INDEX SUPPLEMENT.

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THE

Telegraph and Telephone Journal.

VOL. I. OCTOBER, 1914. No. 1.

CONTENTS.

A GREETING FROM THE POSTMASTER-GENERAL.

I AM glad to learn that a new departure is being made in, and a new journal added to, the literature of the Post Office. Your new venture will form a much-wanted link between the Telegraph and Telephone Services. The two Services have so much in common, both from the technical and commercial point of view, that it is essential there should be sources of information and means of communication and comparison open to the Staff of both Departments. Descriptions of new apparatus and of new methods of working will enable your readers to be in touch with the most recent discoveries or theories, and will afford full and free opportunities for all ranks to contribute from their own knowledge and experience to those discussions which are the precursors to the development of existing machinery or the adoption of new inventions. I trust that your journal will foster a spirit of good fellowship and healthy rivalry which should tend to the advantage of the Staff and Department alike.

C. HOBHOUSE.

DEVELOPMENTS IN THE SHORT DISTANCE TRUNK SERVICE.

BY J. STUART JONES.

THE 1st of February, 1914, unmarked though it may have been by the mass of telephone officials, was nevertheless a notable date in the history of the British Telephone Service. On that day a breach was made in the barriers which for nearly twenty years have separated the trunk telephone system from the local exchange system and a wave was set in motion which, before its force is spent, will work a great change in the telephone system of the United Kingdom.

The particular event which happened on that date was the commencement between the Liverpool and Manchester telephone areas of what the Americans, with their happy knack of creating picturesque terminology, describe as a "rapid-fire" telephone service, but which we more prosaic Britishers call a "junction" service, thereby implying that the exchanges in the two districts have been placed in the same relationship to each other as exchanges in the same telephone area.

Up to Jan. 31, 1914, telephonic communication between the two districts, like communication between any other two telephone areas, was hedged round by the ceremonials of the trunk system, ceremonials which were necessary results of the separation of the trunk system from the local exchange system arising from the purchase by the State of the trunk lines of the National Telephone Company in 1896. If a cotton broker in Liverpool wished to talk to a spinner in Manchester, or *vice versâ*, he had to ask his local exchange for "Trunks," he had then to pass to the trunk exchange the particulars of his own telephone number and the telephone number of the other subscriber, and then he had to possess his soul in patience until the trunk exchange rang and told him that he could have his call. It was seldom that he had to wait more than fifteen minutes even at the worst of times, but to the cotton broker anxious to secure orders, or to the spinner worrying about fluctuations in the Cotton Market, these minutes may often have seemed interminable, as minutes always do to an impatient caller.

These preliminary calls and waits have now been swept away. The cotton broker now gets into communication with the Manchester spinner as rapidly as—probably, as a rule, even more rapidly than—he can get into communication with his house in Wallasey or Neston, while the spinner in his turn finds communication with Liverpool as easy and as quick to obtain as communication with his golf club in the Manchester suburbs.

The "junction" service is not confined to the exchanges in the two cities. All the exchanges in each telephone area share the benefits of the improved service, and of these exchanges there are no less than 28 in the Liverpool area and 23 in the Manchester area. The main trunk arteries connect the Central Exchange, Liverpool,

with the Central and City Exchanges in Manchester, the details of the line provision being as follows :—

(1) Liverpool Central, outgoing to Manchester Central, 16 circuits, order wire working.

(2) Liverpool Central, outgoing to Manchester Central, 12 circuits, ringing lines for "lending" traffic from sub-exchanges in the Liverpool area.

(3) Liverpool Central, outgoing to Manchester City, 12 circuits, order wire working.

(4) Liverpool Central, outgoing to Manchester City, 8 circuits, ringing lines for "lending" traffic from sub-exchanges in the Liverpool area.

(5) Manchester Central outgoing to Liverpool Central, 15 circuits, order wire working.

(6) Manchester Central, outgoing to Liverpool Central, 8 circuits, ringing lines for "lending" traffic from sub-exchanges in the Manchester area.

(7) Manchester City, outgoing to Liverpool Central, 17 circuits, order wire working.

A group of sixteen circuits has been left between the trunk exchanges at Liverpool and Manchester to carry calls from the Liverpool or Manchester area, as the case may be, to exchanges beyond the other telephone area, and eight circuits connect the Manchester trunk exchange with the Liverpool Central Exchange.

In all 112 trunk lines now connect the two areas, as compared with the 64 lines which previously connected the two trunk exchanges. Ample provision is thus made for the increase of traffic which it was expected the accelerated service would bring, and it will be seen from the particulars of traffic which are given later in this article that this expectation is being fully realised.

The 88 trunk circuits connecting the Central Exchange at Liverpool with the Central and City Exchanges at Manchester are equipped in all respects as junction lines, the circuits being multipled on the A positions at the outgoing end and being led to B positions at the terminal exchange. The task of connecting up this large number of lines, which was placed upon the Engineering Department, was not only one of some magnitude but one of considerable difficulty as well, owing to the type of switchboard in use at the two Central Exchanges.

The work of the Traffic Departments at Liverpool and Manchester was no less onerous. Not only had the traffic conditions of each trunk route and of each junction route in the two areas to be closely investigated, and necessary adjustments made in the number of lines allocated to each route, but no less than 1,200 members of the operating staff had to be educated in the rules of trunk working. It says much for the efficient manner in which the work was done by both the engineering and traffic officers, and for the way in which the new methods were grasped by the operating staff that, from the date of commencement of the junction service, not a hitch has occurred to impede its smooth working.

The results achieved with the accelerated service have surpassed the most optimistic expectations. The caller has now merely to pass to his local operator the number of the subscriber in the Liverpool or Manchester area, as the case may be, with whom he wishes to talk, precisely as he passes a number for a local call, and, in the case of about 70 per cent. of the calls, the call is effected on demand, the average time taken from the moment when the caller lifts his receiver until the time when he is talking with the distant subscriber being only 57 seconds. Indeed, the average time taken in the case of calls between the main exchanges in the two cities is only 30 seconds. The business men of the two cities have not been slow to acknowledge their appreciation of the better service, but the voice of the grumbler is still heard. One or two persons have been heard to complain that the service is now too speedy, that they are "through" before they have made up their minds what to say!

About 22 per cent. of the calls cannot be effected at the first demand, owing to the engagement of the distant subscriber on another call, and they are effected later. The prior engagement of all the junctions serving outlying exchanges accounts for 3 per cent. of the calls being temporarily suspended, and only 5 per cent. fail to be effected because subscribers do not reply or from other causes.

The extent to which the public has appreciated the acceleration in the service is best indicated by the following figures showing how rapidly the traffic is increasing. For some years past the rate of increase has averaged 7 per cent. per annum. In comparison with this rate of increase the following figures are illuminating :—

AVERAGE NUMBER OF CALLS DAILY BETWEEN THE LIVERPOOL AND MANCHESTER AREAS.

Before commencement of new service.

Month.	Average daily number of calls.
December, 1913 ... ... January, 1914	2,163

After commencement of new service.

Month.	Average daily number of calls	Increase over average of December and January.
February, 1914	2,397	11.5 per cent.
March, 1914	2,440	13.5 ,, ,,
April, 1914	2,507	16.5 ,, ,,
May, 1914	2,530	17.7 ,, ,,
June, 1914	2,527	17.7 ,, ,,

It may be remarked that there was no alteration in the fee, and the remarkable growth can only be attributed to the attractions of the accelerated service. The fact that the June figures show no increase over those for May is probably due to the commencement of the holiday season.

As was indicated at the beginning of this article, the introduction of a "junction" service between Liverpool and Manchester marks the first step in a revolution of the short distance service. A similar service has since been commenced on the routes connecting Warrington with Liverpool and Manchester, and, more recently, between the Bradford and Leeds areas. Thereafter, the new type of service will come into operation in increasing rapidity as the months go by, on different routes throughout the country. Telephone cables are being laid in large numbers and exchange equipments are being extended to permit the introduction of junction working on all important short distance trunk routes.

We hope shortly to be able to publish a diagram of the plans which have been made for the development of the trunk service throughout South Lancashire. In all about 160 exchanges in this district are concerned, and the plans provide for a subscriber to any one of these exchanges being placed in communication with a subscriber to any other exchange on demand, with the rapidity which now obtains in the case of communication between subscribers to exchanges in the Liverpool and Manchester areas. Similar schemes are in progress for the district surrounding London, for the Birmingham district, for the Glasgow district, for West Yorkshire, in fact for all the important industrial districts. These schemes will necessarily take time to mature in their entirety, but, as the accelerated services come into being, they will confer an incalculable boon on the business community.

In past days the daily press has been much given to denouncing the alleged shortcomings of the British telephone service, and telephone officials have often wished that it were possible to give more publicity to the other side of the picture. This article concerns merely one phase of the telephone service, but it will indicate that the Post Office is not false to its stewardship.

THE SIEMENS' HIGH-SPEED PRINTING TELEGRAPH.

By F. Hird (*of Siemens Bros. & Co*).

The Siemens' high-speed printing telegraph is one of the latest machines of this class which has been produced, and it has already established itself as a great practical success in Germany. One of the reasons of this success lies in the extreme mechanical simplicity of the apparatus, which renders it little liable to derangement and very easy to look after.

The complete station consists of three main pieces of apparatus —namely, a perforator, a transmitter, and a receiver. The perforator is illustrated in Fig. 1, which gives a general view of it.

It would be outside the scope of this article to describe minutely the detailed working of the perforator, and it may be sufficient to say that each key of the keyboard is provided with a sort of selecting comb, which enables it to select the suitable electrical connections to the punching magnets which effect the perforations required for a particular letter. The actual perforation of the paper is effected by a series of punches, each of which is individually operated by an electro-magnet. It may be remarked that in this case use has been made of the principle of exciting each magnet as required by means of the discharge current of a condenser, because this has the advantage of giving just the kind of sharp stroke which is required for the purpose and the operation of the magnet is quite independent of the time during which a key is depressed.

Along each edge of the perforated tape there is a row of small holes, which are used for propelling the paper through the machine. The telegraphic signs are represented by perforations, which are punched in rows across the tape. Each sign consists of five current impulses: a perforation indicates a positive current, and the absence of a perforation a negative current.

The tape, having been prepared, is passed through the transmitter, whose function it is to give out in due succession the positive and negative current impulses for each sign. This apparatus consists of a small electro-motor geared to a suitable roller which serves to propel the tape. Corresponding to the five rows of holes are five contact levers, which are electrically connected to five insulated segments on a disc over which rotates a brush driven by the motor. By this simple arrangement it is possible to send out into the line an exact reproduction of the positive and negative current impulses, which correspond with the perforated tape.

A view of the transmitter is given in Fig. 2, and another view in Fig. 3, in which the cover has been removed so that the brush arm and divided segments can be seen. A small speed indicator will be seen in Fig. 2, which shows the speed at which the machine is running, and a sliding rheostat enables the speed of the motor to be readily adjusted.

The receiving apparatus is shown in Figs. 4 and 5. The receiver consists of a motor similar to that on the transmitter, driving a main shaft by means of gearing. This shaft carries a set of brushes arranged to pass over a disc of segment-shaped contacts, and it also carries a printing wheel on the rim of which the telegraphic signs are engraved. A printing magnet, which becomes energised at the proper moment by the discharge of a condenser, throws the paper tape into momentary contact with the type wheel when the required sign is opposite.

Here I may draw attention to the characteristic feature of this system, which differs from all other printing telegraphs which have yet been put into practical use, inasmuch as the type wheel is constantly running at a uniform speed, and the printing is done simply by striking the paper against the wheel at the moment when the desired letter is there. As the speed of the type wheel is often as high as 1,000 revolutions per minute, it would hardly be supposed that a clear impression could be obtained, and one would expect the letter to be blurred In fact, however, the use of the sharp condenser discharge causes the contact of the paper to be so short that the letter is clearly printed.

Fig. 5 shows a general view of the whole receiver, from which it will be seen that in addition to the above apparatus, there are two sets of five relays each, and a multiple switch driven by a small motor. To describe the actual method by which this apparatus succeeds in selecting the right moment for striking the paper against the wheel would require a somewhat long and technical explanation. We can, however, easily explain in general terms the principal functions which have to be performed.

The first necessity for the correct working of the apparatus is that the moving brushes of the receiver shall make the same number of revolutions as those of the transmitter, and not only so, but that both shall be in a corresponding position at any moment; in other words, the apparatus must be in synchronism and in phase. This is achieved by means of the actual signal currents themselves, which are so arranged that they may be received through any one of three different brushes on the receiver. If the receiver motor is slightly in advance, the current will be received through the first brush. If it is slightly behind, it will be received through the third brush, and if it is exactly in step it will be received through the second or middle brush. Relays which are connected to these brushes are arranged to slightly increase or diminish the speed of the motor by varying the resistance in its field. This is accomplished by means of the small motor before mentioned, which drives the multiple switch or field rheostat. This motor is controlled by the above-mentioned relays, and can run in either direction so as either to insert or cut out resistances in circuit with the field of the receiver motor.

The whole of this action is entirely automatic, and the operator has no duty to perform in order to bring the receiver into its proper synchronism and phase relation with the transmitter. When no perforated tape is being sent through the transmitter, an arrangement is made by which, nevertheless, one current impulse per revolution is sent, and this suffices to keep the receiver in syn-

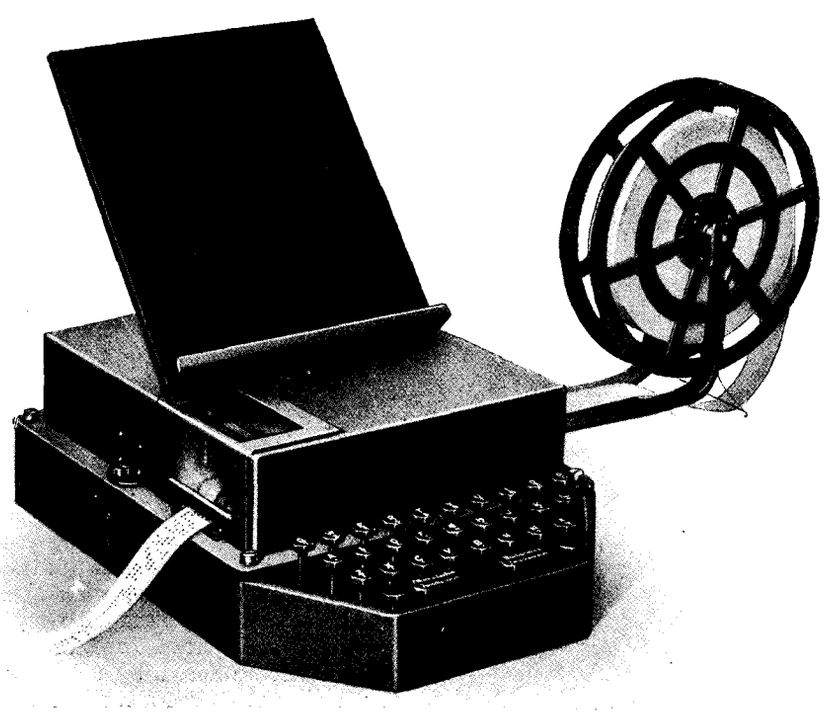

Fig. 1.—General View of the Keyboard Perforator.

chronism. The selection of the correct letter is effected by the combined action of five relays, which correspond to the five possible current impulses sent out in each revolution of the transmitter co-operating with the five segmented rings of the receiver over which the brushes are running. These are so arranged that for any possible combination of current impulses there can only be one position of the brushes (and therefore of the type wheel which is fixed to the same shaft), at which a complete circuit can be found. This circuit being found and completed permits the discharge of a condenser through the printing magnet. The reason why it is necessary to provide two sets of relays is that whilst one is occupied in selecting and printing the desired letter, the other is in use in receiving the current impulses and preparing the circuit for printing the next letter. The functions of the two sets of relays are alternately changed by means of two-way switches driven from the motor.

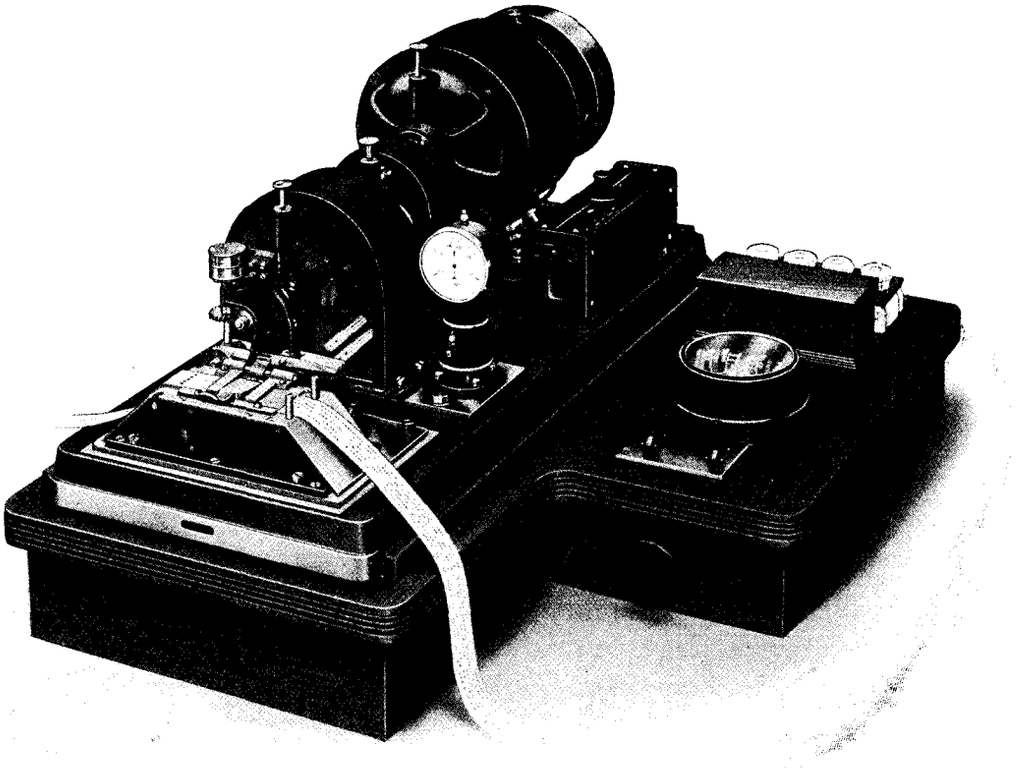

FIG. 2.—THE AUTOMATIC TRANSMITTER.

A more complete technical description for those who are interested in following exactly the working of the whole apparatus may be found in *Electricity*, Nos. 1,211, 1,212, 1,213, and 1,214, in which a full description of the whole method of working is given. I hope, however, that this short description with the aid of the figures will have sufficed to make the principle of the apparatus clear.

It may now be of interest to enumerate the points in which this apparatus differs from older types of printing telegraphs and the advantages which are claimed for it. The principal advantages are simplicity of construction, higher speed, and the fact that the speed can be easily modified to meet varying conditions in the lines.

As regards the first point, the greatest attention has been paid in the design of all the apparatus to avoid all difficult mechanical motions. The most complicated part of the whole apparatus is the keyboard perforator, and even this is much simpler mechanically than any of its predecessors. In the receiver and the transmitter the mechanical movements have been reduced to the utmost simplicity, since almost all motions are simple uniform rotations which, as is well known, are far less trying to apparatus than reciprocating or any other motions. The result of this is that the cost of maintenance is low, and that the apparatus is easily kept in good working order and requires very little attention on the part of those in charge.

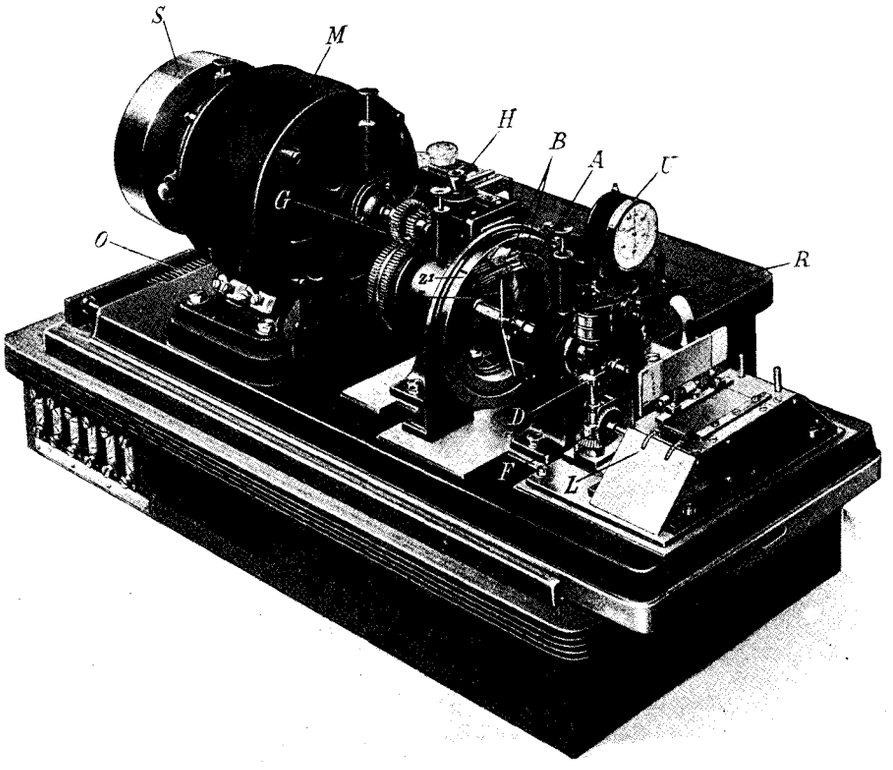

FIG. 3.—THE AUTOMATIC TRANSMITTER WITH COVERS REMOVED.

The speed of the apparatus has been fixed at a maximum of 1,000 revolutions per minute, and since one character can be, and is, telegraphed in each revolution, this gives a speed of 1,000 characters per minute. It may, however, often happen that line conditions will not permit so high a speed. In this case the speed is gradually reduced by the use of the regulating rheostats of the receiver and transmitter, synchronism being automatically maintained the whole time, until a speed is reached at which transmission again becomes satisfactory. This flexibility has proved in practice a great advantage, and is one which has not been offered by any previous forms of printing telegraphs, the speed of which is fixed so that if the conditions become too unfavourable it is necessary to resort to some other means of telegraphing.

The apparatus is capable of working duplex, and on long lines retransmission can be effected at an intermediate point or points, using similar methods to those used for the same purpose on the Wheatstone system. Attention may be drawn to one little detail of the transmitter, which has been found very convenient in practice—namely, that by lifting the spring cover which holds down the perforated tape it is possible to take out this tape sideways without drawing it right through. This enables a message to be interrupted at any time in order to substitute more urgent matter, or to permit of corrections, service messages, etc.

In the German telegraph offices where this apparatus is now largely used it is found that three or four

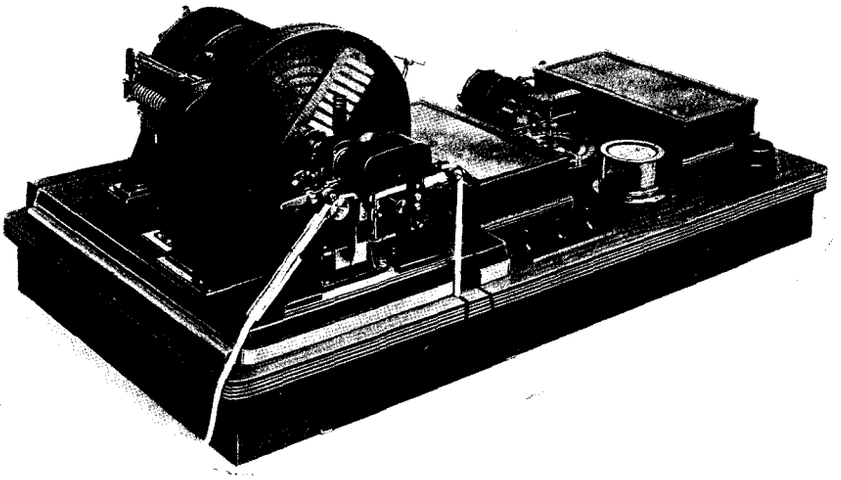

FIG. 4.—A VIEW OF THE RECEIVER.

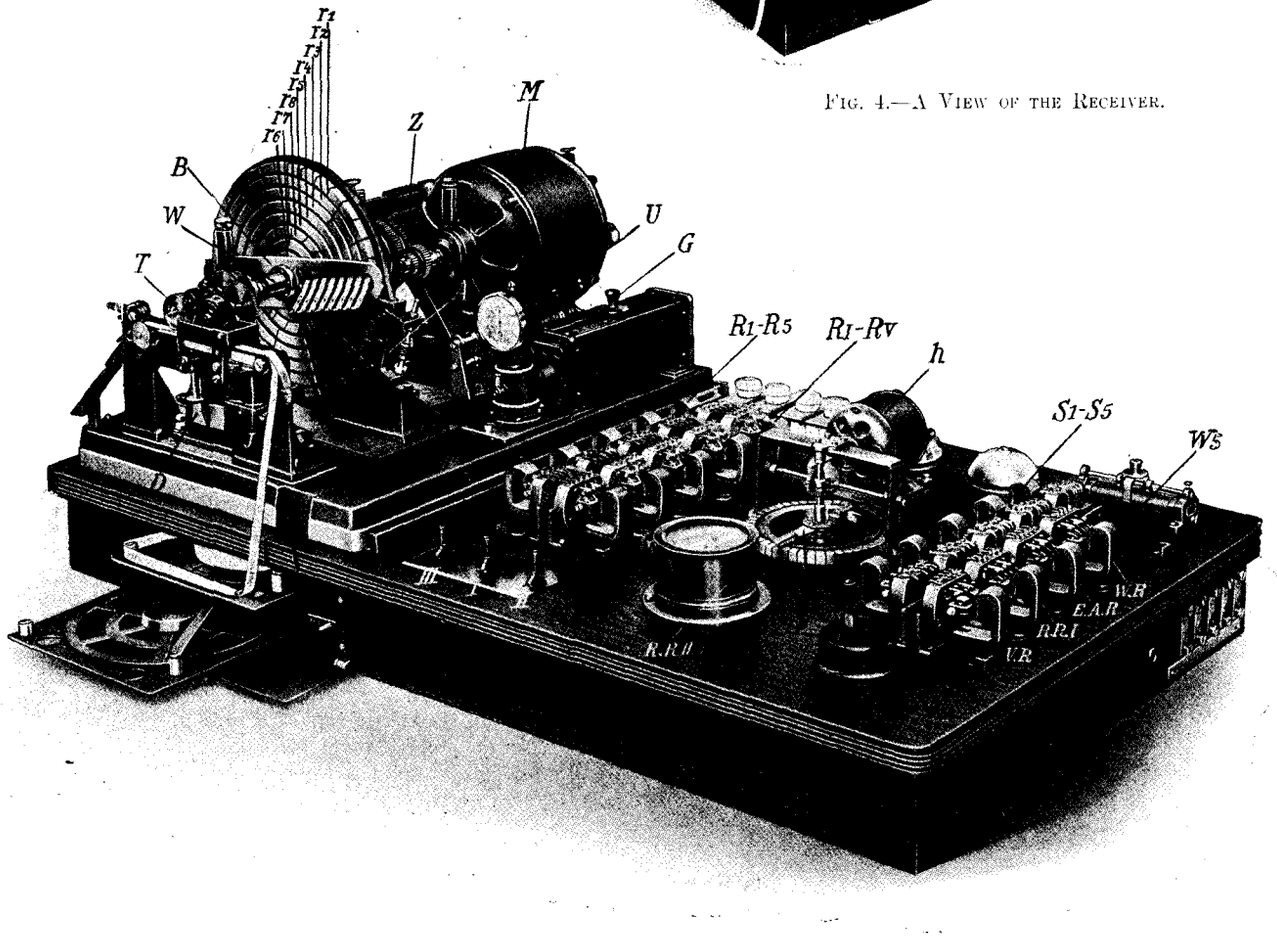

FIG. 5.—GENERAL VIEW OF THE RECEIVER.

keyboard perforators are on the average necessary in order to provide perforated tape for one transmitter. Each receiving station is provided with one extra perforator, which is used simply for corrections, service messages, and the like, and for no other purpose. This enables all corrections to be effected with the minimum of delay and trouble.

A considerable number of these high-speed telegraphs is at present in use by various Continental administrations, some of them since October, 1912. Many more are now in course of construction and it seems probable that within a very short time all the capitals and principal towns on the Continent will be connected by telegraph apparatus of this type. It has proved capable of working equally well on underground cable or on overhead lines, and seems less sensitive to line troubles than any other system.

THE PROPOSED POST OFFICE BATTALION.

NEEDLESS to say we wish the heartiest success to the proposal to raise a Post Office Battalion for the War, the first suggestion for which appeared in our contemporary *The Postal and Telegraph Record*. We read in their issue of Sept. 17: "If the opportunity arises, as we sincerely trust it will, we shall be prepared to find that the eligible men of the service will enthusiastically rally to the Post Office standard. If postal employes as a whole can manage to equip a battalion, it will make the pride of the service so much the greater."

With these words we are entirely in accord. We have already had a gratifying earnest of the eagerness of Post Office men of all ranks to serve with the colours.

THE JERSEY POTATO AND THE CREED RE-PERFORATOR.

By G. MOGG.

(*Photographs by F. N. Tipton.*)

BEFORE attempting an account of the telegraph work done on the Bristol-Jersey circuit during the potato season of the present year, it will be as well perhaps to make a passing reference to the methods adopted for the disposal of the very heavy seasonal traffic before the introduction of the gummed slip system some five years ago. Under the old system the messages were received by "Wheatstone," and the names of the addressees entered on the ordinary "R.D." slips by a telegraphist as the tape ran out from the receiver. The totals received were exchanged between the two offices at the end of each quarter of an hour, and much waste of time frequently occurred in checking and adjusting apparent wrong "totals."

The blue slips on which from one to three messages were recorded in the Morse code were broken off and placed singly upon hooks to await transcription at a period more or less late, according to the state of pressure that existed in various parts of the instrument room. Frequently, the hooks, some 30 in number, were filled with slips, and the vicinity of the Jersey circuit during the busy hours of the forenoon looked gay as a May-day festival.

