paper on "Foreign Trunk Traffic," and in view of the rapid strides made recently in international telephone communications this meeting will be eagerly awaited. On Feb. 3 there is to be a debate on "Is the welfare and social side of exchange life sufficiently developed ?" Miss B. V. Lambert will argue that it is and Miss M. Binder will present the opposite view. The debate will be followed by a paper to be read by Miss Pyne, entitled "Recollections of a visit to Chicago."

The usual (and some unusual) competitions will be held, and the Society will again be responsible for the production of an original play from the pen of Miss McMillan. This time the play will be performed on two successive nights.

Tandem.

In last month's *Journal* there was an article, "When we get Tandem." Well, we have got it ! At 10 a.m. on Thursday, Aug. 18, the life-blood of telephone traffic commenced to circulate and it is now something more than a name. Tnere have been many detailed descriptions of the processes through which calls pass in their progress from the originating exchange, through Tandem, to the objective exchange, but none of them has summed the matter up so concisely as did an interested visitor, who after listening to a complete technical account of the process, remarked : "Well, its all very simple, isn't it ? You just think of a number at Buckhurst and it turns up at Addiscombe."

Accounts Branch.

Mr. C. Magee's many friends will learn with great regret of his retirement through ill-health. He has been suffering for some time from the after-effects of sleepy sickness, and despite a long spell in a nursing home his recovery was not rapid. He has now returned to his friends in Ireland and all his colleagues will unite in the hope that his new environment and native air will combine to give him a new lease of life.

Mr. Magee was one of the earliest servants of the L.T.S., having joined the then General Manager's Office in 1903. At the time of his retirement he was a Higher Clerical Officer in the Accounts Branch, where he had spent practically all his official life. He served with the Army during the War from 1915 to 1919.

A retiring presentation in the form of a substantial cheque is being forwarded to Mr. Magee from well-wishers in the Controller's Office.

Contract Branch.

The business done by the Contract Branch during the month of July was as follows :—

New business obtained	6,966	stations.
Ceasements	3,272	„
Net gain ...	3,694	„

These figures are rather disappointing as the net gain is somewhat less than that of the corresponding month last year. The falling off is accounted for by the general depression in trade. There seems to be a pretty general complaint on the part of everybody that there is no money about.

The Advertising Exhibition recently held at Olympia was marvellously interesting from many points of view. The attractiveness of the advertising posters and folders printed in all the colours of the rainbow and some others, made one wish for a little colour in some of our own over-modest advertising literature. Black and white, or black and buff as it is sometimes, palls after a bit and even two colours would be more attractive and as a result produce more results and so pay for the slight additional cost.

This Exhibition was notable for the fact that the number of telephones to exhibitors reached the high figure of 83%. This is the highest percentage of any recent exhibition and next year, if the Advertising experts hold another exhibition, we may perhaps hope to reach the 100%.

The many friends of Mr. John C. Shortt, who was a clerical officer at the Headquarters of the Contract Branch, will learn with regret that he died on July 20 but a few weeks after his premature retirement on the ground of ill-health. After two short periods of service in Portsmouth and in London, he re-entered the service of the late company shortly before the transfer. Since the transfer he has been connected with the Contract Branch either in one of the District Offices or at Headquarters. For some time past he has been a great sufferer through failing health, and although his premature decease has come as a great shock to many, it was not altogether a surprise.

We were recently asked to make an alteration in the Telephone Directory as a subscriber named Miss Lemon was marrying a Mr. Sole.

The papers are perpetually pillorying us, but are they perfect? What depth of wisdom is contained in the following statement which appeared in a well-known London newspaper on Aug. 1:—

"When the August Bank Holiday falls early in the week as it does this year . . ."

Another newspaper recently suggested that the Post Office staff generally did not do anything to push the wares of the Post Office, more especially with regard to the telephones.

We might well say, "Physician, heal thyself," for whoever heard of a newspaper man trying to get anybody to buy the newspaper which employs him? Generally speaking, the last thing in the world a journalist wants to talk about is the particular "rag" with which he happens to be connected. However, if every member of, say, the staff of the London Telephone Service were to obtain from their business connexions or friends only one additional station a year, the growth would be nearly 12,000 higher per annum than it is.

Cricket.—We have to record a further defeat at the hands of the Traffic Section who proved to be the better team in the final game played in connexion with the League tournament. Good bowling rather than bad batting was responsible for the small total of the Contracts team, and a drying wicket seemed to favour the bowlers in the early stages of the contest.

The match, however, like the others played this season was thoroughly enjoyed, and the visits to the Chiswick Ground with its excellent accommodation has enabled the games to be played in surroundings which have become quite familiar and homely.

It is hoped with an increased membership next season that the Contract Branch will secure the honours.

With the passing of Cricket, Football is already engaging the attention of those who have made preparations for the winter game.

The L.T.S. will run a team and invitations are extended to the staffs of all Contract Offices to join the section either as players or honorary members. Arrangements have been completed to rent a part of the War Office Sports Ground at Coombe Lane, Raynes Park, and the facilities offered include an up-to-date pavilion and baths. The Club has been accepted for membership of the Civil Service Football League, and arrangements are in hand for completing the fixtures for the 1927/28 season, which will include 22 League games.

The subscription rates, which are very moderate, have been fixed as follows:—

Playing members ... ... 10*s.* 0*d.* per annum.
Honorary members ... ... 2*s.* 6*d.* „

Prospective player members should make early application, as it will be necessary for them to be registered with the League before they are eligible to take part in competition games. Practice matches will be played before the season commences.