It was a highly trying time for the supervisors, I imagine, in finding the necessary staff to cope with the rushes of work, and frequently single message slips were handed out for transcription to temporarily disengaged operators on some of the most important duplexed circuits in the office. Naturally, an improved system of dealing with the work became more and more needed, and eventually the "*gumming*" of slips to special message forms was given a fair trial.

FIG. 1.—STAFF EMPLOYED AT THE BRISTOL-JERSEY CIRCUIT, INCLUDING THE SUPERVISOR OF THE SECTION IN THE FOREGROUND IS THE CREED RE-PERFORATOR.

To add to the difficulties a comparatively large body of "stick" punchers had to be found to prepare perforated slips for the re-transmission of the messages, the bulk of which were for the Midlands and the North. With the introduction of the "Gell" perforator, the army of "stick" punchers was considerably reduced, while to-day by the aid of the "Creed" re-perforator, which prepares automatically the messages for forward transmission as they come, punching by hand has practically ceased. It can be readily imagined that a large amount of overtime was necessary to deal with the inward and outward Jersey messages under the old system, and much of this burden fell upon the late and night duty telegraphists, to the great dissatisfaction of many, for they felt, and rightly felt perhaps, that the brightest hours of golden sunshine should have been spent, whenever possible, far away from the precincts of the

FIG. 2.—SAME AS FIG. 1 BUT VIEWED FROM OPPOSITE END OF THE DESK. "GELL" PERFORATOR AND OPERATOR IN FOREGROUND.

post office. To reduce the amount of overtime in any class of work is immensely beneficial in all respects, and no more so than in the liberation of postal employees for the pursuit of pleasure on the cricket pitch, in the green fields and shady woodlands, or on the health producing links, where unlimited space exists for the abundant scattering of illuminating phrases—and turf—in most ancient and right royal fashion.

With the introduction of the "gumming" system in 1909, there was no longer need for the existence of slip hooks at the Jersey circuit, or for the handing out of message slips to operators in all parts of the instrument room. Needless to say, the arrival of the gumming apparatus and Gell perforators caused not a few to regard the new system, in some measure at least, as a menace to the occupation of the ordinary telegraphist, who took justifiable pride in his individual handiwork, and co-operated generously with the operator at the distant end of the circuit. Much could be written regarding the healthy rivalry that existed between man and man, and office and office in the days of the distant past, but many considerations forbid. To most of us, however, who in some matters are still radically conservative, let it be confessed in candid spirit that the introduction of more or less noisy apparatus for the transmission and receipt of telegrams by mechanical means, if not viewed with unalloyed alarm, is not appreciated immediately to the extent results appear to merit. In moments of retrospective thinking, leaden clouds of pessimism at times press heavily upon us, and we see more of the evils of the factory system, with its blight and desolation, than of its marvellous achievements in the path of enlightened progress. There exists in fact even at this distant date a poetic prejudice against the "father of the factory system," in that, besides inventing "Spinning Jenny," he bartered for gold the silken tresses of fair women, and shaved clean the faces of men in subterranean "saloons" at half the ordinary price. Also that this subterranean financier was publicly dubbed Sir Richard, and died a multi-millionaire, in reward of his business acumen. It seems difficult then entirely to free the mind of bias when writing

of the merits or demerits of up-to-date machinery in a modern telegraph office. Moreover, it is not easy while watching the course of quick-changing events to feel a full measure of enthusiasm, because the rhythmic roll of the expert "stick" puncher is giving way to the perfect clock-beat measure of the quicker "Gell" operator, who perhaps, never was, and never will be regarded as a true telegraphist; that the natural easy-flowing pencilled transcription of Morse signals yields to the stiff-set mechanical typewriter, with its lightning movements and uncanny rap-tappings; or that the finely judged signals resulting from the concentration of mind and wrist on the well-balanced Morse key are to be a thing of the past! The fact remains, however, that the "art" is fast disappearing, but who will be bold enough to deny that much necessary progress will be made by the aid of the machine, used judiciously? Every indication is apparent that manual labour, with its excessive wear and tear and ultimate dissipation of physical fibre is to be reduced in all paths of life to an essential minimum. Whether the machine *vice* or *versus* the man is for the ultimate good of the human element in the Telegraph Service remains to be seen. So much depends upon the spirit and attitude both of the administrators and the staff in such highly important matters, that it behoves each and all to seek mutual co-operation, and study the various changes from the point of view of those who desire them in the best interests of the general good, and for the progress and ultimate welfare of the Nation.

The Jersey potato season commences in the early days of May and usually extends to the end of June or the first week in July. During the height of the pressure, around the Whitsuntide period, the tablet returns indicate totals of from some 2,000 to 2,700 messages transmitted over the wire during a full day, Wheatstone duplex working being adopted daily from about 9 a.m. to 1 p.m. or later, according to the exigencies of the service. The make-up of the circuit is unique in many respects, and the wire is subject to many electrical variations. The distance from Bristol to Jersey is about 200 miles, along the route of the wire, a subterranean double-line cable connecting Bristol and Exeter; a single aerial line runs between Exeter and the coast via Dartmouth, and a long stretch of submarine cable thence to Jersey via Guernsey. The circuit is also relayed at Exeter to increase its working speed. The hours during which the circuit is most heavily pressed in both directions together are from 10 a.m. to 1 p.m., or 2 p.m., and during that period any electrical variations, which naturally occur chiefly in the aerial sections, make themselves felt detrimentally, and it is with reference to these hours chiefly that my remarks will be confined.

The texts of the bulk of the telegrams vary but little, and treat as a rule of the prices of potatoes, and of potato trade prospects generally. They are not, therefore, of a very complex nature. Further a large number of the messages are for the same addressees each morning, and the combined features render the work relatively easy to handle by a specialised staff of experienced telegraphists at the Bristol end of the circuit. Nevertheless, much excellent work is done every season on the circuit, and it is fairly evident during recent years that with improved organisation and additional, or improved apparatus, the working value of the circuit is being considerably improved; consequently the task of the operators, at least, is made less irksome. In the first place the merchants in Jersey have at last been prevailed upon to hand in a large number of addresses to be signalled to the delivering offices in advance of the texts. This arrangement should result in making matters easier generally, and in reducing the pressure during the busy hours of the morning.

At 6 a.m. daily Jersey commences to signal the "advance addresses," which have already been grouped in Jersey for circulation by Wheatstone via Bristol to Liverpool, Manchester, Leeds, Newcastle, Cardiff, and Brighton; and to Bristol for circulation in ordinary course to such offices as Reading, Oxford, Bath, etc.

The staff in Bristol comprises one telegraphist to gum the slip to distinctive message forms for ready reference, another telegraphist to check the addresses and enter briefly the particulars on the forms, and a third to take the perforated slips from the Creed re-perforator, fold them in the relative forms prepared by the gummer and checker, already mentioned, and distribute them to the various Wheatstone circuits. Practically the whole of the "advance addresses" are disposed of in this manner before 7 a.m., at which time the morning speed trials commence. As a general rule the circuit is free for the ordinary traffic at 7.30 a.m., and the third telegraphist arrives at that time to distribute the "Creed" slips to the appropriate circuits. The full complement of staff at the Bristol end of the circuit at 8 a.m. is six, including one key telegraphist and an expert "Gell" operator to deal with the traffic to Jersey. The standard speed laid down by the Engineer-in-Chief is 150 words per minute to Jersey, and 140 from Jersey; there being a slight reduction of speed for practical working to allow for exceptional electrical variations of the circuit that may from time to time occur. The transmitters at both ends of the circuit are motor-driven, to obviate the necessity of periodical winding-up, and to ensure, so far as possible, uniformity of speed in signalling.

On May 30 last, eight of the principal potato merchants in Jersey handed in 870 "advance addresses," this being a record number of the kind, and 244 of these were from the same sender and bore identical texts.

The text, together with the necessary preamble, was prepared some three or four times on the same slip in Jersey, and signalled

Fig. 3.—A Busy Corner of the Bristol Instrument Room. A "Creed" Printer in use on the Birmingham Circuit is shown in the foreground.

23 times to Bristol; the necessity for so treating the text being that a perforated slip of a single text would become worn, and the signals weakened by running it through the automatic Wheatstone transmitter many times. The preamble and text comprise some seventeen words, so that each time the text is signalled the operation may be regarded as equivalent to one telegram. An average of from seven to eight texts are received per minute, and the whole 244 messages were disposed of in about five minutes, so far as the Bristol-Jersey circuit is concerned. The signalling of the texts 23 times enables the gumming telegraphist to attach a text to each group of prepared addresses, and in this way ready reference is made possible in Bristol, in case corrections are asked for by offices to which the messages are re-transmitted by "Creed." The signalling of the texts a limited number of times also reduces delay by obviating copying in Bristol.

Corrections in "Creed" slips which may not be due to serious errors in Jersey, or to badly disrupted signals, are given by Bristol to avoid reference to Jersey where the pressure is most keenly felt. Every effort possible is made in fact to allow Jersey a free and uninterrupted run, and in the course of a day much time is saved by the specialised staff at the Bristol end of the circuit adjusting minor defects which naturally occur on a long wire worked at high speed.

On the date in question the texts of the 870 telegrams were

signalled 129 times only by Jersey, and occupied the circuit approximately twenty minutes altogether: but the texts were not all handed in at the same time, or in fact during the same hour

Fully 80 per cent. of these 870 messages were *re-transmitted* by "Creed," and as the average time taken to dispose of the "Creed" slips is well within the "ten minutes" period, the advantage of the system is apparent. It is interesting to find that with the use of the "Creed" apparatus, the special type of which worked eminently satisfactorily, the largest number of messages dealt with over the circuit in question for many seasons past was disposed of on May 30 last. Between the hours 7 a.m. and 8 p.m. the forwarded number from Bristol was 798, and the received number 1,670: the total for the whole day being 2,795. Jersey's forwarded numbers for the day amounted to 2,694, some 1,988 of which were received by Bristol: 82 per cent. of the total received up to 1 p.m. was re-transmitted by means of Creed slips.

On June 2, which date is believed to be a day of records for the Jersey Telegraph Office, the "advance addresses" for Bristol numbered 569, the texts of which were received 97 times. The total number of telegrams received from Jersey during the full day was about 1,890 out of some 2,819 handed in. Between the hours 7 a.m. and 1 p.m., Bristol received 1,554 messages including the "advance address" messages, and 78.4 per cent. were re-signalled from "Creed" slips. The percentage of "Creed" slip messages was relatively low owing to the comparatively large number of single messages for re-transmission to small offices.

With the "Creed" system of working the Bristol-Jersey circuit the labour of heading the forms is considerably reduced; thus one experienced telegraphist does the necessary work. Further there is very little copying of "batch" telegrams to be done, an operation which used to entail no little labour and caused some delay in Bristol. The grouping of the telegrams is now done in Jersey, and the ultimate results of the change will no doubt serve as a guide to future developments of the system. On June 5 the "Creed" apparatus was not in use, owing to a broken spring, which could not be replaced locally, and the following brief records made at the circuit at the time may not be uninteresting.

The receiving telegraphists were hard pressed during the hours 7 a.m. and 1 p.m., and 1,300 telegrams were received from Jersey out of about 1,700 handed in. Jersey, however, was clear of forwarded work soon after 12.30 p.m., and, owing to the exceptionally good working of the line, there being but few electrical disturbances on the date in question, the maximum delay in Jersey was much reduced; 362 "advance addresses" necessitating the signalling of 58 separate texts were received, and during the busiest hours, 10 a.m. to noon, Bristol received 705 messages, including 65 of the "advance addresses," requiring seventeen texts, and a very large number of "batch" telegrams which had to be copied in Bristol. The additional labour of a large amount of "stick" punching followed, with increased delay, and the disadvantages of the ordinary working, so far as Bristol was concerned, was obvious. In order that a fair idea may be formed of the working of the "Creed" system on a representative day, after the "Creed" apparatus had received a prolonged trial, the following summary of the practical working during the busy hours of June 10 is submitted:—

Time.	No. received.	No. of Creed messages.	Percentage of Creed messages.	Average per operator.
8 to 9 a.m. ...	171	160	93.5	42.7
9 to 10 a.m. ...	189	162	85.7	47.2
10 to 11 a.m. ...	196	156	79.5	49.0
11 to 12 a.m. ...	267	210	78.6	66.7
12 a.m. to 1 p.m.	137	102	74.4	34.2
Average per hour for 5 hours ...	192	158	82.3	48.0

In the received totals, column 2, the numbers indicate equivalents, *i.e.*, after due deductions have been made in respect of the "advanced address" telegrams.

The following table represents traffic comparisons between the present season and last season's work during the periods indicated:—

	To Jersey.	From Jersey.	Total.
May 5 to June 14, 1913 ...	16,826	39,900	56,726
May 4 to June 13, 1914 ...	20,336	44,119	64,455
Increase in 1914	3,510	4,219	7,729

ST. MARTIN'S.

OUR old friend *St. Martin's le Grand* appears this quarter as an issue of particular value. It has articles on Sir A. F. King and Mr. E. Crabb, both of them revealing an intimate appreciation of our late chiefs. In speaking of Mr. Crabb the writer gives us an interesting *obiter dictum*. He says that "Of public economy there are but few supporters now." Perhaps our views of economy have changed a little. Mr. Crabb was a disinterested and eager chief, whose loyalty to his office and kindliness of heart in his personal relations merit the appreciation of the writer. "The Post Office Wireless and the World" discovers the expert hand of Mr. R. W. Hatswell, and there is a charming nautical article on "The Cruise of the Kalos." As usual the list of promotions and retirements is admirably complete. It has its sad side, but lovers of the Post Office magazine turn to it with unvarying interest.

POSTAL ORDERS.—REDUCTION OF PRICE.

WHAT an opportunity was lost by our colleagues on the postal side in not advertising the withdrawal of commission on postal orders. Just think of our up-to-date commercial methods and grieve that we missed seeing every post office in the country placarded to the following effect:—

"Great reductions in the price of postal orders at all our branches. Buy now at reduced prices. All sizes to suit all purses. No such opportunity since their introduction in 1881. Lay in a stock for the next 33 years."

STRIKING IMPROVEMENT IN THE TELEPHONE SERVICE.

CERTIFIED BY "PUNCH."

Extract No. 1. July 1, 1914.

"To step lightly to the telephone, ask for Charles's number, get the wrong one, ask again, find that he had gone to his office, ring him up there and get through to him, was the work of scarcely 25 minutes."

Extract No. 2. July 15, 1914.

"Posted at Ventnor, Isle of Wight, on July 14, 1904, a postcard has just been delivered at the Grapes Hotel, Cowes. The recipient is said to have expressed the opinion that it would have been quicker almost to have telephoned the message."

Extract No. 3. July 29, 1914.

"*Inspector*: Stand back, Clarkson; this job requires thought. (*Takes up telephone receiver.*) Circus 20,634. Miss . . . That you, Doc.? Come round at once, please. Two or three men shot. Right. (*Hangs up receiver.*)"

A HANDY-MAN.

THE Post Office is so constantly subjected to adverse criticism that perhaps you will permit me to give two examples of the obliging nature of postal officials. Both of them occurred in Liverpool during the past week. I had occasion to "express" a letter to London, and as I was beginning the complicated process whereby one telegraphs to the Metropolitan postmaster to have the letter received by special messenger at the station, and so on, the total cost of which in this instance was 1*s.* 9*d.*, the clerk in charge courteously pointed out that as I was in time for the ordinary morning mail I could compass the same end by merely having the letter "expressed" on its arrival, whereby I should save 1*s.* 5*d.*, and I was naturally pleased to adopt his suggeston. Then a day or two afterwards a prepaid telegram arrived at my house while I was at business. My wife was out, and a maid was in charge, with a nine-months-old baby in her care. The maid recognised the message's urgency, and wished to reach a telephone to get my instructions. To leave the house under the circumstances was undesirable; to take the baby with her was impracticable. The telegraph boy gallantly solved the dilemma by taking charge of the baby for a matter of ten minutes, during which period, I was given to understand, his uniform was the subject of her profound approval.—*Liverpool Daily Post & Mercury.*

AUTOMATIC TRAFFIC DISTRIBUTION.

By William J. White. *Exchange Manager, Central Exchange, London.*

Even as the issue of the first number of this journal marks the commencement of a new chapter in the history of the Telephone Service, so does the introduction of Automatic Traffic Distribution indicate the beginning of a new phase of Telephone Traffic.

The question is one of absorbing interest to all classes of telephone workers. For the telephonist the system provides a means whereby the physical and mental strain is considerably reduced. The officer in charge of an exchange is to a large extent independent of violent traffic fluctuations or errors in distribution, and traffic superintendents can co-ordinate staff and traffic requirements by a mathematical process which is hardly more complicated than a sum in simple division.

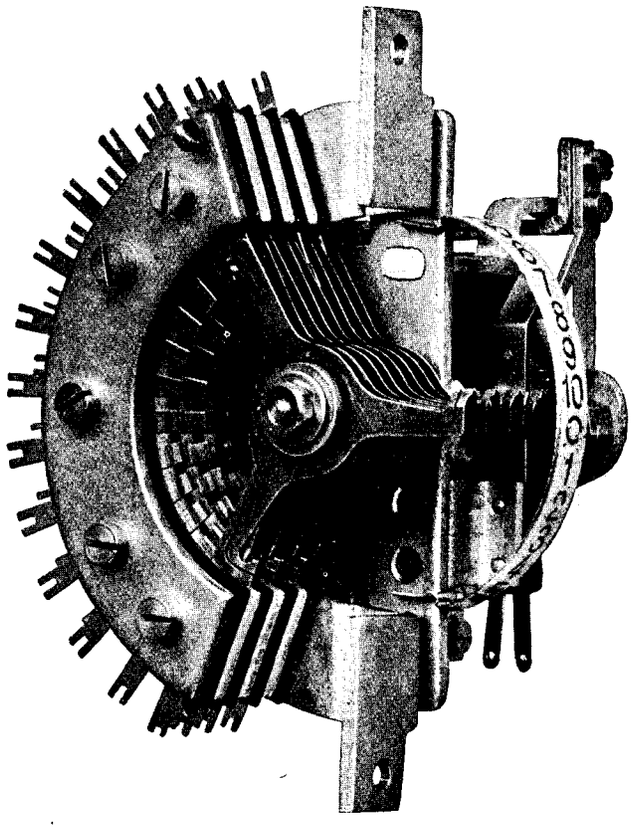

Fig. 1

Automatic Traffic Distribution is a generic term and covers a considerable field of telephone practice. The distribution may be the allocation of subscribers' calls over a team of telephonists or even over the whole staff of telephonists working on A positions. Again, the traffic of a multiple order-wire group may be distributed over the B telephonists operating that group, or, to go to the other extreme, a single B telephonist handling the traffic of a number of small exchanges connected to her position may be connected with each exchange in turn by means of the automatic mechanism. There are also other developments which call for something more than passing mention as, for example, the automatic distribution of trunk calls to Record telephonists, and similarly the distribution of telegram calls to phonogram operators, and further the application of the principle to large auxiliary groups of subscribers' lines; and the possibilities of adapting the principle to the requirements of straight order-wire working must not be overlooked.

In a journal of this character the editorial limitations of space do not permit of a study of the various systems that have been designed for automatic distribution. Up to the present there are some half-dozen systems in practical operation and apparently each efficiently serves the purpose for which it was designed.

The principle underlying all forms of automatic traffic distributions is that it shall be possible by electrical mechanism to bring a moving set of contacts into connection with another set of a series of stationary contacts until the desired conditions are obtained. In order to fix our ideas we will take the rotary selector designed by Messrs. Siemens Bros. as an example.

A view of this selector is shown in Fig. 1. The stationary contacts are fitted on the semi-circular bank, and the tags for joining the wires will be seen projecting on the left-hand side. The moving set of contacts is the three-armed portion at the centre, and the construction of the contact will be apparent from an inspection of the figure. The object of having three arms is to ensure the elimination of delay. As soon as the moving contacts of one arm have broken connection with the last set of stationary contacts, the contacts on the arm following at once make connection with the first set of stationary contacts. It is obvious that if only one arm was employed delay would be introduced to the extent of the time required by the single arm to move round from the last set of stationary contacts to the first.

The numeral to which the spare arm is pointing is the number of the stationary bank contact which is at that instant in connection with the rotary contact.

Briefly the operation of the selector may be described thus. It is required to distribute automatically subscribers' calls amongst a team of operators. Each subscriber's circuit would be connected with the moving arm of a selector, and the circuits of ten or more A operators would be connected with the respective sets of stationary contacts. As soon as the subscriber lifted his receiver to make a call, the driving mechanism would be brought into operation. The moving arms would commence to revolve and make contact in turn with each of the operator's connections. As soon as a disengaged operator was found the driving mechanism would be cut off and the subscriber and the disengaged operator would then be put into communication.

The practical side of automatic distribution consists in the adaptation of the principle already enunciated to the various requirements of telephone practice. It is proposed in this article briefly to consider a few cases where the principle has already been put into operation and the results that have been obtained.

Split Order-Wire Distribution.

There are few, if any, split order-wire positions in this country that are worked as economically as they should be. I might perhaps qualify this somewhat sweeping statement by a slight variation and say that there are few order-wire positions having two or more order-wires connected that are carrying the same load as a straight order-wire position.

The objection will at once be raised that such a statement is absurd, as the youngest student of telephone traffic is aware that for every additional order-wire on a position a due allowance has to be made in the load to compensate for the increased difficulty in working. With the ordinary conditions of working this is so, and it is perhaps desirable to explain in support of our contention that with automatic traffic distribution split order-wire positions can be worked under the same conditions as regards load as straight order-wire positions. Therefore, when such facilities are available the present methods of working split order-wire positions can only be described as the reverse of economical.

The chief difficulties associated with the working of split order-wire positions are two. The grouping of sufficient exchanges to secure a proper load, and the low transmission efficiency due to

the connection of the order-wires in parallel. An example of such a group, with the corresponding traffic, is shown in the following table :—

Circuit.	Length of circuit in standard miles of cable.	No. of junctions in group.	Busy hour traffic.
Bromley Central ...	15.0	8	120
Enfield ,, ...	11.0	4	60
Finchley ,, ...	9.5	7	70
Purley ,, ...	13.5	4	40
Sutton ,, ...	—	4	50
Total			340

A group such as this forms a combination which it would be impossible to work under the ordinary conditions, but with automatic distribution excellent results have and are still being obtained.

Reverting for a moment to Fig. 1 and the accompanying explanation, we have now to realise that for split order-wire distribution the conditions are reversed. The Central B operator's connections are now associated with the moving arm, while the order-wires from the five exchanges are connected with the alternate or odd numbered contacts on the stationary bank. If the operator at an exchange, say Bromley, depresses the order-wire key then the moving arm rotates until it makes connection with the contacts of the Bromley order-wire, and the operator at Bromley is then able to pass the demand. Similarly if an operator at Purley depresses the order-wire key, the moving arm again rotates until it reaches the contacts proper to the Purley order-wire, and the B operator at Central is now in communication with the A operator at Purley. In other words the B operator—represented by the moving arm—hunts over the stationary bank to find the order wire on which a call is waiting for her.

That there may be no doubt in the minds of the distant A operator as to when they are in a position to pass the call, arrangements are made for a tone test to be placed on the order wire so long as communication is not possible. The cessation of the tone signal indicates that the connection is established and that the demand can be passed.

So long as one or more order-wire keys at an exchange are depressed the B position operator will remain connected with that exchange even though order-wire keys at other exchanges are being operated. As this is undesirable, in so far as it might result in the holding by one exchange of the order-wire to the exclusion of the others, a system of lamp signals combined with a "transfer key" has been provided. If the B operator is connected to Bromley and an operator at Finchley desires connection, a lamp associated with the Finchley order-wire lights in front of the B operator. The latter then operates the transfer key. The Bromley order-wire is then disconnected for a brief interval and the moving arm rotates until the Finchley contacts are reached. The B operator is thus, by means of the transfer key, in a position to distribute any delay, due to traffic pressure or otherwise, equally over the whole of the order-wires connected to that position.

As only one order-wire at a time is connected to the B position the difficulties of defective transmission due to the connection of several order-wires in parallel is overcome. This fact should prove of special advantage not only in London where the small exchanges, which must occupy split order-wire positions, are all on the outskirts of the area, but also in those cases where District Managers have in view the provision of a "no delay" trunking service between adjacent towns and a big centre. The provision of the automatic selector will enable a number of small groups to be worked on the order wire principle and probably permit of a considerable decrease in the number of positions now necessary.

The results obtained show that, with five order-wires connected with one B position fitted with automatic selection, loads of 400 calls per hour can be handled without any strain whatever on the operator. As this figure is greater than that usually maintained over straight order-wire positions the advantages of the system are apparent.

MULTIPLE ORDER-WIRE DISTRIBUTION.

Where the traffic between two exchanges, or local traffic between the A and the B sides of such an exchange as Central London, is sufficient to warrant the provision of several order-wires, the distribution problem with the ordinary manual system becomes difficult. As a beginning a somewhat rough and ready division of the A operators amongst the B telephonists may be made, and final adjustments arrived at by a process of elimination. As an alternative, an elaborate record of the traffic can be made and the distribution effected on the results of the record. The success of the arrangements is not only dependent on the accuracy with which the distribution has been effected, but it also depends on the observation of the instructions by the telephonists and on their carrying out the arrangements. For example, if the first order of a group is allotted to twenty telephonists, and, owing to the fact that a somewhat indifferent operator is in charge of it, these twenty telephonists are from time to time forced to try other order-wires in order to dispose of their traffic, the net result will be a certain amount of confusion and overloading on other order-wires of the group, with a consequent reflex action on other A operators who will have to go on more than one order-wire in order to obtain a junction. Further results so far as the B telephonist is concerned are :—

(*a*) Tendency to allot junctions in advance of connection.

(*b*) Wrong numbers.

(*c*) Inability of A operators to distinguish the junction assigned to their demand.

(*d*) Triple connections due to failure to test properly.

There are other defects, but I will refrain from adding to the list as these will more than suffice for our purpose.

With the automatic system of distribution of traffic on multiple order-wire groups it is not possible to overload the B operator. Breaking in by A telephonists disappears, as once the A telephonist secures connection with the B operator she retains it as long as she chooses to keep her order-wire key depressed, and at the same time prevents any other A operator obtaining access. Further, the selection of the disengaged operator being automatic, the loading of the B telephonist is equalised and no A operator can single out a particular B operator for special attention. There is therefore no tendency to allot junctions in advance. The liability to wrong numbers is lessened. Each A operator has the line to herself and can keep it until she is quite clear as to the junction assigned, and the B operator can take what time is necessary properly to test the circuit before making the connection.

Referring once more to Fig. 1, there is a similar pre-selector in connection with each A operator's position. The head-set connections of the B operators are connected with the stationary bank contacts of the selector. Depression of the order-wire key by the A operator starts up the pre-selector, which proceeds to hunt over the contact bank until it finds a disengaged operator, when connection is immediately established. The A operator receives a tone signal as long as the B operator is not connected and, once connection is established, can hold the order-wire as long as is necessary by keeping the order-wire key depressed.

The system has been given a thorough trial extending over some eighteen months and has proved very successful. Its chief merit is that it allows the B positions to be closed without upsetting the distribution, as the traffic is always distributed equally over the staffed positions. The "cleaner" working possible with the apparatus enables the full standard load of 500 calls per hour to be reached on all positions during the busy hour, and a load of 400 calls per hour can be maintained during the whole working day without strain on the operator.

The results of the experiments show that a saving of 15 per cent. on the B working costs can be secured by the introduction of automatic distribution on multiple order-wire groups.

AUTOMATIC DISTRIBUTION OF ORIGINATED TRAFFIC.

I approach this subject with a certain amount of hesitation on account of the lack of definite experimental results. The

following criticisms represent only my opinions on the matter, and while I have little doubt that they will be more than confirmed by the practical results, yet they are offered with reservation.

The distribution of subscribers' traffic can be effected in the same manner as the distribution of multiple order-wire traffic. A number of subscribers' lines are connected not direct with operators' positions but with automatic switches. The latter distribute the calls as they occur to the disengaged operators of a particular operating group. The size of the group is governed by the design of the switches, and may extend in number from three or four to the total number of A operators in the exchange.

Let us imagine then that each subscriber's line is connected with the moving arm of a pre-selector and that the stationary contacts are connected with calling lamps on the operators' positions. The subscriber lifts his receiver. The pre-selector starts to hunt over the contacts on the stationary bank until it finds a disengaged lamp on a disengaged operator's position. The selector stops, the calling lamp glows, and the call is then handled by the operator in the usual way.

The number of operators to which the subscribers can have access is limited by the number of contacts on the stationary bank. The latter is circular in form and the number of contacts that can be fitted is therefore a measure of the diameter of the circle. It follows from this that the number of operators can be as large as we please, and it is only necessary to determine what is the best number of operators to which a subscriber should have access in order to secure the best results.

From mathematical considerations of probability the chances of a subscriber's securing a disengaged operator increase considerably as the number of operators increases. As the traffic decreases, it is possible to make "busy" one or more of the positions and distribute the traffic amongst the remaining operators. By distributing the traffic over the whole of the exchange, a more simple form of apparatus will probably suffice for the requirements. Therefore, on theoretical considerations, the best form of automatic distribution is one whereby the whole of the subscribers have access to each of the A operators.

Desirable as such operating conditions would be, it is somewhat doubtful if they would work well in a telephone service. In an ideal telephone service every operator must work at the recognised standard of efficiency in order that the standard can be maintained and a satisfactory service given. It appears to me, therefore, that in a service where excellent, very good, and good service are rewarded precisely alike, and where there is very little hope of reward for even super-excellent services rendered by the individual to the administration, there will undoubtedly be a deterioration towards that minimum of excellence compatible with an absence of complaint or liability to censure.

This evil may to some extent be combated by the cultivation of a spirit of competition and enthusiasm. The spirit of competition is not looked on with favour, for reasons that are obvious. The spirit of enthusiasm is good, but controlling officers who can maintain enthusiasm amongst a large staff over periods extending into years are almost as rare as the reward given for such gifts. The only remedy for mediocrity therefore is supervision, and as the necessary corollary to the latter, the power on the part of the controlling officer of fixing responsibility for bad work on the particular officer responsible.

The difficulty of fixing responsibility when trouble has occurred with a particular call is often a matter of some difficulty. The team system of working does not improve matters in this respect, and with a system of automatic distribution where the call can be handled by any of the A operators in the exchange the association of a particular operator with a particular call becomes impracticable.

A suggested solution of the difficulty is that the distribution should be confined to teams or divisions, and that the supervisor in charge of the team or division should be the officer responsible to the Exchange Manager for the standard of efficiency in that particular section. By means of comparative statistics, the section efficiency can be demonstrated and the natural disposition to excel, which is inherent in everyone, will supply the necessary stimulus for working each section up to the proper standard.

A review of the telephone traffic statistics of the past ten or twelve years affords a striking illustration of the improvement in the service that has been given to the subscribers. In no single particular has the service deteriorated, and on the whole the service of to-day is from 50 to 70 per cent. better than the service of ten years ago.

This improvement can be traced to many causes, but the improvement in the actual type of operator is not one of them. Like the immortal *Punch*, operators never are what they used to be, and as the older operators are never tired of the repetition of this assertion, we are constrained to accept it. But if the operator, *per se*, has not improved, great advance has been made in the facilities at our disposal. From magneto to the original common battery system, lamp signalling, machine ringing, and keyless junctions, we have now arrived at keyless and testless junctions with automatic clearing. Finally, we have automatic traffic distribution with all its possibilities, many of them at present dimly realised but soon with experience to be put into actual operation, and beyond this, so far as we can at present conceive, nothing but the advent of the complete automatic system, when the human agency which now assists the subscriber to the completion of his wishes shall be eliminated. The adaptation of the present systems to the new developments presents a task at once onerous and fascinating, and of the ever-changing and absorbing developments of telephone work the workers may with truth exclaim "*Tempora mutantur, nos et mutamur in illis.*"

OUR ABSENT COMRADES.

(AUGUST-SEPTEMBER, 1914.)

EACH day they leave us, one by one they go
To distant shores unknown, perchance to stand
Some in grim battle's front before the foe,
Some guarding our dear land.

They have exchanged the pen for sword and gun,
The postbag for the knapsack, and a life
Of cultured, sane activities for one
Of stern and shattering strife.

They go, O irony! to stay the spread
Of that *Kultur* of which the world is sick,
A culture marching over mounds of dead,
Stained by *Welt-Politik!*

They go, our comrades, valiant ranks to fill,
Not in the lust of conquest of new lands,
But to avenge a Neighbour's wrong which still
Unexpiated stands.

They go that Europe never more shall be
Of nightmare-scenes the bloody theatre,
That in a Land, de-Prussianized and free,
Its truer soul shall stir.

They, following Britain's proud traditions, serve
With other dauntless hosts who will not fail
To keep the sword unsheathed, and never swerve
Till their just cause prevail.

W. H. G.

REVIEWS.

WE propose in future issues to assign a column to reviews of books. We shall be glad to receive for the purpose any works relating to telegraphic and telephonic questions, regarded either from the technical, economic, or political point of view.

The Telegraph and Telephone Journal.

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Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

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

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All correspondence relating to advertisements should be addressed to MESSRS. SELLS, LTD., 168, *Fleet Street, London, E.C.*

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OUR JOURNAL.

WHEN our JOURNAL was projected in the spring-time of the year, many troubles and difficulties of the Transfer had passed away. The Telephone Service was becoming adapted to its new conditions and its new organisation. Its union with the Telegraph Service had been happily inaugurated. No one could doubt that the time was opportune for the establishment of a more general and far-reaching means of securing that interchange of ideas and that community of spirit which is necessary for every successful service.

Now that our JOURNAL has taken actual shape the sudden war-storm has broken over our heads, and we find ourselves faced with problems and possibilities beside which the problems of our Telegraph and Telephone Services seem to shrink into insignificance. The football field and the golf course are deserted. Music and the drama appeal to scanty audiences, and all the lesser interests of life have lost their influence in the stress of the appeal which patriotism and freedom make on every inhabitant of these islands.

Someone may say, how under such conditions is the production of this JOURNAL necessary or useful? To such we answer that the continuance and efficiency of our Telegraph and Telephone Services are as necessary now as they have ever been to our national success; that the steadfast performance of our special duty is of national importance, and that we shall be better, and not worse, prepared to answer the utmost call of our country in other directions if we continue in the faithful execution of our ordinary work, even to the same point as the brave telephone operator of Etain, of whom we read on another page.

The JOURNAL will help us to do this and to do more. The units of our Telegraph and Telephone Services are scattered over the length and breadth of the country, and are hedged round by a larger Postal organisation. The individual worker knows only the restricted limits and results of his own efforts. He knows little of the work even of others like himself. Like the soldier in the modern widespread battle it is hard for him to realise the aims or the achievements of his commanders. The soldier, however, has the excitement of the battle to inspire him. The peaceful secluded worker has no such stimulus and his mind is apt to be dulled by the monotony of daily routine. To those who are in such a position we offer fresh interest in descriptions of the larger movements, and of the new developments of the Services. Every member of the staff will be able to get a general insight into the working and administration of his Service which he could never obtain in the ordinary course of his duties. By a comparison of the results of his own work with the experiences of others engaged in similar work his attention will be aroused and his powers of observation stimulated. Gradually also he will come to see the relation of his own duties, however unimportant and uninteresting they may seem, to the general working of the system. It is true of the Telegraph Service, and still more of the Telephone Service, that each consists of a huge network of interrelated parts of which no single part can fail or lose its efficiency without causing a reaction on every other part.

Our pages will be open to every member of the staff who has something to say which is worth saying, irrespective of his or her rank or position. We do not desire merely to deal with those subjects which appear to be of special importance. There is no part of our work which can be considered unimportant or insignificant. The records of real experience and of faithful observation will always be valued and no one need hesitate to send us a contribution because he fears that the subject may be dismissed as too trifling if it contains the results of his real knowledge and insight. It often happens that the people who can tell us the most interesting things do not do so, because they imagine that the ideas which their daily work has impressed on their minds must be obvious to every one, and because they do not see how essential for the success of some large branch of work an accurate knowledge of the facts of some apparently simple detail may become. The success of our Telegraph and Telephone Societies in London and elsewhere has shown how much added interest can be gained for the work of daily life by the interchange of thought and experience amongst those engaged in the various branches of our Services.

A telephone journal is no novelty. Those who were readers of *The National Telephone Journal* in the past know how much good service it did in promoting sympathy and co-operation among the members of the Company's staff. Our JOURNAL aims at doing no less, but it will work in a wider field. The Telephone Exchange Service is expanding year by year. It is now united with the Trunk Service as a single organisation, and the Telephone Service

as a whole now works in close relation with the Telegraph Service. The action and reaction of the ideas and influences of the two Services must have an important effect on both, and the fostering of this influence will be one main object of our JOURNAL. We shall not interfere with the work of other Post Office periodicals. We shall not deal with technical subjects from an Engineering standpoint. When such matters are touched upon the subject will be to illustrate the practical manipulation of plant or the organisation of traffic. *The Post Office Electrical Engineers' Journal*, of which as a Department we may be proud, must remain the recognised exponent of engineering subjects. The historical, biographical, and literary side of the Post Office, now so pleasingly dealt with in the pages of *St. Martin's le Grand*, will still remain the peculiar field of that magazine. The appearance of our JOURNAL will not we believe cause the loss of a single subscriber to either of these excellent periodicals. On the contrary the increase in the unity of the Post Office Service which it is our aim to foster will bring added support to all kindred movements.

In another direction we hope for useful results from our JOURNAL. It is notorious that one chief difficulty of a Government Service is that its work is open to much misunderstanding and misapprehension which it is difficult to meet. The individual members cannot speak with authority, nor can the Administration officially enter the arena of public discussion. The JOURNAL will carry to the outside world sound information as to the work we are doing. It will enable the Newspaper Press to form a better opinion of its merits and to give a better account of it than is possible now with the material at their command. Finally, we hope that many copies of the JOURNAL will find their way to the Colonies, to Foreign Countries, and to the United States, and may bring us in return contributions from the Telegraph and Telephone Services of those countries and the benefit not only of their experience but also of an increased good will on the part of our colleagues in kindred Services.

A. M. OGILVIE.

TELEGRAPHS AND TELEPHONES AND THE WAR.

SOME of us thought, in our innocency, that the close connection of nations by means of telegraphs and telephones had made war impossible. We knew that international finance depended largely on these means of communication ; we knew, too, that international trade and barter were the more sensitive and adaptable to human needs because purchasers and sellers, however widely apart, were thus kept in momentary association. Of all the telegraph offices in the world the Berlin Head Telegraph Office seemed to give the best evidence of this. Mr. NORMAN ANGELL would have been thrilled a few months ago in one corner of that office to see telegraph instruments busily working to London, Paris, Vienna, Copenhagen, Stockholm, St. Petersburg, Moscow, Bucharest, Constantinople, and Rome. It was a visualisation of the world's commerce. It was a visualisation of international co-operation. Possibly no other telegraph office could so represent the interdependence of nations, for Berlin had the telegraphic and telephonic advantage of geographical position. So it is a sad irony that from Berlin the word came that the interdependence must be shattered. One may try to reconstruct in the imagination that same corner of the great office as it is to-day. Maybe the Wheatstone to Constantinople, and the Baudot to Vienna are working. But of the rest, most of the wires are silent.

While international telegraphy and telephony were thus crushed, domestic telegraphy and telephony came suddenly to be the foremost servants of the nations. The time is not yet ripe to state in what way our crafts served the needs of our country. The ramifications of the arrangements which were suddenly required to meet this and that emergency are probably grasped in their fullness only by one mind in the Service. The rest of us have had our divided and devolved responsibility. But it can be said that the brotherhood—and the sisterhood—more than rose to the occasion. There were heavy withdrawals of those of our fellows who were called upon for active service, the men of whom we all think, hour by hour, with especial tenderness. Those of us on whom this privileged responsibility did not fall had our own loyal contribution to make. There was a heavy strain on us all. It is not the time for an appreciation of the way in which we bore the burden, for there are burdens yet to be borne and sacrifices yet to be made. Maybe it is the time to say that the Telegraph and Telephone Services faced their extended duties unshrinkingly. There was a closer co-operation between them. There was a closer co-operation between the different sections of each Service.

The war has deepened the spirit of brotherhood in the nation. To that deepening a tribute has already been paid in those journals which deal with national life on a plane wider than our own. For ourselves, the fraternity of telegraphy and telephony, the war already has brought, amid its many sorrows and calls for sacrifice, a vision of a spirit of co-operation of which many of us have dreamed in days long past. Our organisation is not without its imperfections ; there are misunderstandings yet to be cleared away. Admitting these facts with the frankness which, we trust, will ever characterise these pages, there is a wistful spirit abroad among us which looks for a closer mutual spirit, for a transfusion of the older spirit of distrust, for a readiness to accept suggestions and to make suggestions, for the fostering of the ideal of constructiveness rather than the passion of fault-finding, for the building-up of a true craft which will have in it the elements of social solidarity as the foundation of a real efficiency. Those of us to whom the duty of directing this journal has fallen are anxious that it shall have some influence in fostering this development. It may become a common ground for the discussion of those subjects which are the primary life-interest of the two Services. It may become the organ of interchange of enlightenment, whereby administration may be based on the widest possible assembly of information, and whereby that information may be distributed so that all may share it. Economic theory has been broken into fragments. It may equally be true that sociological theory is similarly shattered. In the coming reconstruction, in which the nationalised industries may be expected to take a leading part, it is our fervent hope that we may be permitted in these columns to make a contribution of some

little worth, and none the less is it our hope because we strive to face our own problems without prejudices and without particular interests.

THE TELEPHONE DEVELOPMENT OF THE WORLD.

A SOMEWHAT melancholy interest attaches to the article which we publish in another column giving statistics of the telephone stations of the world at the beginning of 1913, and more especially to that part of it which gives the incomplete figures for Europe for 1914. These figures which came to hand before the outbreak of the War are nevertheless sufficient to enable us to form an idea of the telephonic development of Europe at the beginning of the present year, and, unhappily, there seems to be every probability that they will represent the high-water mark of that development, in some of the great States at least, for a long time to come. There is, moreover, little likelihood that official figures from many of the countries concerned will be available for some years, and what systems will then be included in the returns of the present administrations must remain a matter of conjecture.

The number of telephone stations in Europe on Jan. 1 of this year was probably 3,900,000, distributed as follows :—

Germany	1,420,888
Great Britain	774,229
Russia (estimated)	360,000
France (estimated)	310,000
Sweden (estimated)	237,000
Austria-Hungary	229,650
Denmark (estimated)	130,000
Switzerland	96,624
Italy	94,796
Norway	83,850
Netherlands	78,743
Belgium	51,009
Other countries (estimated) ...	10,000

We have also received official figures relative to Japan, Egypt, South Africa, Canada, the United States (the Bell and allied systems), and Argentina ; that is, for all the principal telephone-owning countries, except Australia, outside of Europe. A fair idea of the total number of telephones in the world can thus be arrived at :—

Europe	3,900,000
Asia	310,000
Africa...	58,000
North America	9,720,000
South America	170,000
Australasia	173,000
	14,331,000

Europe's heavy arrears which under happier conditions might well have been expected to diminish steadily are little likely to do so within the next few years. We may, however, hope that when the time comes for the arts of peace to be once more pursued with full vigour by a new Europe, the development of the telephone will not lag behind.

THE TELEPHONE AND TELEGRAPH SOCIETIES.

IN the near future we ought to see a great extension of the work performed by the Telephone and Telegraph Societies throughout the country. The practical fusion of the Telegraph and Telephone Services is an accepted policy, and the two staffs will need constant intercourse in order to ensure an interchange of views and the full realisation of one another's difficulties, without which the combination of the two great Services cannot be carried to a successful issue. Neither Service is going to swallow the other, and neither staff is going to benefit at the expense of the other ; but whole-hearted co-operation must enhance the efficiency of both Services, and will thus materially benefit the business communities of this country. In these circumstances it is hoped that efforts will be made to form Telephone and Telegraph Societies in those districts where such organisations do not at present exist. Under the aegis of Mr. GILL, the Telephone Societies flourished exceedingly ; but, during the stress preceding the telephone arbitration, Mr. GILL's enthusiasm was to some extent deflected from them, and in the changed conditions brought about by the transfer of the National Telephone Company's business to the State and the subsequent transfer of the engineering work to the Superintending Engineers, most of the smaller Telephone Societies came to an end. But, with the wider interests of telegraphs and telephones, stronger and more enthusiastic new societies should spring from their ashes. The strictly technical problems can safely be left to our colleagues on the engineering side and to their successful institution and its *Journal* ; but engineering questions with their mysterious symbols and wonderful diagrams are not the only serious problems which face us in connexion with the development of the Services, and it behoves those who are not on the engineering side of the Post Office to study the problems of development, organisation, traffic, operating methods, contract department methods, tariffs, etc., so that the so-called commercial side may not fall behind and hamper progress on the engineering side. There are funds available at headquarters for assisting the formation of new societies, and any applications for monetary assistance for such purposes will be favourably considered. Help in other ways will always be readily afforded by headquarters' staff. Grants in aid are also given to existing societies. It may interest readers to know that the London Telephone Society was reorganised last year with a view to including in its purview both telegraph and telephone subjects. The experiment was a huge success. The membership roll rose to 778, and the lectures were given before large audiences, including members of the Institution of Post Office Electrical Engineers, who were the welcome guests of the society. The arrangements between the society and the institution under which a member of either organisation was entitled to attend the lectures of both, were so well received that in the coming session similar arrangements have been made between the society and the London

Telephonists' Society, which latter society boasts of a membership of 589, and is second to none in its enthusiasm.

It would be well in this first number of the JOURNAL to give the following particulars of the Telephone Societies which existed during the 1913-14 session :—

Name of Society.	No. of Members.
The Telephone and Telegraph Society, Brighton ...	49
,, ,, ,, Douglas ...	28
,, ,, ,, Glasgow ...	366
,, ,, ,, Liverpool ...	113
,, ,, ,, London ...	778
,, ,, ,, Northampton	22
The London Telephonists' Society	589
The Southern (London) Engineering Society ...	75

OUR FUTURE.

THE TELEGRAPH AND TELEPHONE JOURNAL will attempt to cover the whole ground of telegraph and telephone development, not only in the United Kingdom, but throughout the world. Articles are in hand on various systems of automatic telephony, on new inventions in telegraphy, such as the Murray Printing Telegraph and the Western Electric Printing Telegraph, on new improvements of manual switchboards, on applications of the automatic principle to manual working, and on developments of superposition of telegraphs on telephone circuits. Every effort will be made to ensure that the articles are authoritative, and yet written in direct and non-technical language.

HIC ET UBIQUE.

Telephony recently devoted an article to the drawings, diagrams, and arabesques which a man is wont to execute on a blotting-pad or elsewhere whilst he is waiting at the telephone for a call to mature. The habit is almost universal, and even the most staid, sober-minded, and unartistic persons are given to it; whence *Telephony* is driven to attribute its prevalence to some sort of microbe called in the American language the "telephone bug." The question was rashly referred to an "alienist" who is said to have "recognised it at once." Happily, so far he has invented no name for this aberration. A witty modern French writer said that alienists were as ingenious in the invention of new mental maladies as the ancient theologians were in the invention of new sins. Our most innocent tricks of manner, fantasies, and whims are seized upon as diseases of the mind and labelled with terrifying scientific names, and we are fortunate if we are not stigmatised as incipient criminals.

THE following is a good story from the *Manchester Guardian*, and is said to be authentic :—

A complaint was received from a subscriber, who may be described as Southern 6666, that he was constantly being called up by mistake for the well-known firm of Blankleys. The allegation was sufficiently surprising, for the firm in question rejoices in a single number on a different exchange. The line was, however, placed under observation, and it was noted that the number was called for several times a day by a subscriber with an unmistakably masculine voice, which was usually answered at 6666 by one as unmistakably feminine.

Under such circumstances the connection was always effected without a hitch, but it was observed that when, as occasionally happened, the "Hello" at 6666 was given in gruff and businesslike accents, it was invariably met by the ingenuous query "Is that Blankleys?" with the result that after a violent repudiation the 6666 receiver was furiously banged on its hook. After waiting a few days till the procedure was well standardised, the officials decided that their observation might be relaxed, and forwarded to the aggrieved subscriber the diplomatic intimation that "The trouble appears to arise from causes beyond our control."

The story, besides being amusing in itself, throws an interesting light on the "wrong number" question. It is by no means uncommon for subscribers who have by mistake asked for the wrong number to let the indignant called subscriber attach the blame to the operator, but here we have a type of case where a right number is given and the subscriber is allowed to think he is called in error while the odium of the mistake falls on the Post Office.

ONE of those original geniuses who always rise to the occasion with invaluable suggestions in cases of national emergency has offered the following proposition to the *Observer* :—

"Might I not suggest," she writes, for it is a lady, "that every subscriber to the telephone in England, Scotland, Ireland, and Wales should be asked to contribute 1*s.* towards the fund."

We have no desire to stay the flow of contributions to the Prince of Wales's admirable fund: we only wonder why the suggestion is limited to telephone subscribers. Why not include subscribers to circulating libraries, shootings, and societies for the suppression of something or other? Why not include the possessors of gramophones, grand pianos, garden-hose, hat-racks, hen-coops, and Dalmatian dogs?

AMERICAN business men are reported to be exercised in their minds about the annoyance caused by the interruption of personal interviews by a telephone call from a third party. "The telephone, it is said" (we quote from the *Telephone Engineer*), "has no respect for any man, no matter what he is doing or how he may be engrossed. Persons get instant access over the telephone who would not get recognition in the ante-room. The remedy proposed was to refuse calls when receiving visitors."

Here we meet a very old friend in a not particularly new guise—the invasion of privacy by the telephone. We thought he was disposed of long ago. Most business men who possess an "ante-room" possess also an extension telephone, and need not be interrupted unless they wish. If a man is engaged on business of a particular nature he can very properly refuse to take up a call, and can ask his correspondent to ring up again. Of course a long distance call, involving some expense to the caller, would be entitled to special consideration; but, for the rest, the application of some method and common sense would overcome the supposed difficulty.

THE following figures will give some idea of the activity of the service during the events of the past two months. Between the commencement of the War crisis and Sept. 19, 245 direct exchange circuits, 262 internal and external extensions, 87 private wires, 48 telegraph circuits, and 65 pieces of subsidiary apparatus were provided in Government offices by the London telephone service. Instruments to the number of 89 have also been removed from one position or address to another. As might have been expected the War Office has made the heaviest demands for special services, and accounts for 44 per cent. of the total with 112 exchange circuits, 100 extensions, 52 private wires, and 23 telegraph circuits. The Admiralty is responsible for 26 per cent. of the total.

In the Canterbury district (comprising all the county of Kent, with the exception of Tonbridge and neighbourhood and the south-eastern suburbs of London) no fewer than 125 lines have been provided as emergency circuits in connexion with the crisis.

IN future issues we hope to include notes of news from different offices, and in the next issue to begin with the Central Telegraph Office. We hope that these notes will indicate the developments of telegraphy and of telephony at the various centres, so that officers and offices throughout the kingdom may be in more close touch with each other.

ECONOMISING ON SENTIMENT.

THE telegraph operator rapidly ran his pencil over the message handed him by the lady: "Dearest John,—Glad to say I got here safely. Send me ten pounds and a kiss." "Three-halfpence more, madam," he said "There are three words too many." "Then leave out the last three," replied the lady, promptly.

SIDELIGHTS ON WAR.—SOME INCIDENTS AT HEADQUARTERS.

THE European crisis at the end of July led to great activity at headquarters, especially in connection with the telegraph and telephone services. Many high officials were practically in attendance continuously for days together; the rest of the staff were ready and willing for any work at any hour; couches were commandeered for snatches of rest; and at least one officer is stated to have secured a few moments of oblivion stretched on the hearthrug. When, if ever, the whole facts become known, the country will realise that the Post Office staff were not behindhand in their patriotism or self-sacrifice. A strict censorship of foreign telegrams was necessary and, when the work became too heavy for the clerk-in-waiting normally on duty, other headquarter officers under the control of Mr. Ferard were summoned by telegraph on Sunday afternoon Aug. 2, and some of them worked right through the night at the Central Telegraph Office. As a matter of routine the dust of the Central Telegraph Office was swept over them at intervals, which created such a thirst that the announcement of breakfast at 7.30 a.m. was greeted most enthusiastically.

The telephone lines between London and Paris and London and Brussels were closed to commercial traffic, and their use reserved for Government communications and for communications between the Embassies of our Allies. The inland trunk lines were called upon to carry double the normal traffic, and the operative staff nobly answered to the calls which were made upon their energies.

Considerable difficulties have been involved in the collection of telephone revenue owing to the financial situation created first by the crisis and then by the moratorium, and it is certain that the work of collecting outstanding rentals, etc., will loom large in district offices for months to come. Other difficulties of a different nature arose through the Aliens' Restriction Act and the Regulations made thereunder, by which it was laid down that a subject of a country at war with England, *i.e.*, an alien enemy, should not be allowed to possess a telephone installation without the written permission of the aliens' registration officer, the chief officer of police in the district. It was obviously not desirable to disturb the telephone service of all alien enemies, many of whom were enemies only in law and in name; and it was the object of the Post Office and Police authorities so to administer this law that legitimate business was not throttled. This object was achieved without risk of danger to the State; and it is thought that in the great industrial districts very little disturbance of facilities was experienced. In one case, however, where the circuit of a German consul was withdrawn at the request of the police and the subscriber was subsequently imprisoned, the following letter was received three weeks afterwards:—

"Will you please let me know per return certain when I may expect my telephone communication to be reinstated again.

"Kindly note that I must have your reply *per return certain*."

The portion in italics was underlined by the writer. It is regretted that, owing to the necessity of referring to headquarters for instructions, the writer did not get his reply by return, and that the reply when it did arrive must in his view have been eminently unsatisfactory as it simply referred the writer to the Police authorities, who still had the principal of the firm in durance vile.

General instructions were given that telephonic conversations in the German language or languages which the telephonists could not distinguish from German were to be terminated at once, and, although such disconnections gave rise to some difficulties, the reasonableness of the instruction was generally recognised.

Under the Proclamation as regards the Defence of the Realm, Naval or Military officers were empowered to order "lights out" in certain districts and "inhabitants in." In these cases it was necessary to make such preparations as would enable the telephone and telegraph services to be carried on as usual during such emergencies, and these arrangements were made with the co-operation of the Naval and Military authorities and the Office of Works.

Colonel Ogilvie, the Director of Home Signals, is in supreme command of the telegraph and telephone arrangements for the War Office, and, aided by officers of the Secretary's Office, the Engineer-in-Chief's Office, and the Central Telegraph Office, some of whom were given brevet rank in the Army for the purpose, he was responsible for the successful way in which those arrangements were carried out.

At the present time it is difficult to touch on these subjects without revealing matters which might perhaps better be left in obscurity, but perhaps enough has been said to show that there was plenty of enthusiasm in the telegraph and telephone services of this country.

AUTOMATISM IN TELEGRAPHY.

THE extensive adoption of high-speed systems, in all of which the automatic element is conspicuous, has given support to the view that the art of the telegraphist is one requiring simply manual skill rather than judgment and general intelligence. Each new invention seems to proceed a step further than its predecessor in destroying the basis of the claim that in telegraphy the trained ability of an expert is indispensable. Wheatstone's automatic system showed that the function of the time-consciousness which produced the correct duration of dots and dashes in manual telegraphy could be more accurately performed by mechanical means. Murray's system added a typewriter-keyboard to the perforator, thus dispensing with a knowledge of a special telegraph alphabet. Similarly the mechanical means adopted by Messrs. Creed, Bille & Co., by which translation from perforated slip was effected, reduced to a minimum the necessity for expert knowledge of the Morse code. In this respect it accomplished for high speed what Professor Hughes had long before introduced in a low-speed system. Baudot, however, represents a contrary movement, in that his system requires a mastery of a complex code and a correct time consciousness, elements which make the human factor of importance. Siemens and Halske revert to the principles on which the main advance has been accomplished, and both in transmission and reception dispense with a knowledge of special codes, the function of the ordinary operator being limited to an acquired dexterity in typing and gumming. There is no reason to suppose that the ingenuity of inventors has exhausted itself, and the rapidity with which new systems are being evolved would indicate that automatic telegraphy is still in its early stages. It is therefore opportune to consider the effect of these important changes upon the art of the telegraphist, and to estimate the mental qualities likely to be required in the future.

Prior to the transfer of the telegraph systems to national control, and for many years thereafter, in most large telegraph offices there were a certain few individuals who by reason of special gifts and training were enabled to transmit and receive telegrams at an abnormally high rate of speed and, in some cases, without apparent effort. That operators of this class have diminished in number is a fact hardly to be questioned. The cause of the evident decay is frequently discussed, but without arriving at any general agreement. Whether it is to be attributed to changes in methods of selection for entrance into the service, to changes in the system of tuition, or to the greater variety of instruments now employed, is still open to question. The main fact, however, remains undisputed that an aristocratic few were recognised as being peculiarly adapted to the career of a telegraphist, and that this class has diminished in number.

Those who were acquainted with individuals of the type described will, no doubt, recall their qualities, which, taken quite generally, were versatility and adaptability, powers of concentration, tenacity, endurance, discrimination, and memory of sounds (frequently accompanied with a musical taste), and to these were added suppleness of wrist and manual facility. In addition to these requirements, judgment and general intelligence were necessary to supplement the defects of broken signals and to avoid errors. With the extension of cross-country channels and the introduction of switching systems the opportunities for sustained and rapid operating decreased. A number of operators of varying capacities were aggregated and given in alternation the task of co-operating

with an equally heterogenous selection of telegraphists in offices having traffic of varying proportions, from the small rural town to the large seaport. The qualities which were useful in the previous era were no longer acceptable. In such circumstances the tendency was bound to be towards a reduction of output to the capacity of the weakest members. Unfortunately, the necessity for cultivating other qualities was not fully recognised, and instead of encouraging a growth of co-operation as between telegraphists working jointly, and discrimination in the allotment of circuits to the most suitably qualified, the expectation was indulged in that without any attempt to organise concentration in a specially appropriate way, the best results would be attained by a continuance of the former individualistic spirit. This lack of special organisation has been partly made good, but there is still scope for a clear and well-defined method of utilising switching systems to the best advantage. It is obvious, however, that to obtain the best results qualities are required in the staff which have not yet been fully exhibited. These may be characterised as the social element in telegraphy, the willingness to co-operate, the enthusiasm to extend service beyond the purely narrow groove of one circuit, the desire to assist a neighbour, a switch-clerk, or distant weakling: and the spirit of goodwill generally. Unless these qualities predominate, switching systems labour under serious disadvantages.

With the advent of high-speed systems fresh requirements are introduced. The expert telegraphist is in no sense more valuable than anyone else when assigned to a modern typewriting system. To gain dexterity in typing or gumming it is necessary to utilise the tendency of the nervous organism to acquire automatic actions. Given powers of concentration and a plastic nervous equipment, the merely manipulative art can usually be acquired without great difficulty. This is not, however, the only important element. The qualities mentioned as social are indispensable to success in high-speed working, and, since the traffic carried is heavy, stoppages and hindrances are more serious than in individual telegraphy. It is in the cohesion between the members working the system that success lies; and to secure this, intelligence, enthusiasm, and spontaneity are essential. To say that there is an automatic element in telegraphy is merely to class it with every other form of human activity. The orator in his sublimest utterances, the statesman in his deepest problems, the scientist in his most profound researches, employ many actions which from habit have become purely automatic. Judgment and intelligence are required in initiating and utilising each series of automatisms, and in a precisely analogous way the modern telegraphist must be possessed of these higher qualities if he is to be fitted for his vocation. LARA.

DAY OF NATIONAL INTERCESSION.

AN interesting service was held at St. Andrew's in the Wardrobe on Friday, Aug. 21, the day appointed for National Intercession for the War.

The Rector, the Rev. P. Clementi-Smith, very kindly arranged a special service for the convenience of the Telephone staff at 5.30 p.m. All ranks of officers attended from the Controller downwards, and several members of the Engineering staff were also present.

The singing, which was led by a choir formed of young ladies from the three exchanges in G.P.O. South, was excellent. The hymns were—

"Oh God our help in ages past," "For those in peril on the sea," and "Give peace in our time O Lord."