Applications for membership should be made to:—

Mr. J. A. Dickinson,
Development Section,
(K.D. 1A),
St. Bride Street.
Telephone, City 2000, Extn. 302.

Cricket.

The final of the London Telephone Service League fixtures took place at the Civil Service ground at Chiswick on July 26, when the Accounts Branch, the winners of the League, played The Rest. A very interesting game was witnessed by quite a number of spectators, amongst them being the Accounts Club's President, Mr. Stirling, and Vice-President, Mr. Bold.

Extra time was played in order to bring the game to a finish.

The Accounts lost by 8 runs after a very close contest, the score being as under:—

Accounts.		*The Rest.*	
H. B. Taylor, run out	10	F. Oliver, b. Taylor	2
R. Pick, b. Hodgekiss	8	S. H. Hodgekiss, run out ...	0
G. Moon, c. Oliver, b. Shepherd	20	F. Thomson, l.b.w., b. Moon ...	0
F. Young, b. Canham	10	F. R. Grove, b. Taylor ...	0
F. W. Smith, b. Shepherd ...	5	F. J. Crossley, c. Taylor, b. Young	19
E. Widdup, c. Canham, b. Crossley	18	J. Shepherd, l.b.w., b. Moon ...	6
F. Moyle, c. Cox, b. Crossley ...	0	W. Adams, b. Taylor	28
A. Edwards, b. Crossley ...	3	C. W. Gerrard, b. Moon ...	14
G. Lewis, not out	1	E. Hancock, c. Widdup, b. Taylor	0
C. Williams, b. Crossley ...	0	J. Evans, not out	10
C. Drabwell, b. Shepherd ...	0	R. Canham, c. Widdup, b. Moon	5
Extras	9	Extras	8
	84		92

Crossley took 4 wickets for 30 for the Rest, while Moon took 4 for 25 and Taylor 4 for 29 for the Accounts.

SECRETARY'S OFFICE CRICKET CLUB INTERBRANCH COMPETITION.

SEMI-FINAL.

Buildings and Establishment Branches v. *Mails Branch—At Chingford June* 20, 1927.

Buildings & Establishment Branches.		*Mails Branch.*	
Bray, c. Oakshott, b. Dickens ...	29	Appleby, c. Pearce, b. Hambridge	14
Scholes, c. Radice, b. Abramovitch	37	Andre, c. Peel, b. Newman ...	0
Newman, c. Radice, b. Dickens	5	Abramovitch, b. Newman ...	0
Peel, not out	84	Oakshott, b. Newman ...	4
Hanson, c. Wyles, b. Appleby ...	9	Tickner, c. Peel, b. Newman ...	0
Drew, not out	1	Dickens, b. Newman	0
Extras ...	8	Wood, c. & b. Newman ...	0
	173	Figures, c. Scholes, b. Hambridge	1
Declared for 4 wickets.		Radice, c. Scholes, b. Peel ...	13
Messrs. Garrett, Hambridge, Colyer, Pearce and Waters did not bat.		Wyles, not out	4
		Sellars, c. & b. Newman ...	0
		Extras ...	2
			38
		Newman took 7 wickets for 6 runs.	

Telephone Branch v. *Telegraph Branch—At Herne Hill, June* 21, 1927.

Telephone Branch.		*Telegraph Branch.*	
Cooper, c. Read, b. Hoare ...	12	Read, c. Watts, b. Beaton ...	48
Watts, c. Read, b. Hoare ...	12	Hughes, b. Wakelin	15
Richardson, b. Hoare	23	Hoare, c. Watts, b. Beaton ...	66
Wakelin, b. Hoare	24	Mallett, not out	10
Foster, lbw., b. Hoare... ...	28	Wright, not out	0
Bruton, b. Hoare	3	Extras ...	16
Fallon, b. Mallett	16		
Pugh, not out	16	Total for 3 wickets ...	155
Harrison, c. & b. Mallett ...	1		
Beaton, not out	3	Messrs. Roberts, Martin, Reeve, Long, Darby and James did not bat.	
Extras ...	13		
	151	Beaton took two wickets for 0 runs.	
Declared for 8 wickets.			
Mr. Simpson did not bat.			
Hoare took 6 wickets for 65.			

FINAL.

Building and Establishment Branches v. *Telegraph Branch—At Chiswick, July* 18, 1927.

THE weather was ideal and the pitch perfect. Some very good cricket was witnessed by those who were fortunate to get down. Some 40 members sat down to tea. The Buildings and Establishment Branches play the stronger game and won a very good match.

Buildings and Establishment Branches.		*Telegraph Branch.*	
Bray, c. Welch, b. Price ...	20	Read, b. Newman	37
Scholes, c. Read, b. Moore ...	1	Barton, c. Hambridge, b. Pearce	3
Newman, c. & b. Read ...	38	Hoare, c. Waters, b. Rixon ...	7
Hanson, b. Moore	13	Hughes, b. Newman	8
Rixon, b. Darby	16	Darby, run out	1
Garrett, b. Moore	5	Welch, c. Waters, b. Hambridge	1
Hambridge, c. Hill, b. Darby ...	10	Belgrave, b. Hambridge ...	7
Colyer, c. Welch, b. Darby ...	5	Moore, b. Hambridge	9
Pearce, c. Hill, b. Darby ...	6	Price, b. Newman	10
Waters, not out	9	Hill, c. Newman, b. Hambridge	8
Drew, c. Welch, b. Darby ...	2	Wright, not out	0
Extras ...	5	Extras ...	8
Total ...	130	Total ...	99
Darby took 5 wickets for 34 runs.		Hambridge took 4 wickets for 19 runs.	

INTERBRANCH CRICKET COMPETITION.