The service was very devout and impressive, and the thanks of the staff are due to the Rector and organist of St. Andrew's for enabling them to join in the intercessions of the Nation.

THE TELEPHONE AND TELEGRAPH SOCIETY OF LIVERPOOL

THE following is the programme of the above society for the 1914-1915 session:—

Oct. 13	...	"The Elements of Wireless Telegraphy," by Mr. G. C. Marris.
Nov. 10	...	Ladies' Night: 10 minutes papers on any Telephone or Telegraph subject.
Dec. 8	...	"Some Aspects of Postal Work," by Mr. W. W. Young.
Jan. 12	...	"The Future of Machine Telegraphy," by Mr. John Lee.
Feb. 9	...	"Contract Work and Development Studies," by Mr. O. G. Lee.
Mar. 9	...	"Statistics," by Mr. Eustace Hare.

THE TELEPHONE STATIONS OF THE WORLD AT THE BEGINNING OF 1913 (WITH SOME STATISTICS RELATING TO 1914).

BY W. H. GUNSTON.

I.

THE following tables, it is believed, present as accurate a summary of the telephonic development of the world as it is possible to obtain up to so recent a date as Jan 1, 1913. The chief difficulties in the way of obtaining precise statistics are the reluctance of many private companies to furnish the required figures, and, even where that reluctance does not exist, the practical impossibility of approaching the thousands of small companies which operate telephones in the New World. There is a further difficulty to be met in the divergencies in the dates on which the financial years of different countries end. Some administrations for instance furnish statistics of their telephone systems as at Dec. 31, some at March 31, others at June 30, others again are only able to give the figures for the preceding year; so that even in Europe, Asia, and Australasia where precise official figures are tolerably easy to obtain, a slight element of inexactness necessarily enters because estimates have, in a few cases, to be resorted to in order to place all the figures on a common basis. These cases however form but a negligible proportion of the total, and it is satisfactory to note that one's estimates of previous years have been substantially justified by official figures subsequently obtained.

Several causes combine to render the tables which I have compiled for 1913 more accurate than those which I have prepared in previous years. The first and most important is the publication of the quinquennial census of telephones in the United States. This disposes of the greatest difficulty encountered in estimating the number of telephones in the world, because if the figure for North America (which contains three-fourths of the total for the world) is some thousands out, which may easily be the case when it is arrived at by estimating on the basis of probable increase and by the piecing together of information derived from companies in the United States, the estimate for the world is sensibly affected. Other causes are the availability of later and fuller figures for the Russian Empire, of an American consular report giving precise figures for the whole of South America, and of official information as to the Northern African States.

EUROPE.

Table I shows the number of telephones in Europe and the proportion of telephones to inhabitants. When allowance is made for the fact that last year the whole of the telephones in the Russian Empire were included in Europe, it is seen that there was an increase of about 400,000 telephones in Europe between January 1912 and January 1913. As already stated, fuller information than heretofore was obtainable respecting *Russia*, the stations of leased, local, and private wire systems being now included. These swell the total to over 309,000, inclusive of telephones in Finland, but even excluding these there was an increase in Russia of some 50,000 stations. The systems owned by Swedish companies in large cities of Russia are well developed. St. Petersburg has 46,842 stations, Moscow 43,348, and Warsaw 28,935. Riga possesses more telephones than either Marseilles or Lyons.

The increase of the number of telephones in *Germany* in 1912 was 121,770. There are at present no fewer than nineteen cities and towns in the German Empire with over 10,000 telephones.

The development of *France* outside of Paris is extremely poor, but there was an increase during the fifteen months following January, 1912, of 24,000 telephones. No city other than the capital possesses 10,000 stations, and only Lyons, Marseilles, and Bordeaux possess more than 5,000.

Austria increased her stations by 18,000, a large increase on a total of 127,293 telephones. In *Sweden* the increase was also nearly 18,000 or 9 per cent.

The increase in Great Britain was 32,000 after making allowance for an Inventory Adjustment made in September, 1912, by which the stations appearing in the books were reduced by 3,100. It should, in addition, be borne in mind that the real increase of the telephone system is not shown by the net addition to the total stations. A process of weeding out duplicate telephones, necessitated in several towns by competition which is now dead, has been going on slowly for several years. The number of telephones in Glasgow for instance has, apparently, actually declined since 1910 for this reason; and if the same process were applied to Sweden and the United States a remarkable diminution in their annual increase would in all probability be seen. Great Britain is only second to Germany in the total number of stations operated, and possesses in all eleven urban telephone areas containing upwards of 10,000 telephones.

The figures furnished for Finland related to 1911, and estimates have been employed to show the position at the end of 1912.

The figures shown in brackets in the following tables are those relating to Jan. 1, 1914, which have up to the present come to hand. It may be estimated that the number of telephones in Europe at the beginning of this year was about 3,900,000.

Table I.—Europe.

Europe.	No. of telephone stations. Jan. 1, 1912.	No. of telephone stations. Jan. 1, 1913.	Population (thousands).	Population per telephone.
Denmark	107,153*	119,398*	2,757	23
Sweden	199,690	217,554	5,522	25
Norway	—	78,000†	2,392	30
		(83,850)		
Switzerland	84,058	90,573	3,753	41
		(96,624)		
Germany	1,180,902	1,302,672	64,926	49
		(1,420,888)		
Gt. Britain & Ireland	701,082	732,045	45,365	62
		(774,229)		
Luxemburg	3,575	3,910	260	67
		(4,239)		
Iceland	896	1,027	80	78
Netherlands	65,314	71,706	6,102	85
		(78,743)		
France	260,998	285,095*	39,601	139
Belgium	42,101	46,645	7,516	161
		(51,009)		
Austria	127,293	145,179	28,568	197
		(160,017)		
Hungary	56,183	63,432	20,886	329
		(69,633)		
Roumania	19,438	20,500†	7,200	351
Italy	80,000†	90,000†	34,686	373
		(94,796)		
Russia	186,024	269,900	138,467	450
Finland	36,000†	40,000†		
Spain	26,747	29,660	19,588	606
Servia	—	3,606	2,911	809
Portugal	—	6,864	5,960	876
		(7,831)		
Greece	1,760	1,967	2,631	1,384
Bulgaria	2,801	3,015	5,500	1,700
Bosnia-Herzegovina	802	1,012	1,828	2,077
Total, say	3,250,000 (including Russia in Asia)	3,623,000	400,000	110

* March 31. † Estimated.

ASIA.

Table II gives the number of telephones in Asia. This is considerably increased by the inclusion of the figures for Russia in Asia, which last year had to be included with those for Europe. Japan furnished more than three-quarters of the total. The figures for China are somewhat rough estimates based on reports in electrical papers of the progress of systems in Pekin, Shanghai, Tientsin, and Canton. The figures for Japan, the British, and the Netherlands Indies are official; those for Korea, Formosa, Ceylon, Siam, etc., are based on previous official figures.

There are altogether about 277,000 telephones distributed amongst the 900,000,000 inhabitants of Asia.

Table II.—Asia.

	1912.	1913.
Japan	159,675	198,425
		(214,429)
Manchuria	—	3,715
Chosen (Korea)	8,259	9,260
Sakhalin	358	393
Formosa	3,456	4,317
India	13,154	14,640
Netherlands East Indies	9,735	11,839
Russia in Asia	—	12,600
China (estimated)	8,000	12,000
Straits Settlements	—	1,749
		(2,935)
Indo-China (French)	747	857
Siam	686	800*
Ceylon	1,330	1,414
		(1,803)
Phillipine Islands	—	5,500*
Total, say	206,000 (not including Russia in Asia)	277,000

* Estimated.

AFRICA.

South Africa possesses more than two-fifths of the telephones on this continent. The system of Egypt, which is in the hands of a company, is second in importance. The French colonies and dependencies have power over 10,000 stations between them.

Table III.—Africa.

	1912.	1913.
Egypt	13,000*	16,096
		(17,307)
Algiers	7,000*	8,004
Tunis	1,792	2,222
South Africa	18,700	21,922
		(28,232)
Madagascar, Senegal, Dahomey (French)	581	700*
Total, say	40,000	50,000

* Estimated.

NORTH AMERICA.

Table IV gives the number of telephones in North America. The preliminary figures of the United States census Report on Telephones show that at the end of 1912 there were 8,729,592 telephones in the United States, of which 5,087,027 were owned by the Bell Companies and 3,642,565 by Independent Companies. Of the 370,884 telephones in Canada at June 30, 1912, 174,336 belonged to the Bell Telephone Company, 38,797 to the Manitoba Government, and 26,486 to the British Columbia Telephone Company. No recent information is available respecting Mexico and the West Indies (with the exception of that relating to the Cuban Telephone Company), and the figures for these countries are therefore only approximate.

Table IV.—North America.

	Jan. 1, 1912.	Jan. 1, 1913.	Population (thousands).	Population per telephone.
UNITED STATES—				
American T. & T. Co. (Bell system)	4,474,171	5,087,027	—	—
Systems in connection with the Bell	2,158,454	3,642,565	—	—
Independent systems	1,725,000*			
Total U.S.A.	8,357,000*	8,729,592	92,036	10.5
DOMINION OF CANADA—				
302,759 June 30, 1911 / 370,884 " 1912	—	say, 410,000	7,206	17.0
Cuban Telephone Company	17,000	11,500	—	—
Other West Indian*		8,000	—	—
Mexico*	16,000	25,000	—	—
Total, say	8,700,000	9,184,000	110,000	12.0

* Estimated.

The number of stations on the Bell system of the United States and those in connexion with it is now 8,133,017. From this

the number of telephones in the United States on Jan. 1, 1914, would appear to be about 9,150,000. The number of telephones in Canada at June 30, 1913, was 463,671.

SOUTH AMERICA.

The data for South America are, as I mentioned before, obtained from an American consular report and are fuller than the estimated figures published last year. They seem to err, however, on the side of generosity. The number of telephones in the Argentine for instance is given as 68,547, whilst the official census gives the number of telephones in that country as 63,747. Again, the Chile Telephone Company (the principal company working in Chile) has 12,650 subscribers, but the total number of stations in that State is shown in the report as 24,482. The total number of telephones in South America may therefore be computed at 135,000 instead of the 139,691 given in the consular report. The population of South America is 35,000,000, or 1 telephone to every 260 inhabitants. In the Argentine Republic there is 1 telephone to 113 inhabitants.

Table V.—South America.

Argentine	68,547
Brazil	21,264
Bolivia	2,000
Chile	24,482
Colombia	1,700
Ecuador	2,550
The Guianas	1,220
Paraguay	350
Peru	3,800
Uruguay	9,210
Venezuela	1,568
	139,691

The number of telephones in the Argentine at Jan. 1, 1914, was 74,296.

AUSTRALASIA.

Table VI shows the figures for Australia and New Zealand, which are official in each case.

Table VI.—Australasia.

	Jan. 1, 1912.	Jan. 1, 1913.	Population (thousands).	Population per telephone.
AUSTRALIA—				
New South Wales	41,234	47,489	1,777	38
Victoria	29,784	33,775	1,380	41
Queensland	11,627	13,692	636	46
South Australia	8,513	9,890	430	45
West „	8,458	9,198	306	33
Tasmania	3,038	3,458	197	58
Total	102,654	117,479	4,733	40
NEW ZEALAND	40,598*	41,451*	1,070	26
	143,252	158,930		

* March 31.

From the six foregoing tables it will be seen that the total number of telephones in the world at Jan. 1, 1913, was as follows :—

Europe	3,623,000
Asia	277,000
Africa	50,000
North America	9,184,000
South „	135,000
Australasia	158,900
	13,428,000

It may be of interest to show here the total number of telephones in the British Empire. They are :—

Great Britain and Ireland	732,000
Canada	410,000
Australia	117,000
New Zealand	41,000
South Africa	22,000
India and Ceylon	16,000
Shanghai, Hong Kong, Singapore, West Indies, etc.	8,000
Total	1,346,000

(To be continued.)

Part II will deal with the development of the telephone in the large cities.

THE IDEAL OPERATOR FROM A SUPERVISOR'S POINT OF VIEW.

BY EVELEEN BRERETON (*London Telephone Service*).

EVERYONE who has any knowledge of the working of a telephone exchange, with its unalterable routine, its wonderful organisation, and its immense responsibility, must realise how important a factor in the success of the whole is the personality of each individual operator, for the keen business public with whom she deals day by day demands, before all else, capability, and in order to convey the desired impression she is obliged to rely solely upon voice and manner.

To define the really perfect worker is a rather difficult matter, for it is necessary to remember that one is dealing, not with impersonal virtues, but with very human gifts. However, the qualities which make for success are latent in every woman, ready to start into life and activity the moment she realises that her work is really worth while, and therefore worth doing well.

The operator who is going to be of value soon decides that she is no longer a schoolgirl, but a business woman who is striving, with humble tools perhaps, but with two capable hands, to carve out a career for herself.

She understands the requirements of the public, the irritation which unnecessary delay or indifferent working will cause, and the necessity for meeting every demand upon her time and patience with cheerful voice and courteous but convincing manner. By her intelligent, decided intonation she succeeds in making the most mechanical of standard expressions sound sincere, conveying to the hitherto sceptical subscriber the belief that difficulties are really unavoidable but that she may be relied upon to exercise every effort on his behalf. Moreover, she possesses the happy knack of subsequently explaining matters to her superior officer, should the necessity arise.

Unconsciously she has set herself a standard, one in which, no doubt, personal pride plays a large part, but pride of this type is a hard taskmaster, and is dissatisfied until the smallest detail is faithfully discharged. It accounts for her dexterous movements, the handling of her cords in a way which can only be described as "clean," and her wholesome dislike of the word "incompetent." Her neat dress, quiet movements, and courteous manner are usually the outward signs of the well-ordered mind within, and when, being a human girl, she merits an occasional reproof, the memory of it is very lasting.

The subscribers with whom she deals are insensibly impressed. They may, at times, sound harsh and impatient, but they will never attempt to be familiar, and, though she may be often unsuccessful, they decide that she is undoubtedly reliable and thoroughly understands her work, which, after all, is the highest praise a business man can bestow, or a business girl wish to hear.

THE IDEAL SUPERVISOR FROM A TELEPHONIST'S POINT OF VIEW.

BY FLORENCE A. CATES (*London Telephone Service*).

AN ideal supervisor, from the telephonist's point of view, should possess many important attributes. In the first place, the telephonist should feel she can rely implicitly upon the capability of her supervisor. In order to win this confidence from her subordinates, the supervisor should be competent in all matters relating to the service, and give careful attention to detail. The telephonist is dependent upon her supervisor for advice and assistance in times of difficulty and pressure, and relies on her to act with tact and promptitude when occasion arises. Co-operation in dealing with the work is very important, and a supervisor who takes a lively interest in her staff, and shows keenness in the performance of her own duties, is the one who commands the highest respect and obtains the best results.

Courtesy is a valuable asset, and the supervisor is critically judged with regard to her personality and manner in her dealings with the staff. She should possess a bright and even temperament, and so encourage her staff to perform their duties cheerfully and willingly.

Discretion should be exercised when dealing with irregularities, and a word of encouragement or commendation when work has been satisfactorily performed is greatly appreciated.

Justice is a very important qualification, and partiality shown towards any particular officer, either in the arrangement of duties, or in the performance of any preferential work, is keenly resented.

An ideal supervisor, therefore, is one who is capable in every branch of her duties, sympathetic and just in her dealings with all, and who, by her own example and encouragement, inspires her staff with zeal and thoroughness in the performance of their duties.

THE USE OF THE TYPEWRITER IN TELEGRAPHY.

By A. P. OGILVIE, *Telegraphs, Edinburgh.*

HE would not be a rash prophet who ventured the opinion that we should witness during the next few years a gradual extinction of the handwritten telegram. With the advent of the typewriter, and the extension of type-printing telegraphs, the use of the pencil and the stylus in modern telegraphy is becoming more and more restricted.

There may be something to regret from an æsthetic standpoint in the passing of the familiar carbon copy, for handwriting as an art is not without brilliant exponents in our Service, and the telegram, essentially utilitarian in its mission, has not infrequently been admired for the excellence of the caligraphy. A story is related of an old Scots dame who had been wired to by her son explaining that he was leaving for home on holiday. Gazing with pride at the brief, neatly-written message, she was heard to exclaim: "Eh me, but oor John has got tae be a bonnie writer since he gaed up tae London."

Apart, however, from the question of legibility, the typewriter is entitled to a place in telegraphy. The wonder is not that it has "arrived," but that its coming was so long delayed. Long since it has passed the stage of being merely interesting as a machine. Time-saving, labour-saving, reliable and useful, it has lived down successfully every prejudice against its use. It has lessened the troubles of the editor and the author, simplified and expedited the correspondence of commerce, and in that most conservative of all professions—the law—its merry click has effectually silenced the scratching of mediæval quills.

Telegraph-typing is, of course, no new thing. The American telegrapher was not slow to recognise and exploit the typewriter in his business, and to him credit is due for having led the way. In a few of the Colonial Services, too, telegraph operators have taken kindly to the system. Nor has the British Telegraph Administration been altogether lacking in enterprise. Some twenty years ago, typewriters were introduced experimentally in connection with the transcription of press work at one or two important telegraph centres. That comparative non-success rewarded this significant pioneer effort is not surprising. A satisfactory visible writing machine had yet to be evolved, while manipulative dexterity was not taught or practised on scientific lines.

For several years afterwards interest in the matter apparently lagged. Then in 1902 the "Murray" type-printing telegraph entered the lists, bringing in its train numerous forms of type-keyboard perforators. An unwonted activity in type-keyboard working somewhat ruthlessly disturbed the complacency of many of us who had become reconciled to the invulnerability of the Morse sounder system. The tide had turned, and with the institution of organised continuous Wheatstone in 1908, writing machines again made their appearance in the instrument room. Early diasppointments—perhaps inevitable—were accepted in good part, and there has never been reason to regret the patience and perseverance then exercised.

An initial difficulty was that of eye-strain. Typing was at first confined principally to the transcription from Morse tape, gummed to forms, of all telegrams for delivery received on the Wheatstone circuits. Having had no systematic instruction the majority of the operators did not translate the Morse symbols and type the message simultaneously, and the continual movement of the eyes from tape to keyboard, and *vice versa*, which consequently was necessary, made the duty exceedingly irksome. Had no solution been forthcoming the unfavourable impression thus created would

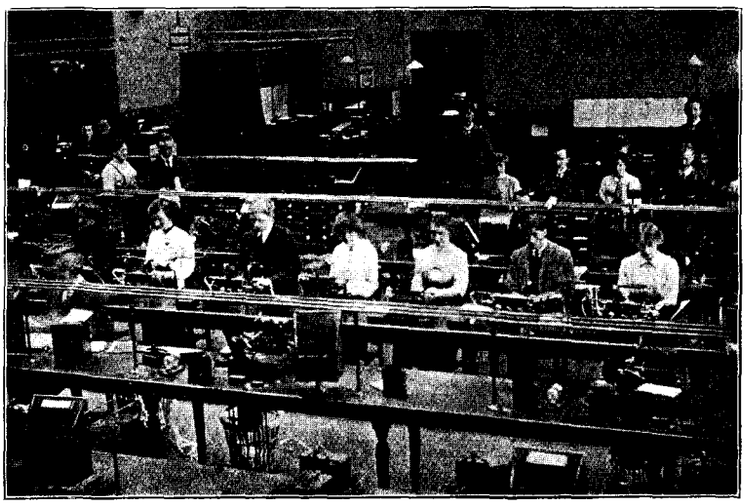

FIG. 1.—NEWS DIVISION, EDINBURGH TELEGRAPHS, SHOWING TYPING TABLES.

have seriously jeopardised the success of the trials. Consideration of the situation, however, suggested that typing from Morse tape would be easy of accomplishment were the typists skilled in the "touch" system of keyboard manipulation. To test this conclusion it was decided to give the essential training to a few selected telegraphists, and experience proved the wisdom of this decision. The work is now performed more easily, better, and more quickly, while typing duty generally has become an appreciated variation from the ordinary routine. To provide for future development of the

FIG. 2.—TYPING TABLE, NEWS DIVISION, EDINBURGH TELEGRAPHS.

system, touch-typing is included in the school curriculum for telegraph learners at large offices, and during the winter months opportunities are afforded to suitable members of the established staff for regular practice under an expert.

Approximately, 50 hours' tuition is sufficient for average pupils, although much depends upon age and aptitude. Dr. Osler's dictum "too old at 40" provides a too generous margin in this instance.

Unless special circumstances exist, telegraphists over 30 years of age when trained seldom acquire the proficiency of younger members of the staff whose fingers are naturally nimble and flexible. To illustrate the progress made it may be stated that more than one-third of the Edinburgh telegraph staff are now qualified in touch-typewriting, and that proportion is being steadily augmented by the accession of promising learners from the telegraph school.

That the use of the typewriter in telegraphy is economical and desirable is proved by the increased operator-efficiency which has been attained, and the improvement effected in working conditions. The average telegraph typist will maintain in normal circumstances a total of from 40 to 50 commercial telegrams hourly, typing from gummed Morse tape, and an expert will readily exceed that output. A comparison with the working conditions of telegraphists transcribing by hand is all in favour of the typewriter, as handwriting at a high speed rapidly deteriorates in quality or quantity when persisted in. Moreover, the appearance of the typewritten telegram commends it to the business man, and in these days the telegraph service must use every available means to maintain and to increase its hold on the commercial community.

The extension of typing to the transcription of press telegrams has also been very successful. At first it was thought that gumming the Morse tape of each news item to a large form would facilitate its treatment. The system was ultimately abandoned as being inelastic in operation. It was found that, while the actual typing was excellently done, the supply of gummed items to the typists,

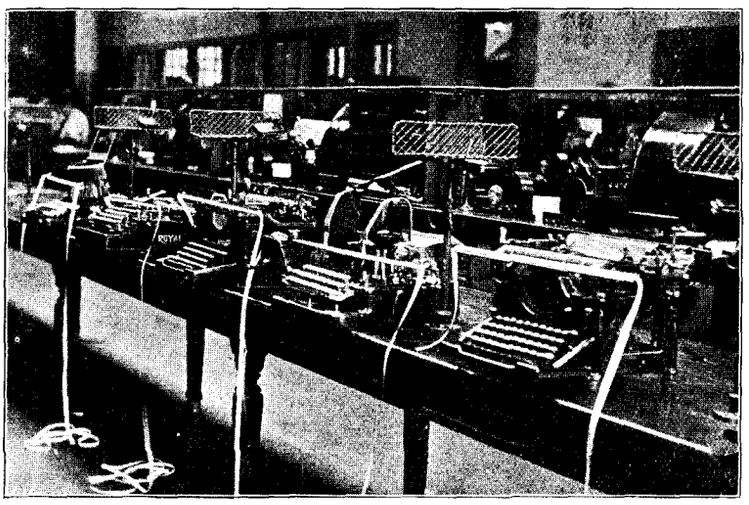

FIG. 3.—SOME OF THE TYPEWRITERS USED, SHOWING GUIDES FOR HOLDING MORSE TAPE IN READING POSITION.

and the number of typists who could be profitably employed, were unduly dependent on the number and expertness of the gummers. Given a steady traffic the system worked well, but in fluctuating conditions staff adjustments became difficult and wasteful.

Narrow metal guides for maintaining in reading position 18 to 20 inches of Morse tape have now been fitted to the front of all typewriters. The ungummed tape is threaded through the guides, and as the signals on each length are transcribed, fresh lengths are pulled into position by hand. To obviate these hand movements a mechanical spring device is fixed to some machines. By its means lengths of tape are propelled automatically across the reading plane on depression of a special key on the keyboard. The advantages claimed for the arrangement are that it practically ensures continuous typing, the hands not having to leave the keyboard for the changing operation, and that no eye-strain is involved since the movement of the tape is automatically controlled, and need not be followed with the eyes as must be done when the tape is pulled along by hand. The attachment, which has been greatly improved recently, gives excellent results in the hands of practised operators.

The average output has risen at least 50 per cent. Fifteen pages of "news" per operator per hour is a total normally attained for continuous working, and in favourable circumstances a page every three minutes does not unduly tax an experienced telegraph-typist. In manifolding large numbers of flimsies the saving is direct and self-evident. Formerly, when the copies required for an item exceeded six or seven, the flimsies were divided between two, or more, writers. The strain has been transferred to the typewriter. A good machine bears the simultaneous duplication of as many as 22 flimsies, all of them distinctly readable. This feature has been of immense value for multiple address telegrams of all descriptions, especially in the Central Telegraph Office where press services are delivered to a great number of addresses.

If comfort be the *sine qua non* of good operating, then in the typing of press matter a considerable advance has been made. Practical telegraphists with experience of prolonged periods of news-writing agree that little in telegraphic routine is more tiresome than continuous work with the stylus. The writing is necessarily slow and laborious, while the position in which one must sit is cramped and unnatural. In typing, however, the operating position is erect and easy, and the executive work is distributed over the digital muscles of both hands. Importance is attached to the position of the operator. The typing table should be sufficiently low to permit of the fingers resting on the keyboard with the forearm horizontal. Standard instrument tables are too high for comfortable typing, and those at Edinburgh on which typewriters are continuously used have been reduced in height by $2\frac{1}{2}$ inches with advantage.

It seems somewhat remarkable that the British telegraphist cannot readily be induced to follow the example of his American *confrere* in adapting the typewriter to Morse sounder reading. Those who have witnessed the bonus telegrapher at work with his "mill" in the United States affirm that a standard of operating which would be impossible with the pencil is comparatively easy with the typewriter. Yet it must be frankly admitted that, so far, sounder-typing in this country has been a failure. The experiments are, however, being persevered with, and although the duty is sometimes reluctantly performed, greater experience may make it more acceptable and successful.

An apparently insurmountable difficulty is that of dissociating the "click" of the typewriter from the signals emitted by the sounder. Elevated screens which bring the sounder close to the ear have partially removed this objection, but a noiseless typewriting machine is a *desideratum* for the early stages at any rate. This matter was recently discussed with representatives of two typewriter companies. With admirable initiative one of the firms specially reconstructed one of their ordinary models with a view to eliminating all cause of possible disturbance. The machine has just been completed and placed for trial; it is astonishingly noiseless, and well suited for sounder-reading.

The evolution of a noiseless typewriter brings the typing-reception of phonograms, or telephone-telegrams, within the range of practicability. Already keen business men have telephones connecting the typists' room with their private offices over which they find it convenient to dictate their correspondence; and of course the "dictaphone" is a commercial reality. It is not anticipated therefore that difficulties would arise in the actual typing of telegrams receive over the telephones. The objection hitherto has been that of the disturbance created by the "leaking" over adjacent phonogram circuits of the noise of a number of typewriters working together.

The make of typewriter best suited to telegraphic requirements in this country is a matter still under consideration. Some hundreds of models, representing every pattern of typewriter on the market, have been purchased and distributed for trial to telegraph offices throughout the United Kingdom. The experiments will be exhaustive and comprehensive, as the decisions arrived at must of necessity be influenced by the existence of many forms of telegraph typewriter-keyboard, some of which have yet to be tried in the British Post Office.

It is perhaps interesting to note that all the machines are fitted so that they type only capital letters in the normal position. Though of considerable convenience in telegram work by permitting the operator to typewrite continuously without determining, as would be required with ordinary pica type, when and where capital

letters should be inserted, the innovation was not at first appreciated by some of the newspaper staffs. The objections proffered were not however of great weight, as the following incident may show. The editorial staff of a certain "daily" complained that while they preferred typewritten copy, the fact of its being all in capital letters was throwing additional work upon them. After an interview they agreed to a further trial. The situation is not without humour, for the malcontents afterwards installed in their offices a costly telegraph type-printing apparatus which supplies them with 70 per cent. of their telegraphed copy, all printed in beautiful block capitals; and they are delighted with it.

As to the future of the typewriter in telegraphy one may well be optimistic. We stand on the threshold of a new era in telegraphic methods, an era in which typewriter-keyboard working is destined to play a prominent part.

THE CABLE ROOM AND THE WAR.

FOR the first time since the inauguration of Anglo-Continental telegraphic communication in 1851, by means of the Dover-Calais cable, has telegraphic intercourse between this country and a European neighbour been interrupted on account of strained diplomatic relations. August 4, 1914, will stand out with the unenviable record of being the first occasion upon which the modern electrical bonds between this country and the Continent have been deliberately severed. Those who were on duty on the fateful evening are not likely to forget the impression of the gradual breaking off of communications, first one German office, then another dropping into silence, until at last only the two capitals—London and Berlin—remained in touch, lingering literally till the last stroke of midnight had died away. The two offices remained linked up to the last second of the time limit, lest by any chance the miracle should happen, and negotiations should be continued. Let it stand on record to the credit of the telegraphists of both nations that throughout the entire period of strain there was never a word to which exception might be taken. Right up to the last moment the telegraphic business of the two countries, now unhappily at war, was conducted with a politeness and tact worthy of the best traditions of the suavest of foreign Ministers. The impression of that evening when communication was finally severed, and the noise of the apparatus of the German section gradually ceased, will remain a lasting and painful reminiscence as of the passing of a friend, as the cords of life silently broke away one by one till the final snap came and Peace was dead!

J. J. T.

THE TELEPHONE AND TELEGRAPH SOCIETY OF LONDON.

THE chairman for the coming session is Mr. John Newlands, C.I.E., the popular controller of the Central Telegraph Office, and the following attractive programme has been arranged:—

Date.	Lecturer.	Subject.
Oct. 26, 1914 ...	Mr. Eustace Hare ...	"A Public Service."
Nov. 23, 1914 ...	Sir Chas. King, C.B. ...	"The Telegraph and Telephone Commercial Accounts."
Dec. 15, 1914 ...	Mr. G. Morgan, I.S.O....	"The Post Office Stores Department: Its History, Functions, and Organisations."
Jan. 25, 1915 ...	Mr. D. H. Kennedy ...	"Special Services in the Metropolis."
Feb. 22, 1915 ...	Mr. V. M. Dunford ...	"Some Outstanding Features of the Central Telegraph Office."
Mar. 22, 1915 ...	Mr. H. G. Trayfoot ...	"Trunk Telephone Working."
April 26, 1915 ...	Colonel Ogilvie, C.B. ...	"Railways, Telegraphs, and Telephones: A Comparative Study."

Members of the society have access to a valuable library to which books of the value of £15 have been recently added, and are entitled to attend meetings of the Institution of Electrical Engineers and the London Telephonists' Society. During last session six printed papers, the sale price of each of which was 6*d*. a copy, were forwarded to each member free of charge. The subscription is 2*s*. 6*d*. for men, and 1*s*. 6*d*. for women. Post Office staff in the provinces are eligible for membership.

THE USE OF THE TELEPHONE FOR THE TRANSMISSION OF TELEGRAMS.

BY W. GENGE (*Telegraphs, Liverpool*).

ONE of the most interesting changes in the Service is the increasing use of the telephone as a means of transmitting telegrams. Most of us have experienced the joys of endeavouring to take down the business man's telegram of years ago—joys that were, alas! sometimes followed by a suitable explanation on form "Postmasters No. 18": but the increased efficiency of the telephone has led to a great development, and to-day a large number of firms send and receive their telegrams over the telephone. The acquisition of the telephones by the State has brought about a natural and obvious linking up of the Telegraph and Telephone Services, and the closest of links is now being forged by the substitution of the telephone for the telegraph at sub-offices. As the Yankees say, this became a "business proposition" from the first day on which the two branches were joined together, and as the proposition possessed points of efficiency and increased public usefulness, it is not to be wondered at that the Department developed the system. Even the keenest of critics must admit that the administrators of the Post Office assumed a greatly increased public responsibility when the telephones became State-owned. That responsibility unfortunately included a legacy from the past in the form of a very fine and healthy specimen of a bogey that "the telegraphs do not pay." Whilst this has no doubt played a part in the changes now taking place, there are some advantages to be gained, advantages which affect the vital interests of the public, the staff, and the Post Office as a whole. The public have gained by the fact that in most cases the change from telegraph to telephone also entailed the improvement in a neighbourhood of the previously existing call office facilities, which occasionally consisted of a wall telephone, situated, say, in a baker's shop, and so placed that it was difficult of access, and more difficult to leave, to say nothing of a bag of flour falling on you when you turned the generator handle, or the equally delightful experience which accompanied the apologetic phrase "May I use your telephone, please?" and the subsequent puzzling of your brain—whilst waiting for the distant subscriber, of course—as to what was the most suitable small article a man could purchase in a baby-linen shop which also happened to be a public telephone call office. Such conditions have been modified in the Liverpool district by numerous transfers of the call office to the nearest sub-post office premises, where a clean and attractive telephone silence cabinet is accommodated.

From a staff point of view it must be admitted that at the outset many foreshadowed the alteration with misgiving, fearing that it was a retrograde move, and another blow to the telegraph service. More than one hopeful individual anticipated that "the Post Office would soon be giving us all our pensions." It is a pity to spoil such pleasureable anticipations, but it should be plainly stated that from the commencement, the authorities wisely limited the experiment to sub-offices where the daily and hourly combined telegraph and telephone load was within the reasonable capacity of a single circuit. Experience shows that the limit so fixed has been wisely chosen, and it is doubtful whether the busier telegraph offices will ever be able to dispense with telegraph working.

The greatest problem has been the finding of space for a silence cabinet at the sub-office itself, the dimensions of the cabinet being, approximately, 3 feet square and 7 feet high. The difficulty has been surmounted in some cases by having a special cabinet constructed by a local joiner to suit the requirements of the office, and this point may be worthy of note because such a cabinet can be made for a few pounds, and it serves the purpose equally as well as the costly and somewhat cumbersome standard pattern cabinet. The latter is a fine tribute to the skill of the joiner, but I am disposed

to think that its silence-proof qualities could be attained by a more lightly constructed and cheaper article.

Generally speaking, sub-postmasters did not welcome the advent of the telephone; there was just that tinge of scepticism and prejudice which accompanies all alterations from the established order of things; but no body of public servants could have shown greater willingness to allow alterations to their premises, or greater enthusiasm in mastering their new duties. It may be of interest to know that in Liverpool nearly 40 out of the 88 telegraph offices are now working by telephone.

The particular point which aroused the comment of the sub-postmasters was the list of analogous words "A" for "Alfred," "B" for "Bertie," etc., used in the repetition of doubtful words. One sub-postmaster expressed the opinion that "he wasn't going to school again for any Department," whilst another hoped that it would be all right to use "C" for "Cat" if he happened to forget "C" for "Charles." I remember sleeping soundly one night with the delightful feeling that "the service was quite safe" after an assurance that both the sub-postmistress and her assistant at a certain office could repeat the whole of the list, without a single mistake, after a careful study during the early closing afternoon.

The advantages to the sub-postmaster under the new system are that he himself, as well as his assistants can use the telephone, and he is not left stranded when perhaps his one and only expert telegraphist is sick, or late, or wants a holiday. At the same time the staff and supervisor at the Head Office may probably appreciate the fact that there are certain minor offices whose feats in telegraphy are now only a memory of a happy past. The privilege of free inward calls to a sub-postmaster, which is granted to all post office call offices, must also be reckoned as an advantage to a man engaged in business, such as a grocer, general stores, or chemist, especially where a number of his customers are telephone subscribers, and this advantage has been recognised in some cases where sub-postmasters, who before the introduction of the scheme were paying a telephone rental in connection with their private businesses, now find it is better to allow their private telephones to be converted into public call office circuits and then pay 1*d.* or 2*d.* for an outward call. The foregoing advantage is not so apparent in the case of small stationers who appear to form the bulk of the sub-postmasters' class, yet even here the telephone may always be used as a quick and efficient aid for business purposes.

In addition, the new system saves maintenance charges and apparatus to the Post Office, and forms a means for much closer administrative touch between the head and sub-offices. Its use for all official enquiries should therefore be steadily encouraged.

Concurrently with the abolition of the telegraph, efforts have been made to establish a call office at every sub-post office where there were reasonable hopes of sufficient revenue to justify the outlay. Here again existing call offices were transferred from private premises, and there is every reason to believe that the change will in time prove a valuable source of revenue, because each non-telegraph post office with a telephone can undertake trunk and local calls, outward telephone express messages, and the public can also dictate telegrams therefrom, provided the telephone fee is paid in addition to the telegram charge. Here I offer criticism by saying that the question of abolishing the telephone fee in the latter case may be worthy of consideration, because it must be very difficult for the public to appreciate the fine distinction between a telephone call office at one post office—which happens to be a non-telegraph office—but where you can send a telegram over the telephone on payment of the telephone fee, and the next post office, which is an authorised telegraph office, and also uses the telephone for the transmission of telegrams but at the ordinary telegram charge. The inconsistency of this arrangement is more noticeable when it is observed that in the first case the public pay the extra fee and do the work of transmission themselves, and in the latter case, the Department does all the work but charges 1*d.* or 2*d.* less. If we simplify the service we want to simplify it both for the staff and the public.

As regards the telephone express message service, I am afraid that the present rules make it a rather complicated arrangement for a sub-postmaster to understand, and, despite the fact that it costs 11*d.* to handle a 6*d.* telegram, I am inclined to believe that if the Department can see profit in a telephone express message service of 30 words for 4*d.* or 5*d.*, there may yet be hopes for a local telegram service of 3*d.* for 12 words; especially so when most of the sub-offices can telephone these telegrams direct from the originating to the delivering office.

It may interest readers to know that out of 168 offices in Liverpool, only 31 were on the telephone in 1912—to-day 128 out of the 168 offices are on the telephone. This means that in the greater portion of the City area a member of the public is never more than five minutes' walk from the cheapest means of electrical communication with his district, and a ready means of direct communication with the rest of the United Kingdom, the increasing use of which must make for the advancement of mankind, and incidentally provide many of us with our bread and butter.

London Scot (proud of his English): "AW'LL BE HAME ABOOT EICHT O'CLOCK THE NICHT, AN'——"

Voice of Operator (obedient to Government instructions): "NO FOREIGN LANGUAGES PLEASE."

[Cut off.]

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POST OFFICE MUSICAL UNION, LEEDS.

A CONCERT was held in the People's Hall, Albion Street, Leeds, on Sept. 4, under the auspices of the Post Office Musical Union, in aid of the Prince of Wales's National Relief Fund. Every item on the programme was provided by members of the staff, the principal soloists being Messrs. W. H. Shaw, H. Blackburn, Nelson Cordingley, and John H. Hall, and Misses E. N. Flasher, M. Chadwick, M. Ridsdale (vocal), and Miss L. Hall (violin). Miss I. M. Walsh was at the piano, and Mr. W. R. Senior conducted. The concert realised over £30 in aid of the fund.

OUR TITLEPIECE.

OUR titlepiece was designed by Mr. R. O. Williams, Town Postman, at Llanfairfechan. Mr. Williams was born in 1886, entered the Post Office Service as Boy Messenger in 1898, and was appointed Postman in 1904. Seven or eight years ago, he took up drawing and painting as a hobby. He is practically self-taught, as at Llanfairfechan there are no "art classes," and he has had no professional tuition. He has evidently made good use of the information obtainable from books on the subjects.

PERSONALIA.

SIR A. F. KING, K.C.B.

IT may seem somewhat of a paradox to express at the one moment our keen regret at the departure of Sir A. F. King from our midst and to welcome him back again. It is not the only confusion of ordinary mental processes which the war has brought about. The chief officers responsible for the administration of telegraphs and telephones were so heavily pressed with their dual responsibility of rendering all manner of telegraphic and telephonic services to the Admiralty and War Office, and, at the same time, of serving the public at home with an organism depleted both in respect of staff and equipment, that after his retirement Sir Alexander offered to return and share the burden. So he is with us to-day and we have the advantage of his co-operation, experienced and kindly and far-seeing.

There are dangers in such a journal as our own of being too little discriminating in personal appreciations. It might be possible to devote space month by month to the consideration of ourselves, our hobbies, our personalities, our official careers. Such a process must end in an unhappy lowering of the value of those appreciations. So if the TELEGRAPH AND TELEPHONE JOURNAL sets out with the intention of being very restricted in its personal allusions, and in devoting itself to the study of telegraph and telephone processes rather than of telegraph and telephone personalities it is not because those personalities are of less importance than the processes. It is because it shrinks timidly from undertaking the *rôle* of universal trumpeter. It would fain regard the brotherhood not as a kind of hierarchy of higher and lower, but as a guild or a corporation in which each is striving to make his own contribution.

To this disciplined silence as regards personal references there must be exceptions, and certainly the monastic rule must be broken in respect of Sir A. F. King. He is of ourselves, the one of us who became Secretary. For long years he was the Assistant Secretary, Telegraphs, and as he held that position at a time when the telegraph service was being unified and standardised, we humbler folk in the provinces knew more of him personally than previously we had known of our chiefs. I venture to glance over an index of subjects which he left behind him and, unaccountably, has fallen to me, and I find him dealing with "Diaphragms fitted to telephones for protection of operators," "Telegraph stores made abroad," "The rejection of scantlings," "Leadless glaze," and "Karri wood." It seems to be an odd collection of themes to an innocent soul who thought at that time that from breakfast to bed the Assistant Secretary, Telegraphs, thought of nothing but one sorry subject. I view with awe the range of knowledge which is thus covered, and the amount of data needed to give prompt answers to the questions put by eager members of Marconi and other Commissions.

So he became Secretary, an approachable Secretary, a paternal Secretary. The classic definition of a good father is one who makes his children happy by not giving them what they want. The paternal Secretary did not give us all we wanted; perhaps he was too kindly and knew us too well. But he certainly shed the radiance of happiness on each of us. He called me a sentimentalist once. He has called me harder names, and I have deserved them, alas. But in his regard I am not ashamed to be a sentimentalist. The tenderness of affection is something of which we English are almost as ashamed of as our religious emotions. But I know no word other than affection to suit the complicated situation when I am to frame my *au revoir* to a friend who has returned. If we who are striving to make this journal an influence which will rid the service of the too rigid conceptions of "department" on the one hand and of "staff" on the other, should be asked to indicate the type of personality which we need for this great task, we might venture to refer to the late Secretary. If we can carry on and develop that which we learned from him, then we are indeed happy.

J. L.

THE NEW SECRETARY.

WE welcome the new Secretary, Mr. George Evelyn Pemberton Murray. He comes to us at a time of stress when the Post Office is undertaking a heavy burden of responsibility amid great difficulties. Mr. Murray is the son of Sir George Murray, formerly Secretary of the Post Office and afterwards Permanent Secretary to the Treasury. He was Commissioner of Customs and Excise and previously an Examiner to the Board of Education. Telegraphs and Telephones, though by no means the whole of his future responsibilities, will present many problems for his consideration, and we have every reason for confidence in his leadership.

NEWS OF THE TRAFFIC STAFF.

PROMOTIONS.

Miss B. S. PHILBRICK appointed 2nd Class Assistant Supervisor at Mayfair.

MARRIAGES.

Miss C. A. REED, Assistant Supervisor, Class II, Purley Exchange.
Miss A. E. LILLYWHITE, Assistant Supervisor, Class II, Victoria Exchange.
Miss L. E. KEY, *Telephonist, Central Exchange.*
Miss M. KELLAWAY, Telephonist, Central Exchange.
Miss S. SWANNELL, Telephonist, City Exchange.
Miss E. M. MARTIN, Telephonist, Holborn Exchange.
Miss G. SKEPELHORN, Telephonist, Holborn Exchange.
Miss H. E. DALTON, Telephonist, London Wall Exchange.
Miss E. L. TYLER, Telephonist, Paddington Exchange.
Miss M. CLAFFY, *Telephonist, Trunk Exchange.*
Miss M. R. FOSTER, Telephonist, Trunk Exchange.
Miss A. M. SHAW, Telephonist, Victoria Exchange.

RETIREMENTS

Miss M. A. ELLIS, Assistant Supervisor, Class II, Gerrard Exchange.
Miss V. G. JUCKES, Telephonist, Kingston Exchange.
Miss F. ELSMORE, Telephonist, Bank Exchange.
Miss C. A. GARLAND, Telephonist, City Exchange.
Miss K. E. ADAMS, Telephonist, Gerrard Exchange.
Miss I. M. WITTERING, Telephonist, *Trunk Exchange.*
Miss G. L. GRAINGER, Telephonist, Trunk Exchange.
Miss H. M. LUCAS, Telephonist, Trunk Exchange.
Miss C. SHEA, *Telephonist, Trunk Exchange.*

DEATHS.

Miss M. J. FLINN, *Assistant Supervisor, Class II, Avenue Exchange.*

[The Editor will be glad to receive information of promotions, marriages, and retirements of the provincial traffic staff.]

OBITUARY.

ONE of the most promising of the Telegraph Superintendents in the country has been removed by death at an early age. Mr. FRANK KELLY, of Cardiff, was well known not only in Cardiff but in other offices as a controlling officer with remarkable gifts. He had long experience in directing both telegraph and telephone business, and his personal qualities attracted the confidence and esteem of those whom it was his duty to control. He served in the 1st Telegraph Division Royal Engineers, and went through the Boer War, being awarded the Queen Victoria and King Edward medals with three and two bars respectively. He was also awarded a long service medal as a Volunteer.

A HEROIC TELEPHONE GIRL.

THE *Matin* says that the little town of Etain has been twice bombarded. The town caught fire, and many of its inhabitants perished in the flames. The post office was finally left in charge of a single girl clerk. Every quarter of an hour she rang up the postmaster at Verdun, the great fortress near by, and reported what was going on.

Suddenly, as she was speaking, the latter heard a loud explosion over the wire, and the words "a bomb"—then the girl's voice ceased.—*Daily Mail.*

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THE

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CONTENTS.

NON-TECHNICAL NOTES ON THE DARLINGTON AUTOMATIC EXCHANGE.

WHILE working on multiplex telegraphy experiments in 1875 Alexander Graham Bell invented the telephone and gave the first public exhibition of it at the Centennial Exposition in Philadelphia in 1876. At this time there were two classes of telegraph services in use, one consisting of a line with two or more telegraph instruments on it, the other consisting of several lines coming into a switchboard arranged for connecting any two lines together, so that service from one telegraph line could be given over any other line coming into this exchange. It was quite natural that the telephone should be connected in the same manner from the time of its advent, and in 1877 numerous small telephone exchanges built on the principle of telegraph exchanges were installed in the United States. Different methods of signalling the operator at the central office were adopted, but the general arrangement consisted in a small magneto generator at the subscriber's station, which he used to operate what is commonly known as a drop at the central office. Circuits on this principle were grouped on a "magneto" switchboard.

As the number of subscribers on central exchanges increased it became impossible for one operator to do all the connecting necessary, and when a number of operators were employed as it was not possible for any one of the number to connect directly one subscriber with all the other subscribers in the exchange a system of "trunking" was arranged by means of lines going from one operator's switchboard or position to the positions of other operators. With this arrangement any subscriber calling the office would attract the attention of one operator, and she on ascertaining that connexion was desired with a subscriber whose line terminated in front of some other operator in the exchange would connect the calling party's line by means of one of these trunk lines with the other operator and request the other operator to complete the desired connexion.

A later development in the art which was found to save considerable time in completing connexions was to have a multiple of all the subscribers' lines in the exchange in front of each operator in the exchange. In other words, supposing there were six operators in the exchange, certain of the lines would terminate in front of each one of the six, and each operator would answer these calls from her own group of lines. In addition to this termination there would be extra points on each line appearing in front of each one of the other five operators, so that any operator could complete a connexion directly between a subscriber calling her and any other subscriber on the same exchange, thereby doing away with the necessity of two operators handling the call. As the business grew still further it became necessary to have more than one exchange in a district. In order to handle calls under these conditions "trunks" such as were formerly used from one operator's position to another were now provided from one switchboard to another switchboard in the same district and a connexion would be handled by two operators, one in the office in which the call originated and one in the office of the line with which connexion was desired.

Systems of this kind were used for a number of years and then a number of exchanges were installed in which the simple removing of the telephone from the switch-hook operated a calling device at the central office by means of current flowing through this device from the central office out over the subscriber's line. These calling devices at first were magnetic signals, and later small incandescent electric lamps were used. During this period the subscribers continued to use small primary batteries at their stations to supply current for talking purposes.

All this while development was being rapidly carried out and in 1896 the first common battery switchboard was installed, which marked a great advance over all previous types of switchboards. In the common battery system the battery current for both signalling and talking purposes was furnished from the central office, thus doing away not only with the magneto generator at the subscriber's station but also with the primary batteries which had always been a source of considerable annoyance and expense to the telephone companies.

Since 1896 common battery systems have been generally adopted in all large exchanges throughout the world, and although many refinements have been made to the system and the talking efficiency and simplicity of operation in the exchange greatly increased, no radical changes in underlying principles were made until the advent of the automatic telephone systems.

Experimental and development work on automatic systems was commenced as far back as the time when common battery systems were first being seriously considered, and some designs of

these systems, more or less satisfactory in operation, have been on the market for the last few years; although it is only recently that they have attained practical efficiency.

The difference between automatic systems and previous systems, which are now all classed under the general heading of manual systems, is that instead of having an operator at the exchange to complete the connexion for the subscriber, machinery is used to accomplish this result and this machinery is controlled by the subscriber himself from his telephone set by means of a dial or other appliance. On a dial appear a series of numbers from 0 to 9.

When the subscriber removes his receiver he thereby causes a certain machine in the exchange (the line-finder) to become connected with his line. He then operates the dial which controls the operation of one machine after another until connexion is secured with the line of the particular subscriber wanted. This subscriber's bell is then rung and, when he answers, the connexion is completed in such a manner that the two subscribers can converse. The replacing of the receiver on the switch-hook sends all the machinery back to normal and leaves the subscriber's line ready to be used again for other connexions.

The latest common battery systems as explained above in connexion with the later design of magneto systems are arranged with large multiples of all the subscribers' lines so that any operator can connect a calling subscriber directly with any other subscriber in the exchange. Strange as it may seem this arrangement does not work out well in automatic systems, and in order to obtain satisfactory operation first principles were reverted to and connexions are secured by working through trunks in conjunction with groups of predetermined size.

Some systems are worked on what is known as the decimal basis. In such a system, say, for 10,000 lines, the subscribers' lines are grouped into sets of 100 each, again ten groups of 100 are arranged in a group of 1,000, ten of these in turn being grouped into the one lot of 10,000 lines. The method of securing a certain line is to have the calling subscriber, after the removal of his receiver connected by means of trunks with the correct group of 1,000, then of 100, and then to find in this group of 100 the particular group of ten desired, and finally connected with the particular unit which is the line desired. The control of this selecting is exercised by the subscriber by means of his dial. In a system of 10,000 lines the lines would be numbered from 0000 to 9,999 and it is necessary for the subscriber to operate his dial four times, each time corresponding to one of the four digits in the number desired. As mentioned, the connexion is completed through trunks from one group to another. Now in any given exchange there will be a number of connexions in process of completion at the same time to any group of lines; also a number of completed connexions in use. This necessitates the supply of a number of trunks from one group to another, and the number of these trunks depends upon the average number of times each subscriber calls per day and the average length of time each conversation lasts.

The subscriber in manipulating his dial connects himself with a set of trunks each terminating in a machine associated with the group through which the connexion is to be completed, and the exchange apparatus picks out an idle trunk from this set.

Economy in trunks and machines is secured in a system by increasing the final group of subscribers' lines; but for the sake of clearness in this description, systems dealing with only 10,000 lines having the small groups of 100 lines each will be discussed.

In the system as installed in Darlington, when the subscriber removes his telephone from the hook, current flows out from the central office through a small magnetic arrangement known as a relay through the subscriber's line and telephone and back to the battery at central office. The relay becomes energised; in other words, the magnet attracts a little iron armature which in turn closes a circuit as one would close a circuit with an electric light switch, and thereby starts several line-finders hunting for the particular line calling. As will be seen, a number of lines are accessible to these line-finders, and when one of these mechanisms has become connected with the particular line calling, connexion is continued from the subscriber's line to another mechanism known as a group-switch, which is to be used for selecting a trunk to the particular group of 1,000 in which the desired number appears. Attached to the circuit connecting the line-finder and the group-switch are a set of registers, and as the subscriber manipulates his dial in accordance with the digits of the particular number desired these registers revolve until they assume positions corresponding with these particular digits. These registers are used to record and store the number in such a way that the further movements of all the mechanisms necessary in completing the connexion will be controlled by the register set. If for analogy we liken the automatic central office equipment to a large machine works which receives customers' orders for all kinds of parts, we may compare the register sets with the order clerk who upon receiving the orders enters them in shop form and distributes them throughout the works so that they are received in the correct department and executed in accordance with the customers' wishes.

The first machine to move after the impulses have been sent into the register set (in fact this machine starts to move as soon as the first digit has been sent into the register set) is the group-switch

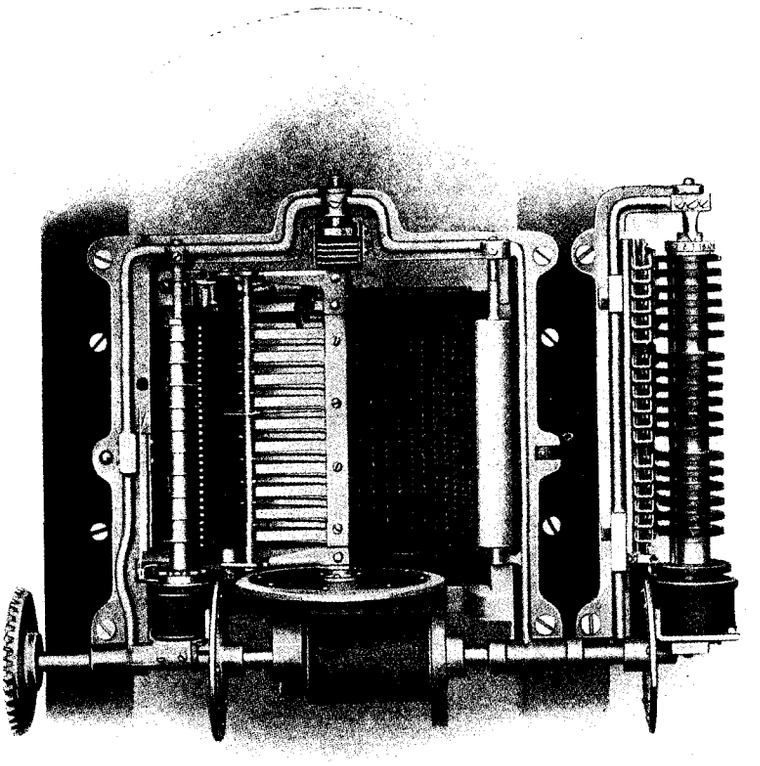

FIG. 1.

which was spoken of before. It will be seen from Fig. 1 that there is a small shaft at the left-hand side of this mechanism in which there are a number of pins projecting radially and in a spiral relationship to each other. This shaft has at the bottom a toothed wheel or interrupter on which there are ten notches, and the shaft now revolves to the extent of so many notches, depending upon the number stored up in the thousands register, this being the register which recorded the number of the first digit sent in by the subscriber. When this shaft or trip-spindle has revolved this predetermined number of notches it is automatically stopped by the thousands register being in its home or normal position, as this register has been stepped home in electrical synchronism with the forward movement of the trip-spindle. In this position of the trip-spindle one and only one of the radial teeth is projecting in the path of the hard rubber portions of the brush carriage or larger revolving member on the group-switch. At this time the circuit is so arranged that the brush carriage starts to

revolve and when it passes the line of radial pins on the trip-spindle one set of brushes is released, and, as the brush carriage continues to revolve, this one predetermined set is dragged across the face of the terminals on the terminal arc. This terminal arc is divided into ten levels corresponding to the thousands, each level consisting of a series of sets of three terminals each. These sets of three terminals represent trunks from this group-switch to the switches of the ten sets of thousands, and as the brush carriage drags one set of brushes over one level of terminals it makes an electrical test to

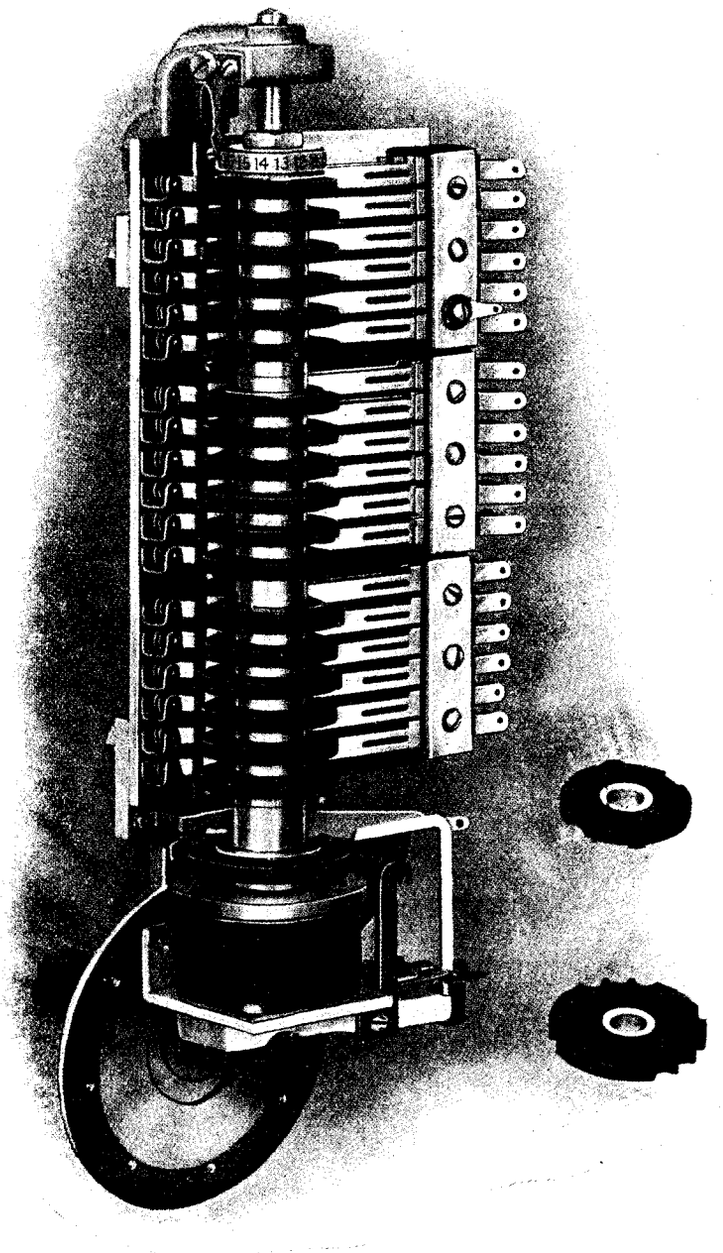

FIG. 2.

determine which one of these sets is disengaged. Having run on to a disengaged set, the mechanism stops revolving and connexion is now completed from the subscriber's telephone through the line-finder through the group-switch on to a trunk leading into the desired group of 1,000 lines. This trunk terminates in a second group-switch which is identical in construction and operation with the group-switch just described, and this second group-switch is connected with the hundreds register in the register set, a certain level is selected by the trip-spindle depending upon the setting of the hundreds register, and subsequently a free trunk is obtained in this level which leads the subscriber's connexion to the particular group of 100 lines in which is to be found the desired line. This trunk in turn terminates on what is known as a final machine, which is very similar to the group-switch, the only difference being that after selecting a particular level it selects some particular number in this level instead of hunting for a trunk, so that its operation is first to set the trip-spindle in accordance with the number as recorded on the tens register and then to drag the particular set of brushes selected over the particular level of terminals in which is to be found the desired line. Instead of simply hunting over these terminals its forward progress is controlled by means of the units register, and when it has sent the units register home to its normal position its forward motion is arrested and it is connected with the line of the desired subscriber. At this stage of the connexion a test must be made to determine whether the subscriber's line is in use or whether it is free, as it may at this particular moment be connected with the line of some other subscriber in the exchange. If the line is found to be engaged, a "busy back" signal is given to the calling subscriber, who must call again. If, however, the line is free, the called subscriber's bell is rung, and when he answers the ringing current is cut off and the "speaking" battery is connected with his line. When the subscribers restore their telephones to the hook the circuits and the mechanisms at the exchange return to normal.

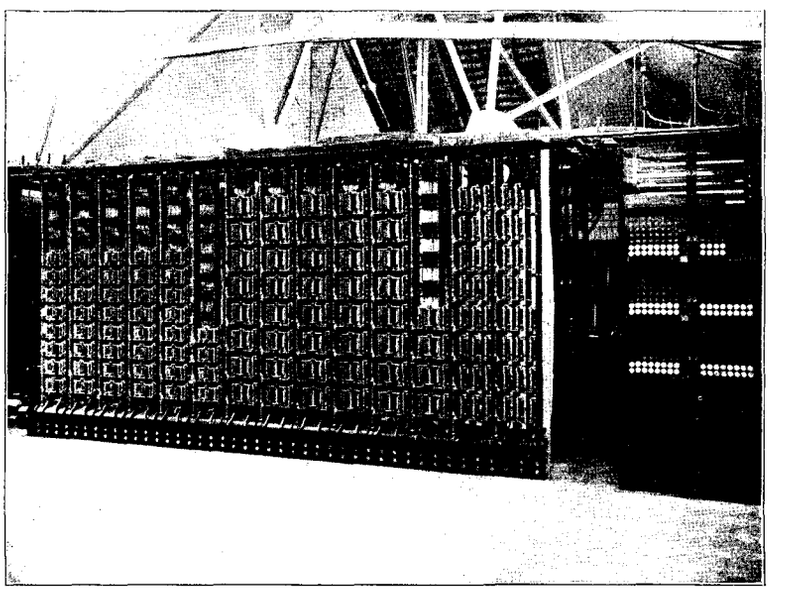

FIG. 3.

As will be readily appreciated from this brief outline of the progress of a connexion through this automatic exchange, numerous different electrical conditions must be obtained to accomplish the different results desired, and these electrical conditions are controlled by the sequence switch which has been variously termed the brains or the soul of the system.

On this sequence switch there are a number of sets of triplicate springs, the middle spring of each set being arranged to assume three different positions—No. 1: resting against the right-hand spring; No. 2: touching neither right nor left-hand springs; and No. 3: resting against the left-hand spring. The position of this middle spring is determined by the cam associated with the spring. It will be seen from Fig. 2 that each of these cams has its periphery cut in different shapes and the position of the cam determines the position of the middle spring. The whole set of cams are fastened together on the shaft which goes through the middle. This can be rotated through any one of eighteen different positions and may stop in any one of these positions, and thus by means of the different cams determine the relationship of the various springs on the sequence switch. A great number of different electrical combinations may therefore be set up on any one of the sequence

switches, the circuits for these combinations being led through the springs so as to be made through the right-hand spring, not made at all, or made through the left-hand spring on each set.

At each stage in the progress of a connexion one of these sequence switch-shafts moves to a new position and prepares the circuit combinations for the next step in the progress. The registers which were mentioned before are made on the same general principles as the sequence switches and operate in the same general manner.

In order to move these various pieces of apparatus with speed and precision this system is constructed with what is called power drive. A small motor drives a horizontal shaft which in turn is geared to vertical shafts, one vertical shaft being equipped on each bay or vertical unit of machines. There is a spool under the middle of the brush carriage which is an electro magnet, and when energised attracts the plate directly above the spool against the plate on the small horizontal shaft going through the middle of the electro magnet. Now as this small horizontal shaft is continually revolving, due to its being directly geared to the vertical shaft at the left of the bay of machines, it necessarily follows that when this electro magnet is energised and the two plates are brought together the brush carriage must revolve, and when the electro magnet is de-energised the brush carriage will remain wherever it may be at that given instant. The same method is adopted for driving the trip-spindle at the left of the group-switch and for driving the sequence switch shown at the right. By the adoption of this power drive in an automatic exchange great simplicity is secured and at the same time absolute reliability in operation. In some forms of automatic systems the mechanisms are caused to advance by means of what is generally spoken of as a step-by-step mechanism, which consisted of a small ratchet or dog arrangement being operated by an electro magnet so that the mechanism advanced one notch every time the magnet became energised.

In any exchange equipment it is necessary to give several kinds of special service in addition to the regular service of connecting one subscriber's line with another. For instance, in some districts more than one subscriber has his telephone connected with the same line, such an arrangement being called a party line. For this service it is necessary to differentiate between the parties when a call is completed to the line. In automatic service this is accomplished at the final machine by means of a certain form of current being used to ring the called subscriber's bell, this form of current depending upon the number called for.

Another class of service is that of private branch exchanges at large offices, works, or shops, and, in the event of one of these lines being busy, it is desirable that the connexion should be completed over another one of the lines without the subscriber having to call another number. This is also taken care of in automatic systems at the final machine which automatically tests the group of subscriber's lines until one which is not in use is selected and the connexion is then completed. In the event of all the lines being engaged the "busy back" signal is given to the calling subscriber.

For trunk or long distance service the subscriber calls a certain number which connects him with an operator who handles his call as in the case of a manual equipment. A similar course is adopted by the subscriber wishing to obtain information or make complaints.

J. N. W.

THE CABLE ROOM AND THE WAR.

THOSE folks "outside the Service," and not a few *inside* too, who have conceived the idea that the enforced interruption of telegraphic communication between Great Britain and Germany and Austria has involved a practical cessation of all Anglo-Continental telegraphic traffic, would readily have received correction could they have been transported to the Cable Room at any moment of the 24 hours during these last three months. That the disruption of so many commercial links must necessarily have caused an appreciable decrease in the volume of telegraphic traffic was to have been expected, but if the daily total number of telegrams has declined considerably other compensating factors have come into force.

The prohibition of code telegrams, the substitution of fully addressed telegrams in place of those with registered addresses, the increased number of lengthy Government despatches, and the many Press telegrams have increased the word average per message, on occasions as much as threefold. This increase in length has served to compensate for the loss of commercial traffic from other more profitable sources. There has in addition been a very fair amount of "diverted" traffic, which, owing to the hostilities, were necessarily sent over the British lines, for example, the Franco-Dutch and Franco-Belgian messages.

Reverting to the increase of Government telegrams, much of this involves more work than the ordinary social and commercial traffic, as extra care has to be exercised in transmitting figures and cyphers, and the paramount importance of accuracy necessitates the repetition of every group back again to the transmitting office. Some of the Anglo-Continental lines have proved a long way below standard during certain stressful periods when "emergency" circuits by circuitous routes, made up apparently of "emergency"

material, were the only means of communication. Thus "operator averages" have ceased to have any definite significance and, as a criterion of efficiency, have been compulsorily side-tracked.

The advent of the Military Censors has emphasised the value of the trained and experienced telegraphist, quite a considerable number of the rank and file, together with certain officers of supervising rank, having been peaceably commandeered by the military authorities. These have proved of material assistance in dealing with the thousands of commercial telegrams containing terms and phrases quite outside the ken even of the average well-informed man. It will probably never be known how far this knowledge has diminished the inconvenience to the public and facilitated the despatch of legitimate telegraph traffic. To the uneducated eye (telegraphically speaking) "hematite," "crown spents," "three-ply," "torn bellies," &c., open up an awful vista of possible spy language. Here the aid of an old hand in explaining the mysteries of certain everyday trade terms has doubtless more than justified its existence. Those of the staff who have thus come into

daily contact with the military authorities bear ready testimony to the excellent relationship that exists between these two departments which the war has thus thrown together.

The intimate and intricate knowledge of international and other firms and companies, and their general relationship to this country —which knowledge naturally in time becomes the possession of observant officers of a specialised service such as that rendered by the Foreign Telegraph Sections of the Central Telegraph Office—has also added its quota to the efficiency of the somewhat maligned Censor's Department. Then too the more than smattering knowledge of foreign tongues possessed by the Cable Room members generally, and by certain officers very particularly, has again accentuated Post Office wisdom in its encouragement of the study of languages.

This loaned assistance has, however, proved a veritable sacrificial act on the part of the C.T.O. administration, having led to a very serious depletion of the normal working staff of the Cable Room. Not only has staff been loaned to the C.T.O. censors, but to the Censor's staff at the private cable companies offices in London and at their various " cable-head " offices round the coast. Telegraphists have also been loaned to special Government telegraph circuits, to special repeater circuits, and last but not least there is the depletion, still proceeding, due to the number of men responding to the call to the colours. Such depletion has necessarily left a very considerable residue of junior officers, as yet incompletely trained, to cope with the traffic at a time of exceptional difficulty. However, these are drawbacks inherent to war-time, and the fledgling telegraphist will doubtless gain the necessary confidence the more speedily that he has had to realise somewhat earlier than usual in his career the responsibilities of his profession and the importance of the latter in regard to national affairs.

Glimpses are now and again obtained of the realities of this stupendous struggle, as when the line to a foreign station is suddenly interrupted and an hour or two after, communication being re-established, the apology comes over the wire, "*Pardon, monsieur, " c' était une bombe que l'on vient de jeter sur les lignes,*" or when transmission is arrested by the remark, " *Veuillez attendre camarade " l'artillerie va commencer ; nous descendons dans les caves. Au " plaisir de vous revoir !* " Sometimes the interruption lasts for two or three days and communication is re-established with the cheerful " *Nous sommes toujours ici mais il y a encore beaucoup de Boches " dans les environs : il s'en pleut !* " Strange indeed would it be if one were not at times to reflect on the different conditions of life obtaining at the two ends of that slender wire, never more fully realised than on those October days during the terrible siege of Antwerp.

" Business as usual " is the correct motto, of course, but many an ordinary rule and regulation has gone by the board during these two or three strainful months, simply because they failed to meet the stress of new and abnormal conditions. Nevertheless, routine is a strong master, so no one was surprised to note, a week or two ago, a small staff of mechanics busily engaged in fitting up a new set of Baudot apparatus under the authority of a Works Order which destined the use of the apparatus between London and—Frankfurt Main !

With the normal working day of the telegraphist lengthening out from eight to twelve and fourteen or even more hours, a wise loosening of the usual strict decorum of a Government telegraph office permitted one little satisfaction in a mildly patriotic display of bunting on certain central points of interest—the Paris and Antwerp telegraph circuits to wit. A reproduced photograph of the London apparatus of the London—Paris wire as it has appeared for some weeks now is given herewith. The French tri-colour occupies the extreme right and left, then the Russian naval flag, opposed by that of brave little Belgium, the whole surmounted by our own Union Jack. These emblems are beautiful specimens of needlework in silk, the handicraft of the wife of one of the staff and the photograph is also kindly supplied by a member of the Foreign Section. When depressing news comes ticking over the wires, there is no little consolation in looking up and breathing—

"And ever above the walls the banner of England flew."

J. J. T.

PRESS-THE-BUTTON TELEGRAPHY.

By DONALD MURRAY, M.A

[*A series of articles, starting with a narrative of personal experience, followed by an account of some of the fundamental principles of printing telegraphy, and concluding with a more or less non-technical description of the practical application of these principles in the improved Murray multiplex.*]

No. I.

FORMER generations in Scotland attached great importance to " fundamentals." As long as your religious fundamentals were all right, nothing else mattered very much. It is the same with printing telegraphy. If the fundamentals are right you cannot go very far wrong. Being of Scottish descent I am strong on fundamentals, and as I understand the aim of the Editors of the TELEGRAPH AND TELEPHONE JOURNAL is to interest and instruct their readers without going too deeply into technical engineering details, it appears to me that an explanation of some of the general principles—fundamentals—of printing telegraphy would be acceptable to many, especially as these fundamentals, though hard to discover, are easy to understand once they are explained, and they have the advantage of giving a bird's-eye view of the subject that can be obtained in no other way—a wide view that enables us to see the general trend of telegraphic development. As I understand that another aim of the JOURNAL is to keep to the practical side as much as possible, I shall deal with the fundamentals of printing telegraphy chiefly from the commercial and traffic point of view. General principles of machine design and engineering problems will not be dwelt upon.

In order to illustrate the fundamental principles by a concrete instance, a general account, with illustrations, will be given of the improved Murray multiplex system, and by way of preface I think it will be interesting to explain the evolution of the Murray multiplex. In doing this I shall have to use the perpendicular pronoun rather freely. I am sorry, but it cannot be helped. In order to complete the picture, reference will also be made to the development of other systems.

Being of a mechanical turn of mind, I have always loved to turn the handle of a sewing machine and watch the cloth feeding through. Turning the handles of machines is a childhood memory with me. I drifted into newspaper work and learnt all branches of the subject, including the mysteries of type and type-setting, and later on of type-setting machines and linotypes. A newspaper office is really a very large and peculiar kind of printing telegraph that sends out multiple address messages which we call newspapers. Also I had gone through the New Zealand, and afterwards the Sydney University, and for my degree I took logic, among other subjects. That set the ball rolling, and it has been rolling ever since—a matter of 22 years. The connexion between the Murray multiplex and logic and a linotype and a sewing machine does not appear to be very intimate, and it certainly requires some explanation. If any reader cares to look up Boole's *System of Logic* and Venn's *Symbolic Logic* he will find a great deal about " A " and " not A." The thing culminates in the *Principles of Science* by Stanley Jevons, which has an illustration of a " logical machine "—a machine that thinks. You press certain keys representing the terms in the premises, and the machine shows the terms forming the conclusions that can be drawn from the premises. On page 94 of Jevons' book, what is known as the logical alphabet is set out as far as the permutations of seven positive and negative things. Table VI is our old friend, the five-unit alphabet. It is the most important fundamental of the Baudot and the Murray multiplex, and, indeed, of most other printing telegraphs nowadays. Other inventors got the idea of selection from many different sources. I got it from a study of logic and particularly from Jevons' logical alphabet in his *Principles of Science*. I dabbled in the idea with some vague notions of making a printing telegraph, and as I had a small amateur workshop in Sydney I made an experimental model

of a printing telegraph of a perfectly weird character, but I knew so little about the subject that the model was hopeless and I had to give it up. The idea was there, however, and a year or so afterwards, while my head was still full of the logical alphabet and selection, I saw a linotype, and I had read about what was at that time a wonderful new invention, the monotype, that cast and set type automatically by means of a perforated paper tape. One day in Sydney the thought occurred to me that I would like very much to turn the handle of a machine that would work the linotype automatically by a perforated paper tape. I could feel myself turning the handle and could see the type matrices of the linotype clattering down to position as the wheels went round. The idea was fascinating, apart altogether from the question of there being any money in it. Obviously the logical alphabet was the way to select the keys of the linotype, and the early memories of turning the handle of a sewing machine urged me on. In a very short time, in 1895, I had a nice wooden model made with selecting combs and all the essential features of what subsequently developed into the Murray automatic printer. At that time it had nothing to do with printing telegraphy. Then I made a complete working model in metal, operating a Barlock typewriter. It worked quite well up to about 30 to 35 words a minute, and I made a machine to perforate paper tape for it. I took the outfit to New York in March 1899, hired a room at the old "Astor House" in Lower Broadway, and had the time of my life showing the invention to all sorts and conditions of people. It was so completely out of the ordinary that it attracted a surprising amount of attention. Amongst many other people, Mr. Philip T. Dodge, the President of the Linotype Company, came to see it: also representatives of the telegraph companies, and finally the Postal Telegraph Company engaged me to develop it into a printing telegraph, as the rival telegraph company, the Western Union, was at that time developing the Buckingham automatic printing telegraph, and the Postal Telegraph Company no doubt felt that they also must be up and doing. The result was that in two years the Murray automatic printing telegraph took practical shape. The printer was strangely like a sewing machine with a typewriter on top of it, and the sewing machine handle was there all complete. They called it the "Baby," and also "Murray's Coffee Mill," and "The Sausage Machine." By that time the speed of the printer had risen to nearly 100 words a minute. It was certainly unique. I brought it, together with the rest of the Murray automatic printing telegraph apparatus, to London in August 1901. The Murray automatic was so new and peculiar that it attracted a great deal of attention in telegraphic circles. High expectations were formed, and the British Post Office decided to have a couple of installations made at Holloway factory After much delay it was started on traffic between London and Edinburgh in December 1902. There are still a few telegraph operators in London and Edinburgh who remember turning the handle of the Murray automatic printer and grinding out telegraph messages.

The curious fact that human progress makes more or less definite advances at more or less definite periods holds true in telegraphy as in most other things. Printing telegraphy was born soon after the Morse key, almost at the beginning of the art, and the result was the Hughes, which developed into the Baudot, which may be roughly described as a multiple Hughes. Matters rested in that position for many years. There were plenty of printing telegraph inventors, but nothing of importance was being done until towards the end of the decade of 1890. Then there came a sudden burst of activity. I have already referred to the development of the Murray automatic. There was also the Rowland multiplex, invented by Professor Henry A. Rowland, of Baltimore. The story goes that he discovered he had only a few years to live and that he concluded he must do something for his family. He decided that printing telegraphy was the best thing to tackle, and after careful study of all the printing telegraph patents and inventions he evolved the Rowland octuplex. It was a page printing multiplex system giving four transmissions in each direction on one wire, the duplex balance being used. It was a very wonderful system, and it was exhibited at the Paris Exhibition in 1900. The Rowland Company boasted, not without justification, that it was the *clou* of the Exhibition. It was tried at the British Post Office for a week or two and rejected. It also went to Berlin after the Paris Exhibition and went through prolonged tests. It made such a great impression in Berlin that it was practically decided to adopt it generally in Germany. An installation was bought and set to work between Berlin and Hamburg. Unfortunately, its promise was greater than its performance and the Rowland had a very chequered career in Germany, partly owing to defects in manufacture, but mainly owing to the Rowland alphabet on which the system was founded. The Rowland alphabet consisted of the permutations of two things in eleven positions, and, as used in the Rowland system, seven cycles or reversals were employed per letter. A cycle or complete alternation or reversal corresponds to a positive Morse dot and the succeeding negative space. One cycle is two units. The five-unit alphabet is composed of two and a half cycles per letter. A system like the Rowland, employing seven cycles per letter, compared with the average Morse letter of four cycles and endeavouring at the same time to get a high speed on the line, 160 words a minute in each direction, working duplex, was bound to fail. The Rowland alphabet was the rock on which the Rowland system was shipwrecked. That is the biggest fundamental in telegraphy. You must choose the best alphabet or code of signals. It seems very obvious now that you cannot hope for success in telegraphy if you use seven cycles or reversals per letter when two and a half will do, and yet a very distinguished professor like Henry A. Rowland went wrong on that obvious point, and the result was the bankruptcy of the Rowland Company and a loss said to have exceeded half a million dollars. The Rowland system, while it was being tried in Germany, was also installed in Italy between Rome and Naples. The distance in this case, about 120 miles of aerial wire, is short, and the Rowland had more success, and I believe it is working there yet—the only Rowland installation now in use anywhere.

After I left New York for London with the Murray automatic, the Postal Company decided to rest on its oars and wait till the Murray automatic was perfected in Europe. The result has been that although they owned the United States patents they have never done anything with the Murray automatic system since I left them in 1901. They had always kept a friendly eye on the Rowland octuplex, and finally they arranged to lease several installations of the Rowland system, and it was worked on several of the Postal Company's lines for a year or two, but it was finally rejected. In addition to the bad alphabet it had direct transmission typewriter keyboards working at 40 words a minute. It was found that with this arrangement there was very little advantage in output compared with the Morse key on the Postal Company's bonus wires. That also is a fundamental point that is obvious now, and it is difficult to understand how it was not obvious then. If your speed is limited to 40 words a minute and you have to stop to sign and time your messages, and in addition have to send operation signals to run the carriage back to a new line, and feed up to a fresh page for the next message, it stands to reason that the actual speed will be more like 30 than 40 words a minute, and a good American Morse operator, with a bonus of a halfpenny a message beyond 300 a day, does not fall far short of 30 words a minute, especially as he signs and times the messages with his left hand while continuing to send with his right, and he has no operation signals to trouble about. Unless a printing telegraph can show substantial advantages over the Morse key there is no hope for it. The Rowland Company, in addition to their installation between Berlin and Hamburg, got an order for a second installation, which was supplied at a considerably later date with a number of improvements, and this was tried between Berlin and Frankfurt. This was a longer line than that to Hamburg, and the Rowland caused serious trouble on the adjoining telephone wires. With seven cycles or reversals per letter and sixteen letters per second in each direction on the one wire duplex—that is to say, 112 reversals per second in each direction on one wire, corresponding to 280 words a minute in each direction duplex on the Wheatstone—there was naturally trouble in adjoining telephone wires. The representative of the Rowland Company complained of the bad balancing of the German telephone wires and everything possible was done to smooth

down the hum of the Rowland signals, but without satisfactory results, and the Rowland is now in the Post Museum in Berlin, It may be mentioned that it was on account of this inductive trouble that the British Post Office rejected the Rowland after a few weeks' trial. The German Post Office spent several years on it before being forced to the same conclusion. This is another illustration of the importance of being guided by fundamentals.

On the ruins of the Rowland, Dr. Louis M. Potts has built up a still more wonderful system that avoids many of the fundamental defects of the Rowland. In the Potts system, transmission takes place automatically by means of perforations in the page-printed message itself. It is a perforated page transmitting multiplex instead of a perforated tape transmitting multiplex. In theory, at any rate, each telegraphic message can retransmit itself indefinitely. Dr. Potts has cut down the alphabet from seven to four cycles per second. That is not as good as the two and a half cycles of the five-unit Baudot alphabet, but it is at any rate as good as the Morse alphabet. I fear that the fundamental principle being disregarded in this case is simplicity. The Potts system is complicated mechanically, and that involves heavy cost of construction and maintenance. Whether this difficulty can be overcome by manufacture on a large scale remains to be seen. The Potts system is a brilliant piece of work that deserves success. Whether it will achieve it is—as always—a question of fundamentals Dr. Potts has not appropriated any of my ideas: he has not attacked my apparatus directly or indirectly, nor has he made ridiculous and untrue claims for his system. Therefore, as the world is wide and there is room for many telegraph systems, I hope Dr. Potts and his supporters will have their full share of success.

(To be continued.)

HOW A BELGIAN REFUGEE BECAME A LONDON TELEPHONIST.

BY IRMA MAYELLE.

Vous désirez savoir comment il se fait qu' à l'heure actuelle je suis téléphoniste anglaise. Voici mon recit. Ne vous effrayez point; aucune aventure bien grave n'a été la mienne, ou plutôt la nôtre, car c'est en compagnie de ma soeur que je suis debarquée sur le sol anglais. C'est précisément grâce à elle que nous avons pu nous éloigner à temps de cette vilaine race teutonne. Ayant eu son congé à son bureau, elle était toute préparée à suivre l'exemple de nos fortunées de l'avenue Louise, donc, d'aller jouir d'un peu de tranquillité au bord de la mer. Car au repos il ne fallait plus y songer à Bruxelles tous les jours, toutes les heures vous apporterient de nouveaux et horribles récits de la guerre et nous rapprochaient aussi un peu plus de ces barbares. Les barricades montées à tous les ponts de chemin de fer, les coups de canon nous annonçant l'explosion de l'installation de la télégraphie sans fil, les aéroplanes étrangers planant toute la journée au-dessus de la ville, tout cela n'était certes pas pour nous rassurer. La frayeur s'emparait de tout le monde et tout ce qui était dans la possibilité de s'eloigner de la capitale n'hésitait plus. Je parvenais donc á décider ma soeur aussi. Le 19 août nous allions trouver nos autorités communales pour avoir un "sauf conduit" pour le Royaume; je m'en fis préparer un également afin de pouvoir rejoindre ma soeur à la première occasion. Tout était donc bien arrêté, le lendemain elle prenait le chemin d'Ostende. Moi j'etais appelée au service à 6 h^res^ du matin. Cela ne me souriait guère de devoir me mettre en route si tôt; je craignais la rencontre désagréable d'un Uhlan-brûleur. Ce mot seul vous glaciait tout votre être. Enfin le service avant tout. Toute résignée, je m'en allai vers la tâche. Je ne fis fort heureusement pas la rencontre tout redoutée et trouvai le bureau comme je l'avais quitté la veille. A peine installée d'un quart d'heure, je vois que tous se dirigeaient vers les fenêtres, fixant le ciel d'un regard scrutateur. Qu'est-ce ? Je n'y tenais plus et allais voir aussi. Que vois-je ? Un Taube ! Qu'il était beau ce grand oiseau ecrivant ses courbes gracieuses dans notre ciel. Je ne pouvais me lasser de suivre le vol de ce monstre, admirant et maudissant à la fois l'habil aviateur. Que cela nous réservait-il ? Rien qui vaille, assurément. En effet vers 7h 15′, nous recevions l'ordre de quitter le bureau; le chef de reseau nous annoncait que Messieurs les allemands désiraient faire une visite à la capitale. La nouvelle fut reçue avec assez bien de calme et la distribution des coupons de service se fit en bon ordre. A 7. 25′ je fis mes adieux aux infortunées collegues et courai chercher ma soeur. Vers 8h 30′ nous étions à la gare du Nord en présence d'une foule enorme et ahurie. Qui se passait-il encore ici ? Gare fermée, plus de départs. Que faire ? Il nous restait encore une chance de salut, partir de la gare du Midi. La même idée s'empara de tout le monde et en un clin d'oeil tous les trams pour cette direction étaient pris d'assaut. A cette gare-ci on faisait file à tous les guichets. J'y appris qu'il y avait encore un train pour Enghien et que de là on pouvait continuer vers le littoral. Ce voyage ne me tentait plus, l'idée d'être débarquée dans quelque village du sud me faisait hésiter un peu; ma soeur ayant obtenu un coupon jusque Ostende, m'assurant alors que le service n'était pas encore interrompu. Suivant donc le mouvement général, nous allions prendre place dans le train. Le voyage ne s'effectuait pas en voiture salon, ah ! non. Tous les compartiments étaient combles; dans le fourgon on entassait les voyageurs comme de vulgaires colis. Nous avions le grand avantage d'être casées sur une des platesformes extérièures, en compagnie d'une famille liègeoise. Les pauvres, ils en étaient déjà à leur seconde escapade. Taisant à mauvais fortune, bonne figure, nous nous mettions à rencontrer nos petites aventures, et ainsi le voyage se passa le mieux. Nous atteignions la mer vers 3 h^rs^ de l'après-midi; j'oublie de vous dire que nous avions quitté Bruxelles vers 2h 15′. Comme vous pouvez le supposer nous avions pas le chemin le plus direct, à recommander aux gens d'affaires: Bruxelles—Enghien—Tournai. On nous mène même à Mouscron, qu' allions nous faire à la frontière française ? Nous y restions heureusement pas; de la on nous expédie à Courtrai—Thielt—Thourout—Ghistelles et enfin Ostende. Combien de fois nous avons dû changer, je ne m'en souviens plus. Inutile de vous dire que nous étions au comble de la joie à notre arrivée; un cri de soulagement sortit de toutes les poitrines. Hélas, nous n'étions pas encore au bout de nos peines. Il s'agissait d'atteindre Groenendyck, petite plage située près de Nieuport-bains. Nous nous dirigions donc courageusement vers le guichet des tramways. Guichet fermé, pas de départ avant 5.12. Il est 3.30, il n'y a qu'une grosse heure à attendre. Nous en profitons pour aller manger un petit sandwich. L'heure approche et voila le tram qui doit nous conduire à destination. Arrivées là il fallait encore marcher pendant un quart d'heure. Prenant une nouvelle dose de courage nous nous mettions en route. Il était environ 8^hres.^ quand nous arrivions chez nos amis. Notre arrivée inattendue jeta l'emoi dans ce paisible petit lieu. Loin de tout bruit, ils ignoraient complètement que la situation était si grave. A 9^hres.^ nous allions chercher le sommeil réparateur. Point n'était nécessaire de nous bercer, nous étions brisées de fatigue. Le lendemain, journée splendide: il nous semblait sortir d'un affreux cauchemar. Nous allions enfin être tranquilles. Cela ne dura pas longtemps. A peine pouvions-nous y jouir de quelques heures de calme. L'après-midi déjà le bruit courait que les allemands se dirigeaient vers Gand et qu'ils allaient continuer leur raid jusque Ostende. Pas de fumée sans feu, dit-on. Nous n'étions plus à l'aise ici non plus. Ma soeur ayant pris la résolution de pousser jusque Londres, s'en tint donc a sa première idée. Le lendemain notre lever fut donc bien matinal, la première chose qu'on nous servait c'etait l'affirmation de la nouvelle de la veille. Cette fois-ci je regrettais Bruxelles; j'aurais donné gros pour pouvoir retourner, mais il ne fallait plus y songer, partir pour l'Angleterre c'etait

MLLE. IRMA MAYELLE.

notre dernière ressource. Mais qu'allai-je devenir la-bas, moi, pauvre téléphoniste ne connaissant que son métier et quelques mots d'anglais. C'etait mon plus grand souci; mais cependant la grande crainte de tomber dans les mains de ces brutes allemandes prit le dessus et ainsi donc je me decider pour le grand voyage. Prenant congé de nos amis que se preparaient à suivre la même route, nous nous mettions de nouveau en route et à 9hrs nous etions à Ostende. Dans le tram le bruit courait qu'il n'y avait plus de service entre Ostende et Douvres, plus loin nous apprenions que c'est le dernier départ. Nous galopions vers la gare, ici on nous dit qu'il fallait un passe-port. On petit pas de course nous nous rendions au consulat d'Amérique et là après une bonne demi-heure d'attente nous parvenions à nous procurer le fameux document. Nous etions sur des charbons ardents. Il était alors 9.55, la malle partait à 10.30. Nous nous lancions à la gare en voiture. Après quelques bousculades, nous parvenions à avoir notre coupon et après de rudes poussées encore, à moitie etouffées dans la foule nous nous embarquions. Ouf! quel bonheur cette fois-ci nous sommes bien delivrées. Ici on se préparait à recevoir ces grands seigneurs Allemands de la plus aimable façon; de grands bâtiments anglais se rangeaient tout le long de la côte. Notre traversée fut excellente, et vers 5hres nous étions déjà installée dans le train qui serait nous mener à Londres. Il etait environ 7hres quand nous descendions dans la grande capitale. Le plus grande calme regnait ici; ces gens semblaient ignorer ce qui se passait de l'autre côte. Nous étions bien vite revenues de notre étonnement, il fallait arriver à Dulwich. Après avoir accosté trois policemen, nous parvenions à partir pour cette direction. Dans le tram j'exhibais un papier avec l'addresse, et le bonhomme nous envoya à Dulwich station. Il fallait changer de tram, de nouveau baragouiner l'anglais. Mais quand nous étions bien installées et que je voulais payer mon ticket je m'apercevais que je n'avais plus un sou de monnaie anglaise. Le receveur ne voulait pas de notre argent, il repoussait même notre or. Nous étions prises d'un rire fou, toutes les deux. Que faire? Il etait cependant trop tard pour faire la route à pied. Un idée me passait par la tête; je lui donnais mon adresse lui proposant de faire toucher le montant du voyage; il acceptait. Malheureusement il nous faisait descendre trop tôt, et grâce à deux braves petits boy-scouts nous arrivions à destination. Impossible de vous décrire l'étonnement de nos amis anglais quand ils nous trouvèrent à leure porte. L'accueil fut des plus chaleureux et ici enfin nous trouvions le bon repos. Nous arrivions le samedi soir et le mercredi suivant ma soeur était déjà du nombre des dactylographes anglaises. Quant à moi je fis mon entrée au bureau central de Londres quinze jours plus tard grâce a la grande obligeance de Mlle Heap, surintendante au téléphone. J'eus d'abord une petite entrevue avec cette dame; jamais je n'oublierai le moment où je fis appelée à son bureau pour la première fois. Mais j'étais bien vite remise de mon emotion; il ne me fallait pas long-temps pour découvrir en cette charmante personne une bonté d'âme extraordinaire. A mon arrivée au milieu de mes collégues anglaises j'eus peine a retenir quelques larmes de joie et de douce emotion. Et voila comment je suis à l'heure actuelle téléphoniste anglaise.

[*The foregoing is Mlle. Mayelle's account in her own words of her escape from Belgium. Appended is a free translation by* Miss S. H. MULVANEY *of the London Trunk Exchange.*]

DOUBTLESS it will interest you to hear how I came to be an English telephonist. . . . First of all you must know that Brussels was in a ferment of excitement, as every day, even every hour, brought horrible stories of the war, and gradually brought us a little nearer to the Germans. The erection of countless barricades; the distant roar of cannons; the destruction of telephone and telegraph wires, and the hovering of hostile aeroplanes over the city was nerve-shattering and terrifying. Panic seized everybody, and those who could lost no time in fleeing from the capital, leaving homes, friends, and everything they valued rather than risk the ill-treatment and all the horrors to which their neighbours had been subjected by the enemy. My sister and I also decided to take this step as soon as possible.

On Aug. 19 I was to take up duty as usual at 6 a.m. My only fear of being abroad at this early hour was meeting one of the dreaded Uhlans. But duty before all. So I set out, and was thankful to reach the office without being waylaid by a single German soldier.

I had hardly been on duty a quarter of an hour before every pair of eyes looked with horror towards the windows Work was forgotten, and everybody was following the movements of a German aeroplane. It looked like a magnificent bird with its graceful wings and upward flight. I could not help but admire this wonderful machine, although cursing the clever aviator, knowing the disaster which would follow in its train. Orders were given by our chief at 7.15 a.m. to flee, as the Germans were entering the capital. The news was received calmly, and by 7.25 a.m. I had said my last good-bye to my colleagues.

I then made haste to find my sister and in her company arrived at the Gare du Nord. There we found a dense crowd of people in a frenzy of despair, for the station was closed. One more chance of escape was left us—the Gare du Midi. Not a minute was wasted; we sped on our way and found that the same idea had occurred to everyone else. We reached the station and here also was a tremendous number of refugees. To our relief we learned that there was still one train for Enghien, and from there could continue the journey to the coast.

Following the crowd we got into the train. The journey was not made in a saloon carriage: indeed, every compartment, every luggage van, and even every truck was packed to suffocation, and we were lucky to obtain room on one of the end platforms of a carriage in company with a Liègoise family, who were fleeing for a second time. Bravely trying to smile at misfortune we related our adventures to each other. We travelled for six hours in this fashion and after changing train several times we found ourselves at Ostend.

I cannot tell you with what relief we reached Ostend. but alas! we were not yet at the end of our trials. We went as far as Groenindyck and there had to walk to the tramway. Our courage was fast ebbing away when we heard that the next tramcar ran at 5.12 p m., and it was now only 3.30 p.m. We braced ourselves and went in search of refreshments. The minutes passed slowly as we wended our way to safety. After alighting from the tram we still had another long walk before us. By 8 p.m. we arrived at our friend s house where our presence caused great consternation, as, so far away from Brussels, they were ignorant of the critical state of affairs in the capital. Worn out with excitement and fatigue we temporarily forgot our troubles in sleep

Next morning we awoke with renewed hopes which were, however, rudely dashed at mid-day by the rumours that the Germans were marching on Ghent and Ostend. Afraid to remain here, my sister and I decided to flee to England. The following day we rose at dawn and found to our horror that the rumours of the previous day had been confirmed. I would have given everything to return to Brussels, but that was impossible, and now our only chance of safety lay in England. By 9 a.m. we were back at Ostend, and there learned that the Ostend—Dover service was suspended. Further on we heard that there was still one boat shortly leaving for England. We raced to the station, and our spirits sank when we were told that we must first have our passports. We almost flew to the American Consulate, and after a very long half-hour were in possession of these precious papers. This terrible time of waiting left us on thorns. It was now 10 a.m., and our boat left at 10.30 a.m. We were whirled off in a cab to the station, and after much jostling and struggling we managed to get our tickets. After more fighting, more struggling, we managed to scramble on to the boat half suffocated by the frantic crowd. Oh, what relief we felt at our deliverance. Great preparations had been made by the English all along the coast to give the Germans a warm reception. We had an excellent passage and by 5 p.m. we were safely in the train which was to take us to London. At 7 p.m. we were in the far-famed city. What a contrast—calm and peaceful as if ignorant of the terrible happenings in our little country!

Now to find our way to Dulwich This was done with the aid of three policemen, several tram conductors, and two little chivalrous boy-scouts. An exciting time came for us in the tramcar when we discovered that we had no English money. We could not help laughing at the absurdity of the situation, but after having our name and address taken were allowed to continue our journey free. It is impossible to describe the astonishment of our English friends at our arrival. We were warmly welcomed, and at last in a safe home. Fifteen days later I made my entrance into the London Central Exchange, thanks to Miss Heap, the Superintendent of the London Telephone Service, whose kindness at our first meeting I shall never forget. I could not repress a certain emotion on finding myself working among my English colleagues in the London Trunk Exchange. Thus it has befallen that at the present time I am an English telephonist.

BRIGHTON TELEPHONE SOCIETY.

THE annual meeting of this society was held on Oct. 5, when Mr. Moorhouse, the District Manager, was re-elected president, Mr. C. T. Crisp, the Sectional Engineer, vice-president, and the following were chosen as committee:—Miss Trott, Miss Puttick, Miss Burden, Miss Ison, Mr. Lumsden, Mr. D. Wallace, Mr. G. H. Drury, and Mr. C. Hooper. Mr. Parsons was re-elected secretary.

The following syllabus was adopted for the coming session:—

Nov. 2.—Questions and answers on "Knotty Points" with small prizes for the best question and best answer.

Dec. 7.—Prize papers by ladies.

Jan. 4.—Lecture by Mr. Stuart Jones, Traffic Manager (Secretary's Office) on "London and Brighton Telephone Cable and its Influence on the Trunk Service."

Feb. 1.—Lecture by Mr. C. W. Stone (of the Brighton Telegraph Department) on "Telegraphy."

March 1.—Lecture by Mr. Eustace Hare (Secretary's Office), subject not yet decided.

April 5.—Prize papers by men.

A PUBLIC SERVICE.

BY EUSTACE HARE

WE print below an abridged version of the paper on the above subject read before the first meeting of the London Telephone and Telegraph Society on Oct. 26. Mr. Hare's interesting paper does not readily lend itself to condensation, and we have therefore given the more important sections *in extenso*, omitting some introductory and other paragraphs.

Public service is ubiquitous; the newsboy, the cab-driver, the railway guard, the hotel-waiter, even the stock-broker are all, in their way, as much servants of the public as the telegraph boy, the telephonist, the policeman, the fireman, the soldier, and the postman. In fact, most of us, not being drones, are directly or indirectly ministering to the community, *i.e.*, to each other—beneficially or otherwise. But our attitude towards those who serve us varies considerably and, on the surface unaccountably.

There are services of which we need not avail ourselves and need not pay for unless or until we do: such as the Railway, the Telephone, and the Press. There are others which may never, or they may, be brought home to us very closely, as the Army, the Fire Brigade, and the parochial care of our streets; for the maintenance of which, nevertheless, all have to pay their share.

We will deal with the last three first; all accepted, well-regulated, and accustomed services; but as such, none of great antiquity So far as our fire-saving and street-cleaning forces are concerned I have never heard of any disposition on the part of the public to cavil at their cost or to question the propriety of placing them under the rule of an appointed public authority; so conscious are we of the need to protect and preserve property, life, and health. We do not concern ourselves with their organisation, nor meddle with the machinery; we see them at work and we see the effects of their work and are content to foot the bill. How they came into being as constituted bodies we forget, if we ever knew; how our forefathers did without them is plainly apparent when we remember, shudderingly, the Great Plague and the Great Fire; memory playing an important part here, and playing into the hands of progress and development. . . .

Take now another service regulated, to a certain extent, but not administered by the people's representatives either in Parliament or elsewhere; for which we need not pay unless we make personal use of it—the Railway.

Here at least, even at its inception, the superficial thinker of to-day would opine, was a boon for the opening of arms; indisputably beneficient, reckoning things as they are now; not then; at the same time forgetting that we are probably as nearsighted now as then. For, speed, as we know it, was 80 years ago undreamt of and the want of it unfelt—the inventor invented it. Snow-drifts, highwaymen, mail-coaches, slow-coaches, and other accepted inconveniences were certainly there but to be borne with as much as colds and tempests; inevitable inconveniences, to be patiently endured.

Another new thing; more antagonism and prejudice. More pamphleteering and petitioning to Parliament lest our own puny efforts to stop the clock of progress be unavailing. Timidity, conservatism, selfishness, and ignorance in arms; more than figuratively—with menace of pitchfork, should surveying emissaries invade our farmlands to spoil our crops and burn our fleeces with coal smoke and escaping sparks. Farmers agitated, horseflesh at a discount, gentry alarmed at the desecration of their estates. Stupidity on all sides—stupidity against which, someone has said "even the gods fight unvictorious."

Nevertheless, a footing was gained somehow, and the tunnelling and cutting and viaducting went on unheeding; where it could. Now, a full-grown, acknowledged service of 80 years or thereabouts; but with supersession by a later form of traction creeping behind it.

These two examples, one under complete State control, the other partially, will suffice to demonstrate how the majority of us ever commit the mistake of viewing innovations only from the standpoint of the immediate present; how we forget the unvarying benefits secured to us by every great discovery and great idea, and by the regulation of it in the hands of a properly constituted authority, State or otherwise; how imagination fails us in the matter of future development; all so limited by the notion that the latest "move" is the first and final one—memory being so short and foresight so rare

One other service—before coming to our main object—not usually recognised as such; and I only touch upon it as a third variety, being in private hands and ordinarily unregulated, viz., the dissemination of News. A subject in itself; to be treated with some delicacy.

But suppose, as a wild proposition, our legislators thought the time had come for the State to take in hand the issue of our daily news, the authentic, ungarnished, and ungarbled dissemination of current history, reasoning thus: we provide and insist upon primary, and we undertake and encourage secondary education, and it is therefore reasonable to conclude that the adult, the newspaper reader of to-day, is in a position to think for himself, to exercise his own judgment, to form his own conclusions. And further, every one *shall* know, or shall have no excuse for not knowing, what is happening around him; for by a small tax the newspaper shall be delivered to all—the resources of the Post Office being illimitable. False news, false impressions of news, false prophets, raucous vendors of stale news shall cease and the seekers after plain and unvarnished truth shall be satisfied.

Rightly or wrongly, how would such a new thing as this be received? With dismay and derision. We get on very well as things are; we want, not our own ideas, not our own conclusions—perhaps having none—but the ideas and conclusions of our chosen guides and sifters of news and chit-chat. We may have been sometimes misled in the past, but we don't take these things (perhaps any things) too seriously, and as for the future, that is projected for us, and we don't want the trouble of verification; and whether to-morrow disproves or confirms to-day—to-morrow will show. In the meantime the raucous newsvendor must live, as did the night-watchman, and the link-boy 100 years ago. And live, not only by, but on his wares; having ability to read what he sells; thereby acquainting himself with winners and sporting odds. Which being no concern of ours, let us leave such institutions alone and pass on to something which matters.

Such as the Telephone Service; some 30 years old and reputed to be still in its infancy; which, if true, must have phenomenal powers of obtrusiveness and have had uncommonly bad nursing.

To talk about the Telephone Service of this country as still in its infancy is pure nonsense combined with ignorance inexcusable. It is full grown and fully developed with possibilities tried and proved; equipped with the most modern appliances, and, to put it modestly, lest we seem to colour ourselves too highly—a process not altogether unknown in some telephone quarters—served by a staff who have some sense of their responsibilities in them and are not without glimmerings of intelligence. In its completeness, the most sensitive machine perhaps ever devised; elementally attuned to and answering the offices of human speech and meaning; but if you fail to recognise and cultivate its finer qualities you will reduce it to the level of not merely an ingenious mechanical contrivance but a mechanical idiot. For the telephone has a way of reflecting the characteristics and limitations of the user, and of rendering exactly what is expected of it.

One of the alleged symptoms of its alleged backward condition is that the telephone has not yet penetrated to remote rural districts; that every village and hamlet is not yet ornamented with its proper quantum of poles and wire—the planting of which, as we all know, is so welcomed and encouraged by estate owners throughout the land. And here we may mark one or two inconsistencies. Town-dwellers accustomed to modern conveniences and luxuries—which occasionally pall—are addicted in these locomotive days to week-end retirement in remote country places—the remoter the better—and are rather boastful of an eight-mile distance from a railway station and of such attractions as oil-illumination and water from the well. What they *do* miss is a telephone; what *does* raise their indignation and incites them to Press complainings—with such acrimony as they may command—is the neglect of a parsimonious Postmaster-General to supply them at a becoming price with this simple necessity. Not that the native population are at all clamorous for it. They, simple souls, being now rid of their forefathers' objections to coal-smoke and devastating sparks, would for the nonce be content with a nearer railway station and a regular water supply. But being in their dim way, mindful of their unprofitableness to dividend-earning concerns, are not unduly persistent Having neither motor-car nor town business, they know little of speed and nothing of the ease of making money by telephone nor of its utility in sickness and health, nor even of the villifying of it. Only the enlightened are lost without it.

Without this Infant Service! Forgetful of Standing Army precedent, Steam precedent, Education precedent, and every other precedent under the sun, with inevitable opposition and inevitable development notwithstanding. Why, in comparison with service still in private (or shareholders') hands, the Telephone stalks the land to-day with giant stride. I, myself, lived recently in a locality only 23 miles from London where there is no gas (to say nothing of electric light) even at the railway station; where a regular water supply is as yet partial and where there is no train from London between eleven and three o'clock in the day, Saturdays excepted. And yet the telephone, the most modern service of all is there, available to all, and to all parts of the kingdom.

Private enterprise is all very well, but all very limited; having a selective way inimical to a community's wants. By all means let it pursue its course; but its course lies not wholly in a national direction, still less in an international; in the sense that it, of necessity, has private as well as public interests to serve—the former claiming predominance; against which protest would be unreasonable and without which its existence would be impossible. For it is only fair that the few who venture their means of living should live by the many who make use of the product. And, to put it in its objectionable form, this means that undevelopment, inefficiency, and other flaws may be due, not to mismanagement or indifference, but to the difficulty of satisfying the claims and expectations of a minority who supply the means for exploitation and expansion on behalf of a majority. It is one thing to lead the public in the direction you want them to follow; it is quite another thing to follow where they beckon.

In a public service controlled by public representatives there is no such clashing of interests; the economic conditions differing widely, although the business element remains. A service is no public service unless the community as a whole benefit thereby directly or, it may be indirectly. Therefore, as no undertaking can be promulgated without initial outlay, those who are to benefit—viz., the public—must provide that outlay; but they are entitled to look for an adequate return, in money or kind At which point, the subject being of a general nature, we may leave it for a particular; being too deep for superficial burrowing.

It has been claimed in some quarters that the telephone business is essentially a commercial business, and that consequently its complete success can only be achieved under commercial control. The truth of this argument depends on the meaning applied to the word "commercial"—a tolerably wide subject for discussion in itself. But without wandering into the labyrinths of supply and demand, sale and exchange, bills and credit, and other economical appurtenances I think we may safely say that a commercial business implies the possession and distribution of a tangible commercial commodity.

Now, in what sense does a telephone exchange system comply with this proposition ?

Roughly, we may divide it into three sections : the apparatus, the product of the apparatus, and the utility of the product.

The first factor we throw aside at once ; because, although the satisfactory purchase and installation of apparatus involves commercial foresight and acumen, all material remains the property of the administration and is not a saleable article.

With regard to the second, the product of a telephone system is an oral communication, and herein lies the crux of the position. Can it be claimed that because an oral communication has to be paid for it becomes a commercial commodity ? (The fact that it is transmitted electrically does not affect the question at all.) If the answer is "yes," the logical sequence is that all communications orally delivered for monetary value are commercial products.

Therefore, by way of example, the oral communications between the schoolmaster who is paid to question and the scholar who pays to answer, become commercial commodities, and every school should be commercially governed. And further, to follow customary development, an outside body should reap a pecuniary profit out of the scholastic process.

The notion may, I think, be at once classed among novel absurdities.

On the third count—the utility of the product—if the tuition in question were exclusively directed towards a commercial training there might be some plausible claim for regarding all schools as commercial institutions ; with the dividend as a culminating object lesson ; but as this is contrary to fact the whole proposition falls to the ground.

Likewise, as telephone conversations are not limited to commercial topics but comprehend, as in a general education scheme, every subject under the sun, you cannot claim the business as a purely commercial concern. It is, to sum up, not strictly a *business* at all, but a national service.

I have been much impressed with the printed comments of an able American writer on Telephone subjects who says, in effect, that no matter how other interests fluctuate, the telephone undertaking always flourishes—for the shareholders. Naturally so, for one or two very uncommercial reasons : you choose your customers and you make them pay in advance ; and this being so you never have a surplus stock, because you only manufacture your commodity on demand. Can anything be more simple or more conducive to success ? It is not difficult to understand that such fortuitous conditions appeal alluringly to the business mind and to the commercial investor. A commercial body which runs an uncommercial service unsuccessfully must be a very unbusinesslike agglomeration of commercial minds.

Which, for the production of equity on all sides, seems to point to an axiom that a business which is not exclusively commercial should not be in strictly commercial hands.

Between the Telephone and all other services, there is a great gulf, sufficient in itself to account for the world-wide controversy which, especially of late years it has evoked, and which again, in itself, is evidence of its arrival at maturity. The fundamental difference is this : take any other service you like ; Army, Navy, Postal, Police, Railway, or Street-cleaning, their management and well-being are solely in the hands of the administrating authority. In a Telephone Service, management and organisation, the best in the world, are absolutely nullified without the intelligent co-operation of the user. The machinery is not only made use of but actually operated by the public.

Consider by analogy what this means A traveller takes his ticket for and his seat in the train ; the staff of the railway company do the rest. Suppose, in place of this simple, comfortable procedure, the railway company supplied each traveller with a small locomotive to be engineered by himself ; gave him simple instructions as to manipulation, a rule or two as to the observance of signals, and urged the claims of other travellers in front and behind ; suppose, in short, the company merely supplied the machinery and had to trust to travellers for the intelligent use of it ; what would be the result ? Incessant complaints of inadequate service ; of failures, attributed, not to misconception of rules, but to administrative delinquencies, which gradually growing in intensity by reason of a general inability to specialise, would soon reach to a sweeping condemnation of our railway system—unfair and unreasonable

Or take another service, the Post. It is not that the writer of a letter merely drops it into the box—confident of careful handling and safe delivery among thousands of others—but in the writing of it he has been under no restraint, has had no rules to observe and is under no obligation to be legible or to make his meaning plain. Should he fail in these points he may and probably does blame the density of the recipient, but not of the postman ; being rather favourably disposed towards that individual than otherwise, even to the bestowal of a pecuniary compliment at Christmas time ; a mark of gratitude comforting not only to the complimented but to the body of which he is the representative.

Or the Telegraph : here we advance a step further ; legibility and condensation having to be reckoned with ; after which a period of unconsciousness ; and, unless of supreme importance the time occupied in transmission is usually ignored, so well and so smoothly does the machinery (in the hands of officials, mark you) in the interim of receipt and delivery work, and so generally is its efficiency recognised.

These points, to us, are on the surface of things and scarcely worth mentioning but leading to something deeper ; to the refusal of the telephoning public to acknowledge the existence of, or the necessity for difficulties in this one service which cannot be overcome without their intervention or co-operation, when no such aid is called for in any other service—money being mainly the only aid required of them. And when we try to explain we are sedulously eluded, even derided ; having always to defend, when we ourselves would desire sometimes to attack. . . .

Briefly, the Telephone system is unique in this most important respect ; it is not we who pull the strings, it is the public ; we provide the means of communication and they operate them at any moment they choose, assisted by a staff to whom immediate access is available in moments of difficulty. An impression exists that telephonic perfection is possible only by the total abolition of human interposition under a purely automatic system. The truth is that as telephony is and must always be manipulated by the inexpert, its millennium will never arrive. The area of perfection might be touched if the whole process, excepting mere talking and hearing, could be operated by an expert staff, on lines parallel to the Railway, the Postal, and the Telegraph systems. In which case and in no other the telephonist might hope in time to vie with the railway guard, the postman, and the telegraph boy in popularity ; a popularity long overdue. In the meantime she may console herself in the hope that her virtues may be recorded and her praises sung, posthumously. . . .

After dealing exhaustively with the question of the value of advertisement, Mr. Hare continued :

In every great commercial or uncommercial concern involving a large staff there must be, among that staff, many shades of character, temperament, and disposition ; men and women with personalities and without ; egoists a few—evidence of weakness in the weak, an offensive but more pardonable creation of strength in the strong—altruists, still less ; some keen and ambitious, others indifferent but honest ; and so on, comprehending a whole gamut of balancing contradictions ; producing on the average, a fairly competent body. But I cannot help saying in passing that as, perhaps, no body of public servants has ever been so disparaged as we have been, it would appear—assuming our guilt—that the larger the staff the less efficient it becomes ; that is to say, the curve of numbers follows a contrary direction to the curve of efficiency and reduces the average value of the latter. Whether this is the usual trend, all things being equal, I do not know and have not troubled to investigate.

That such an immense body as we are should, individually and in the aggregate, be less competent than other bodies in this and other countries is an incomprehensible phenomenon ; that our administration should alone possess and exercise the unique and pernicious power of suppressing its strong men—of which surely it has some in its ranks—is, in these days, unthinkable ; and yet our detractors occasionally throw out hints in these directions. There is a cloud of smoke here and our difficulty is to find the fire.

A guess may be hazarded. There has been and still is a prevalent tradition that a complacent sense of superiority and self-importance obsesses every Civil Servant. The question therefore arises : is there any foundation for this charge ?

In one sense, and one only, the answer is "yes." Because men of this type are to be found in every large concern, public or otherwise ; not more in State service than in any other ; possibly less.

But there *is* something which enters into our branch of the Service which is not found to anything like the same extent in any other ; and that is a close, personal intimacy between the public and ourselves, and the closer it is the greater will be our degree of success. If we fail to admit this ; if we cannot recognise a definite line of cleavage between our work and that, say, of the Postal and Railway Services, in that, in those services the staff run the machinery and in this the public themselves help to run it—and must therefore be continually taught and shepherded—we are working in the dark.

The public confidence must be gained by all possible means ; and one of the chiefest means is the abandonment of anything in the shape of formal, stilted aloofness ; if such anywhere exist. And, perhaps, here and there it does still survive, though not more so in the so-called "officialism" of Government Departments than in railway companies, rate collecting authorities, and other kindred bodies, which cannot, in their corporate capacity always be cited as models of genial flexibility. Shortly, the relationship between ourselves and our *clientele* should approach that of banker and customer, of doctor and patient, solicitor and client ; mutual in object and interest. Such a relationship is surely not impracticable if we set our minds to it and the public meet us halfway, if they can ; if they can, with reason, once begin to realise that the unseen and unknown officials who administer and control (like the inspector and fitter who are usually acquitted of sinister motive) are at least as altruistic as themselves in deed and intention.

Telephony has no place for the egoist—the commercial and official egoist, that is—who cultivates no better means of securing recognition than self-assertion. For the commander of an army or of any body of workers who measures the importance of his post by the extent of his command, by the number of men who answer to his call, may do more harm or less good than the one man in the ranks who achieves distinction by sheer self-reliance and initiative with more than a seasoning of self-abnegation.

IMPORTANCE OF THE TELEPHONE IN WAR.

WHEN I arrived there was a crackling of rifle fire going on at the other side of the wood, which was steadily increasing. In a little cottage, behind the line of field batteries, was the artillery commander, who kindly explained the alterations which would otherwise be inexplicable. The General commanding was located in a building with a tower, about three miles away The commander in the trenches kept telephoning the movements of the Germans in front of them to him, and he then immediately sent directions to the artillery. The telephone, therefore, played a vitally important part, so vitally important that in this flat country, when anything goes wrong with the telephone, as not infrequently happens, the gunners are severely handicapped. —*The Observer.*

REVIEWS.

Wireless Telegraphy. Text-book on Wireless Telegraphy. By Rupert Stanley, B.A., M.I.E.E. Longmans, Green, & Co., 7s. 6d.—Bit by bit the mystery of wireless telegraphy is being resolved by common-sense methods of analysis and of description. Various unfortunate circumstances have put it in a category apart. The tragic events which have marked its history have combined to emphasise its differences from ordinary telegraphy. When we say that common-sense methods are resolving the mystery we would not be misunderstood. We do not mean to suggest that the subtle theories which go to make up the explanations of the phenomena are all explicable or defensible. Rather we mean that in the later presentment of those theories we are given more of their relationship with fundamental principles and with the important natural phenomena the study of which has made radio-telegraphy possible.

So Professor Rupert Stanley gives us an admirable book. It begins with the fundamental phenomena; it studies their relation not to radio-telegraphy only but to other branches of science. He adopts the electron theory, claiming that as this theory is "modern, simple, direct, and well-established" it presents fewer difficulties to the student than the vague fluid theories which it has displaced. This portion of the work is really excellent, and as Professor Stanley has exceptional opportunities in Belfast for handling actual experiences with the transmission of messages by radio-telegraphy, he is unusually well-fitted for combining this study of fundamental theory with an exposition of the development of the application of the theory to practice.

Broadly he follows the historical method. He shows us how the different developments succeeded each other. He gives us in clear language the salient differences between the several systems, and his circuit diagrams illustrating these differences are very clear. The chapter which explains how ether waves are propagated and received is quite excellent, and the history of detectors, from the first coherer to the different forms of crystal detectors, is quite satisfactory even if the descriptions are occasionally too brief and terse. Less than justice is done to Professor Hughes. Our author is probably joking when he tells us that if Professor Hughes had persevered with his wireless investigations he would have "become famous." When our wireless friends separate their own method of transmission in this way from all other forms of telegraphy, they will do well not to limit fame to their own realm. Professor Hughes did become famous; he was even more famous in respect of wireless investigations than this book admits.

We will forgive a few errors which should be corrected in a new edition, for it is necessary to say something by way of an addendum to the book. There are two developments of radio-telegraphy which are of immense interest to those of us who are primarily concerned with traffic problems. "There is no evidence," says Professor Stanley, "that higher speeds than 70 words a minute have been used." There is ample evidence that 100 words per minute has been accomplished, and for this evidence we have only to look at the Postmaster-General's reply in the House of Commons and to Mr. Shaughnessy's striking article in the *Post Office Engineers' Journal*. It is sufficient here to say that a speed even higher than this is now practicable, and that the Morse signals are so clear and definite as to be quite readable by telegraphists with no more than ordinary sounder experience. More than that the high speed signals are received on dictaphone cylinders, and it is found when they are read off at the slower speed that interruptions are so degraded as to lose their effect. Not only, therefore, is there the advantage of the high speed, but there is greater security against interference.

The second development is even more striking. It is now fairly evident that the signalling or the receiving station need not be adjacent to the aerial. The relaying of both outgoing and of incoming signals is being rapidly developed by our own engineers, and high-speed signals can be dispatched from a distant point and "relayed" at the aerial station, and they can also be received at the aerial station and brought by an ordinary telephone circuit to the dictaphone at a distant point. This has an important bearing upon so-called "duplex" wireless. We might conjure up a vivid piece of imagination—which is not quite so wild as it might appear to be. One wire from London to a sending aerial station might be worked one-direction Wheatstone; a pair of wires from a receiving aerial might be equipped as a telephone circuit to London, and the dictaphone placed near to the sending transmitter. Thus London would have a duplex wireless Wheatstone, and is not concerned with the situation of the wireless stations.

The next step in the development of wireless telegraphy would certainly seem to be in the application of more modern apparatus. There have been stories current of a German wireless system working a printing telegraph, by a Swedish method, at 40 words per minute. After all, though Morse hand signalling is a characteristically English method of telegraphy, it is not the last word, and it is little wonder that corporations are looking for some method of machine telegraphy to transmit much more traffic by means of plant which is so very costly as a big wireless station. At the moment Wheatstone seems to hold the field, and "relaying" the Wheatstone signals, in and out, apparently opens the way for a further development. We shall probably learn much from the new Stonehaven-Cullercoats route.

In the meantime Professor Stanley has given us a welcome addition to the study of the subject. It is a useful first volume for those who wish to approach the subject from the point of view of modern telegraphy on wires. If wireless telegraphy is to bear its proper part in the inter-communication of the future it will need to join the telegraph and telephone family with a little less condescension than so far it has shown. And this book does something to bring about the happy re-union.

The Students' Guide to Political Economy. By F. H. Spencer. London: Sir Isaac Pitman & Sons, 2s. 6d.—If we are to look on the wider vista of the bearing of telegraphy and telephony on the work of the world we shall need some acquaintance with the principles of political economy. Those principles, as hitherto understood, are in the melting-pot at the present moment, but whatever reconstruction of economic theory may be before us we shall be able to face it all the more intelligently by a careful study of the doctrines as understood and accepted before the war. Mr. Spencer has a long experience as a teacher, and his book is lucid and sufficiently inclusive. He is most happy in his illustrative suggestions, and he takes us over the main field of commercial economics without asking us to carry an undue burden of technical language. It is an ideal book for the lonely student who cannot avail himself of such aids as the lectures given under the auspices of University Extension or of the Workers' Educational Association.

GLASGOW TELEPHONISTS' SOCIETY AND CLUB.

SUITABLE accommodation for the meeting of the society has been obtained n the Union Rooms, 104, West Nile Street, Glasgow.

It is the intention to continue the discussions inaugurated last season on matters affecting the Telephone Service. These discussions, opened by Mr. N. L. Smith, the Traffic Superintendent, and thereafter contributed to by the operating staff, were found to be very helpful as a means of bringing to light difficulties which could be removed or minimised, and of introducing subjects which would in the future affect the operating staff. It is hoped that much benefit will be derived from the discussions during the ensuing winter.

The session will, as usual, be opened with a social meeting on Oct. 19, 1914, and the ordinary meetings will be held on Nov. 16, Dec. 14, Jan. 11, and Feb. 8. As in the previous session the ordinary meetings will, after the discussion is concluded, take the form of a social evening, music, games, and dancing being engaged in.

The session will be terminated on March 8, 1915, with a social meeting.

The club is, in the meantime, without a secretary, as Mr. Craig has been transferred to Canterbury to take up the duties of a 2nd Class Traffic Superintendent. Mr. Craig, as secretary, took a great interest in the affairs of the society and club, and his transfer from this district will be much felt by the society. The good wishes of the members, however, are extended to him on his promotion to a new sphere of duty.

The Telegraph and Telephone Journal.

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

Editing and Organising Committee - - { MR. JOHN LEE. MR. J. W. WISSENDEN.

Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

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

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"A LA GUERRE COMME À LA GUERRE."

WE of the Telephone Service have known during these last weeks something of the condition produced by war, and may claim in countless instances to have met them in the philosophic spirit suggested by the foregoing motto of our French Allies. Few of us will forget last Bank Holiday or the previous Saturday when, abandoning without a murmur plans of country excursions, tennis parties, and other summer delights, an almost full staff at the exchanges dealt with feverish rushes of calls far on into the evening. When military service depleted the ranks of the night operators, volunteers from the day force stepped into the breach, and for weeks kept the service going long past the canonical hour of 8 p.m.

We have seen the telephonists from "Victoria" giving a splendid service at the War Office Exchange by night as well as by day, getting by relays a few hours' sleep on camp beds in an underground retiring room. Worthy of remembrance too are the feats of the engineers in installing promptly circuits and switchboards wherever demanded for naval and military needs, or to facilitate the work of the numerous new committees and agencies which sprang up every day to meet new developments or prevent distress. We have seen our comrades joining the army in troops, and have shouldered their duties in addition to our own. Nor have the chiefs spared themselves, from the Second Secretary and Director of Army Signals—ever "in labours more abundant"—to the District Manager who at the end of a heavy day took a motor at midnight and rode out with his clerk to the relief of a distant sub-exchange which had been raided and put out of action by an over-zealous detachment of Territorial cyclists. The part which the telephone system and staff have played in the National crisis is something to be proud of, and the result has not been accomplished without toil and strain and sacrifice. But "*A la guerre comme à la guerre.*"

There is, however, another side. Of the devotion of the staff to the claims of duty, and their uncomplaining acceptance of trying conditions we have already written. Knowing something of the women and men with whom we work, we were not surprised at these things, though we were intensely gratified. But what, I think, we were surprised at was the increased efficiency of the staff. Subscribers have written to the newspapers saying in effect: "I take back all my former criticism of the Telephone Service; in this crisis it has served us admirably." Letters of commendation and thanks have been received in shoals; on the other hand the usual stream of letters of complaint has been reduced to a trickle. The reason is not far to seek. When war broke out one and all felt an added sense of responsibility for facilitating communications on which the welfare and happiness of our country might depend, and none could escape the thought that when our sailors and soldiers were facing death and wounds we at home ought to do our utmost, and, if necessary, suffer for the same great cause. Therefore every one of us took pains to be a little more alert than usual, a little more painstaking, and a little more helpful. Needs must we show the spirit of patriotism in our own humdrum way. "*A la guerre comme à la guerre.*"

Now the question which haunts some of us is this. When the excitements and impulses of this time are over, and the peace and settlement come to which we look forward, are we to lose that spirit and relax that effort which now are giving the results of which we are justly proud? Or is there any way of retaining them as a permanent standard? Could we in some senses take as our motto—*A la paix comme à la guerre*?

L. T. HORNE.

MAN AND THE MACHINE.

THERE is a curious parallel in the development of telephone and of telegraph apparatus. In each case certain functions hitherto manual are being performed by machine. In telephone apparatus the development is somewhat more striking. The automatic telephone exchange connects one subscriber to another, and the only human effort is the arrangement of the dial, or similar device, by the originating subscriber. So we have a complete machine telephone exchange, but it is not the only development. Suggestions have been made for the partial adoption of the device. This may take the shape of a so-called semi-automatic exchange in which it is the operator and not the subscriber who works the dial or the apparatus corresponding to the dial. Or it may take the shape of an automatic apparatus to place the calling subscribers in connexion with the controlling operator in their sequence, the succeeding act being altogether manual. Or it may be an apparently smaller intrusion into the domain of manual telephony, the allotment

of the use of order wires or the automatic severance of calls. In their summation all of these semi-manual devices make up an automatic exchange, and it is by no means clear at the present moment whether any one or more of the various devices or all of them associated together, will prove to be the most efficient and the most economical arrangement.

Similar tendencies may be seen in modern telegraphy. This has not happened by mere chance. The ingenuity of telephone inventors has reacted upon telegraphs. The manufacture of telephone relays by modern methods has opened up the way for considering whether some such devices might not facilitate the manufacture of telegraph plant. The new apparatus takes different shapes, precisely as the new automatic telephone apparatus takes different shapes. It may print the telegrams on forms ready for the public as Mr. DONALD MURRAY provides in his latest printer. It may print the telegrams on rolls, ready to be cut off according to the length of each telegram, as is done by the new Western Electric machine. It may print the telegrams on the old-fashioned tape of the Morse type, as is done by the Creed, the Siemens, and the Baudot. Similarly at the transmitting end it may use a type keyboard of the Gell, Kleinschmidt, Murray, Siemens, or Western Electric pattern, using a perforated slip for transmission, or it may use the direct action of five keys as in the Baudot, or it may use an intermediary method such as is adopted by the telegraph instrument patented by the Automatic Telephone Manufacturing Company. There may be even more fundamental differences. The new printing telegraph may be associated with Morse and Wheatstone, or it may find some advantage in using a code with equivalent time values such as the five-unit code with which we associate the name of Baudot. Similarly, too, the fundamental allotment of the wire to a number of channels may be by means of duplex, with high-speed on each channel, or by means of multiplex providing a greater number of channels.

Thus briefly and summarily we indicate the broad features of future controversy in respect of telegraph and telephone machinery. There is room for widely differing opinions, but those opinions are of more weight when they are the result of a careful collocation of fact. The basis of fact must be very wide. Actual trial will need to be on an extensive field before all the disturbing factors are eliminated. It is quite natural that at the outset each type of instrument should have its enthusiastic votaries. Temperament often accounts for this, and long usage with particular methods leaves a mark on most of our minds. Synchronism, for example, may find an initial hostility in our Service as a solution of the telegraph multiplex problem, for when we saw it in the form of the Delaney instrument it had its manifest disadvantages. But invention proceeds with synchronism as with other things, and the modern arrangements for synchronised telegraph instruments are altogether different from the methods of earlier years. Similarly the modern developments of automatic switching in telephony have removed many of the objections which could be urged against the earlier forms of machine switching.

So in the careful examination of the devices which are now being offered we set out on a long journey. It is a journey which sees a parting of the ways at the very outset Is machine telephony a good development ? Will it be so elastic and so applicable to subscribers' needs as manual telephony ? On the other hand, is machine telegraphy a good development ? Will it be available on so wide a scale as the Morse ? Will both of these innovations lower the craftsmanship of the staff ? This preliminary question—for it is one question, after all—cannot be answered as a preliminary. It is only when we have gathered all the data together and eliminated the result of the proposed new operations upon traffic and staff that we can answer the question which seems to assail us at the outset. But there is one outstanding fact. No automatic telephone switch and no machine telegraph has been devised or will be devised which will banish the telephonist and the telegraphist. There will still remain telephone functions calling for more and more skill ; there will remain telegraph functions calling both for manual skill and for more and more knowledge of complicated machines. It may be that the development of machinery will widen the horizon of the operations of telegraphy and of telephony, and that we shall see the result in the form of increased traffic. If the war has taught us nothing else it has certainly taught us that the public reliance on telegraphy and telephony is much more than we have supposed. The theory of five years ago, for example, that telegraphy was a moribund business has been slain, during the past few months, in company with many other theories. So we may look at the development of the machine in telegraphy and in telephony without that anxiety for our craft which is perfectly natural at the first thought. In a thousand ways we have seen machinery increase rather than diminish the value of human operations, and there is no reason to suppose that history will belie itself in our own spheres.

NEW TELEPHONE RATES AND DIRECTORY.

ALTHOUGH the introduction of a new telephone tariff at an early date was definitely promised both in Parliament and elsewhere, these promises were made before the War Party in Germany decided that the time was ripe for them to sow the seeds of German *Kultur* throughout Europe by means of their heavy artillery. With the outbreak of hostilities it became imperative to postpone the adoption of the new tariff for the present. This decision was arrived at in no hostile spirit to the principle of " Business as usual," but for practical reasons. A general change of rates, however carefully carried out, must disturb business circles in various ways ; and, while trade is struggling with and gradually mastering the difficulties created by the war, it would have been a false step on the part of the State to have created fresh difficulties for traders to contend with, which difficulties could readily be avoided by a postponement of the new tariff. Moreover, the Post Office staff on the Engineering side and on the District Office and Accounting sides has been seriously depleted by the calls of the State for reservists, volunteers, and Post Office specialists for Military and Naval service, and at the same time the demands on the Telephone and Telegraph Services have considerably increased.

The introduction of a new tariff gives rise to much work. The installations of existing subscribers require re-arrangements and additions ; and any large influx of new subscribers adds considerably to the traffic and involves the provision not only of the

actual subscribers' lines and the appropriate exchange equipment, but also of additional junction and trunk lines and the switching equipment for such lines. This additional work could not conveniently be undertaken by the depleted and heavily burdened Engineering staff. Again, a new tariff needs the introduction of new books of account and the adoption of new methods, and it gives rise to much additional correspondence and numerous extra interviews with existing subscribers. These would all occupy the time of the District Office and Accounting staff which is heavily taxed at present in meeting the current requirements of the Service and its normal growth.

In the circumstances, whatever may be the drawbacks of the present tariffs, it is better to bear with them for the present than to undertake a work of re-organisation which the trained Telephone staff of the Post Office cannot adequately deal with during this time of pressure. In Hungary the revision of telephone tariffs is also in abeyance at the moment and it seems more than probable that it will remain so until Europe is in a more settled state.

For similar reasons the Telephone Directory will retain its old familiar form for a few more issues. Early in the current year it was proposed to invite public tenders for the work of printing the Telephone Directory in a somewhat different form and for the right of inserting advertisements in that publication, but it has practically been decided to extend the contracts of Messrs. McCoquodale & Company and Messrs. Sell, Limited, for a period of two years. The Directory is at present produced at times of the year when the printing trade is especially busy, *i.e.*, in December and June. In December the Christmas work is heavy, and this and the work of printing calendars, diaries, and other annual productions keep the trade busy from morning to night: while in June there is heavy pressure owing to the printing of railway time tables and other work in anticipation of the summer holiday season. The Telephone Directory is said to be the largest single printing work in the country; and, obviously, pressure in the printing trade would be relieved by its production at less busy periods of the year. With this object and as far as possible to carry out the Government policy as regards the equalisation of work throughout the year in the interests of continuous employment, it has been arranged that the English and Irish Directories shall be published on April 1 and Oct. 1 in future years. Some difficulty would, however, arise if this alteration were carried out in one step as a Directory would have to be issued either three months or nine months after the previous one. The former course would involve heavy extra expense not only for printing but for clerical work in connexion with the preparation and checking of proofs of what would practically be an extra list; and the latter course, *i.e.*, a lapse of nine months, would cause much inconvenience to new subscribers. It is thought, therefore, to be better to bridge over the period of transition by issuing the next Directory early in February and the following one late in August.

The circumstances in Scotland are somewhat different owing to the "letting dates" peculiar to that country, and, in order that the issue of a new Directory shall follow as soon as possible after the date when alterations of tenancy occur, it has been arranged that the new Directories for Scotland shall be issued on Feb. 1 and Aug. 1 in each year.

GOVERNMENT OWNERSHIP.

FROM a short article in the *American Economic Review* which we reprint in another column, it will be seen that the nationalisation of telegraphs and telephones in the United States has got as far as a recommendation by a committee of the Post Office Department, reporting in response to a resolution of the Senate, that a Government monopoly of all telephone, telegraph, and radio-communication should be declared. The report goes on to recommend that Congress acquire the telephone systems by purchase, but in the case of telegraphs it is proposed to license private individuals and companies to operate them. To us in England, and to other Europeans especially, this seems an inversion of the natural order of things. We have been accustomed to see the Telegraph Service in the hands of the State so long that we have come to regard it as an essentially national Service, whilst on the other hand we are quite familiar with telephone licensees in this country, Sweden, Denmark, Russia, and other places. We are perhaps apt to forget that in the United States the development of the telephone is far greater than that of the telegraph system, which is not of that ubiquitous character to which we are accustomed here.

How far the American public will support the recommendations of the committee, and whether they will be adopted by Congress, it is difficult to forecast. No doubt the American telephone companies will avail themselves of all the weapons in their Press arsenal to combat this move, but it is interesting to hear that it is at least contemplated to bring the largest telephone system in the world into line with the systems of Europe. Enormous as was the transaction involved in transferring the system of the National Telephone Company to the State, it will appear quite inconsiderable compared with the transfer of the gigantic Bell concerns and those of the numerous independent companies in competition with them. The American Postmaster-General claims that competition in the long run produces neither such an adequate service as governmental monopoly nor such reasonable rates. It will be seen that Mr. HOLCOMBE, who is well known to us as the author of *Public Ownership of Telephones on the Continent of Europe*, thinks that this claim should be considered as "not proven"; but his conclusions in the book referred to are all in favour of public ownership.

We should be the last to suggest that the great telephone companies, both here and abroad, have conducted their business on purely profit-seeking lines. As many of our readers well know, they have carried out national services with great skill and enterprise and fostered and furthered the telephonic art in so doing. Nevertheless, the unification of telegraph and telephone service under State control, with all its advantages of independence of direct necessity for profit earning, carries with it other benefits which are especially patent in times of national emergency. In these days the expression the "dead hand of the State" which has done yeoman service to so many of our impassioned critics, has begun to lose its first

fine careless rapture. The telephone and telegraph under the aegis of the State penetrate into remote villages whose feeble claims a company is perforce compelled to ignore. A comparison of the scope of the telegraph systems of this country and America would demonstrate this.

The rural telephone system of this country has shown remarkable developments since its acquisition by the State, a subject to which we hope to make further reference in the JOURNAL. We hear much of the rural development of telephones in America, but this in general is due rather to the local enterprise of mutual societies than to the large companies. The fundamental object of State control is to extend the system to the greatest possible number consistent with a bare return on the capital expended. A company quite properly has its shareholders to consider; the extension of the system to the less profitable places in the country is naturally a secondary consideration. Herein lies one of the strongest arguments for State control.

RUMOUR.

"WARS and Rumours of Wars" is an expression whose antiquity is coeval with St. Matthew; and truly rumour, that engaging counterfeit of news, never flourishes more exuberantly than in times of war. Our own branch of the Service has not been altogether immune from its influences. We need only refer to the inspiring story of Lord KITCHENER and the telegraphists which we narrate elsewhere. Would that we could gratify our readers with a photograph of the War Minister marching at the head of the redoubtable Thirty-eight through the corridors of the Post Office! The legend is an excellent example of our old friend "*Vires acquirit eundo.*" The writer first heard it about two months ago in much less dramatic form. Lord KITCHENER demanded a certain number of telegraphists. The Post Office, so ran the story, demurred, and was informed that if they were not forthcoming in a specified number of hours Lord KITCHENER would send and fetch them. About a month later the story appeared in print in one of the less responsible weeklies of the kind which hint darkly at their exclusive sources of first-hand official information. But it was reserved for the Dutch gentleman in the train to develop all the spacious possibilities of the story, and to transform a mere sketchy outline into a gorgeously coloured picture.

"I can't think who puts these things in the papers," said Mr. Vincent Crummles in *Nicholas Nickleby* on reading the announcement which he himself had inserted in a newspaper: "Crummles is *not* a Prussian." Many people, naturalised and others, are eager nowadays to advertise the fact that they are not Prussians; this, however, is by the way. But regarding rumours in general, who does put these things in the papers? Who does deliberately evolve and disseminate the crop of rumours, some amusing, some horrible, most of them witless, with which we are plagued day after day? Is there really a kind of creature who sits down and excogitates stories, reasoning thus: This anecdote will sound plausible tacked on to Lord KITCHENER, to LLOYD GEORGE, to BERNARD SHAW, to WINSTON CHURCHILL, to the KAISER, to KEIR HARDIE, or to Lord CHARLES BERESFORD, as the case may be? Will it sound credible at such and such a moment to spread a rumour that General Blank has committed suicide, Przemysl has fallen, Germany has declared war on Ethiopia, or is sending an air fleet to destroy Lincoln Cathedral? One is inclined to wonder whether these are purely mischievous creatures inspired by no other motive than monetary gain, or whether a curious form of vanity, a desire to indulge in prophecy or what they consider to be intelligent anticipation, is their motive. It is an interesting psychological study, which in less stirring times might afford amusement. But we must confess that in view of the issues involved, we regard these exercises of imagination at present with a certain amount of impatience.

[Articles on proposed new telephone rates in New York and in Hungary are held over owing to pressure on space.]

HIC ET UBIQUE.

TRAVELLING in the dining-car from Folkestone to Victoria the other day an animated Dutchman thrilled a number of fellow-travellers with an account of Lord Kitchener's methods. Among the stories which he told was one which is of special interest to us. "Kitchener is a very strong man. A fortnight after the war he wrote to the Post Office for 38 telegraphists. He waited a week before he received a reply to the effect that the Post Office had no men to spare. On reading the reply he at once left his office, took his motor-car, and proceeded to the Post Office. He went direct to the 'telegraphing room' looked at the various telegraphists working there, and picked out the 38 men he required. Then, without saying a word to the authorities he marched them to the War Office. There is a strong man for you." Certainly! There also is a strong story for you.

MR. W. D. STEWART of the Headquarters' Traffic Section and the London Scottish is now in France and, irony of ironies, has been given the job of working a twelve-line telephone exchange. One hopes that he carefully avoided any breach of the operating instructions, especially that which demands uniform courtesy towards callers, promptitude in answering calls, and speed and accuracy in making connexions and disconnexions.

THE committee at present engaged in revising the Telephone Service Instructions is somewhat handicapped by the temporary loss of one of its members and of its secretary, both of whom have undertaken military service. But it is hoped to complete the work at an early date.

RECENTLY an irate subscriber complained that a telegram addressed to his telephone number had not been delivered at all, although the Post Office was advertising broadcast the advantages of telephonic delivery of telegrams and recommending the use of telephone numbers as addresses. The officer who received this communication was nonplussed until an examination of the telegram form showed that the address was given as "Jones Phone No. London."

GOVERNMENT OWNERSHIP OF ELECTRICAL MEANS OF COMMUNICATION.*

IN response to a Senate resolution of Jan. 12, 1914, a committee of the Post Office Department has prepared and transmitted by the Postmaster-General to the Senate a report on *Government Ownership of Electrical Means of Communication* (Washington, Sen. Doc. No. 399, 62 Cong., 1 Sess., 1914, p. 148). It was called for because of the following passages in the annual report of the Postmaster-General for the fiscal year 1913:—

A study of the constitutional purposes of the postal

* Reprinted from the *American Economic Review.*

> establishment leads to the conviction that the Post Office Department should have control over all means of the communication of intelligence. . . . Since June last the department has been conducting a careful investigation to determine the desirability and practicability of extending the government ownership and control of means of communication, with a view to the acquisition by the government of the telegraph and telephone facilities, to be operated as an adjunct to the Postal Service.

The report proper is comparatively brief and concludes with the following recommendations:—(1) That Congress declare a government monopoly over all telegraph, telephone, and radio communication, and such other means for the transmission of intelligence as may hereafter develop. (2) That Congress acquire by purchase at this time at the appraised value the commercial telephone network, except the farmer lines. (3) That Congress authorise the Postmaster-General to issue, in his discretion and under such regulations as he may prescribe, revocable licenses for the operation, by private individuals, associations, companies, and corporations, of the telegraph service and such parts of the telephone service as may not be acquired by the government.

The greater portion of the document consists of appendices, containing a historical *resume* of the agitation for government ownership of the telegraph and telephone in the United States, a summary of State legislative action relative to telephone and telegraph service, and, most important of all, a series of statistical tables relative to postal, telephonic, and telegraphic services in the principal countries of the world. The Postmaster-General apparently relies upon this statistical evidence to demonstrate the following propositions:—(1) That competition, in the long run, produces neither as adequate nor as satisfactory service as monopoly, nor such reasonable rates. (2) That private monopoly is less efficient than governmental monopoly, charges higher rates, and renders less adequate service. This or similar evidence is likewise relied upon by the chief advocates of "postalisation" of the telephone in Congress, notably Congressman Lewis of Maryland.

The validity of the evidence in support of the second proposition has been challenged by the American Telephone and Telegraph Company (*Commercial Bulletin*, No. 7, Commercial Engineer's Office, New York, March 2, 1914). Even without the aid of the exhaustive criticism by the engineers in the service of the telephone company, it would be evident to the economist that the Postmaster-General's statistical evidence does not demonstrate his propositions, as he supposes. The careful student, however, will examine both documents, and he will not then conclude that the Postmaster-General's case cannot be demonstrated. He will content himself with the Scotch verdict, not proven.

A. N. HOLCOMBE.

THE CARD INDEX SYSTEM FOR USE AT TELEGRAPH DELIVERIES.

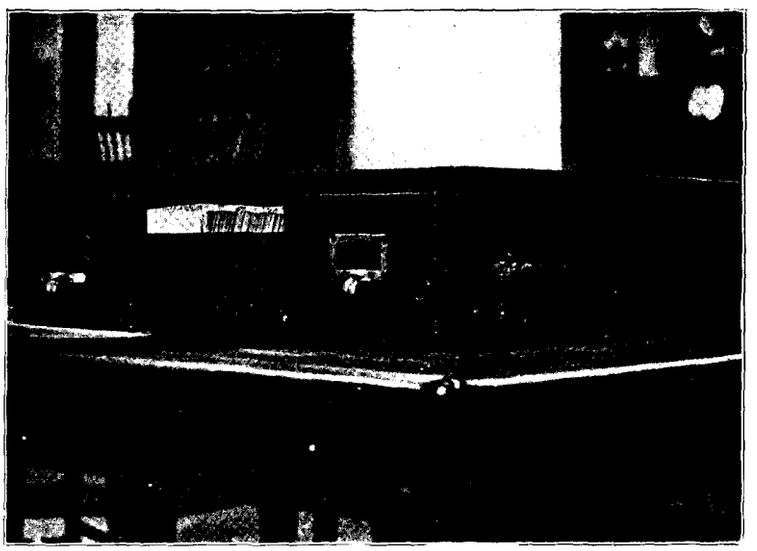
BY J. SPOONER (*Telegraphs, Manchester*).

THE problem of providing for the correct amplification of abbreviated telegraphic addresses on the covers for delivery presents many difficulties to the administrative officials at large offices, and, until recently, Manchester was no exception to the rule.

The old system, whereby the registered addresses—upwards of 5,000—were printed on linenised paper and bound in book form was good in its way, but the percentage of misredirections was evidence of a weakness, and public complaints were a daily trial to the superintendents and officers in charge of the delivery table. The trouble was mainly due to the fact that in course of time the books became unreliable, owing to the numerous additions and deletions which had to be made in manuscript, and further, the books quickly became dirty and decrepit owing to the continuous and varied handling which they sustained.

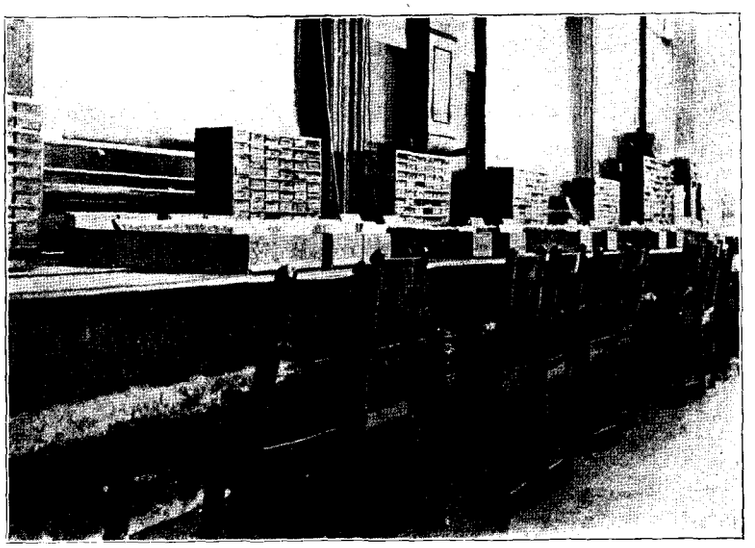
How best to improve upon the method was a matter of some concern, and, after various expedients had been suggested and considered, only to be rejected, it was decided to give a trial to the card index system which had already been introduced at certain small offices, or offices where the number of registered abbreviated addresses was somewhat limited.

During the trial, difficulties from a large office point of view presented themselves, and it is the aim of this article to show what they were and the means adopted to surmount them.



INDEX CABINET, SHOWING ONE BOX OPEN.

A commencement was made with four index cabinets each containing two drawers or boxes, and the 5,000 necessary cards were equally divided between the eight boxes, although none of them were filled to the extent of their capacity. The reason for this will be readily appreciated when it is explained that the delivery table, quite suitable in its dimensions for the book method, is too narrow to admit of the boxes being drawn out to the full when in use.



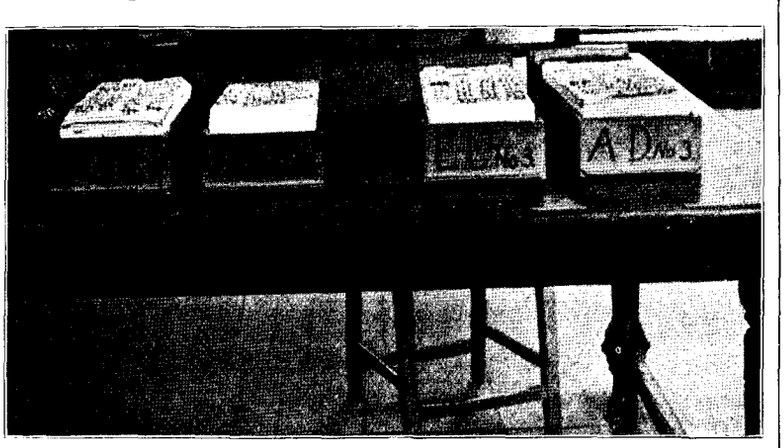
GENERAL VIEW OF ADDRESSING TABLE.

Early on in the experiment it was observed that occasionally the number of telegrams to be dealt with at certain boxes preponderated, *i.e.*, there were more for the letters A and B than for S and T, and *vice versa*. Duplicating the series appeared to be the practical remedy but want of table space, desirability for economy, and necessity for concentration, militated against duplication on so large a scale. The expedient was therefore resorted to of

entirely removing the boxes from the cabinets at the commencement of the day, and arranging them along the table in suitable positions, the empty cabinets being stored away until such time as the boxes fell out of use.

This arrangement, by allowing the boxes to be properly filled, provided for a duplicate set of cards or two sets in the place of one, the same number of boxes being sufficient.

For normal working the two sets of addresses are sufficient, but in order to meet emergencies a third set of four boxes has since been arranged.



FOUR BOXES CONTAINING COMPLETE SET OF CARDS.

The experiment having proved highly successful it has been permanently adopted, and a description of the system as at present used will, it is thought, best serve the purpose intended.

The boxes are marked according to the cards they contain, viz., A to D, E to L, M to R, and S to Z.

The index or guide cards are indexed to meet local requirements, usually from the first three letters of a registration commencing a series such as :—

"ABA" for "ABAFT."
"ACA" for "ACADEMY."
"ADA" for "ADAMSON."

Respecting the positions of the boxes the best results accrue from placing them in duplicate as follows :—

A to D 1 and 2. M to R 1 and 2.
E to L 1 and 2. S to Z 1 and 2.
A to D 3, E to L 3, M to R 3, S to Z 3 (emergency set).

The arrangement described provides for the duplexing of each group of letters as desired, whilst the No. 3, or emergency set, can be used by one or more addressing clerks, according to pressure, at the discretion of the chief circulator who directly controls the work or the assistant superintendent in charge of the gallery where the delivery table is situated.

The addressing clerks are supplied with the telegrams requiring amplification by a distributor or handing-out officer as formerly, but even this work has required revision. This officer formerly walked from end to end of the table putting the telegrams down as they came, but with the card system alphabetical distribution is a necessity, and for a little while until an improvement was thought out, extra work was therefore thrown upon the distributor.

A very successful remedy has been found by placing to the left of the girl probationer who date-stamps the telegrams five small wooden partitions or racks, four lettered similarly to the boxes, and the fifth "RP and Miscellaneous." As the stamping proceeds the probationer divides the telegrams into the respective racks, and this enables the distributor to clear the racks alphabetically and so transfer them to the addressing staff.

Fully addressed or miscellaneous telegrams are prepared for delivery by any of the addressing clerks momentarily disengaged, and by the reply voucher clerk, at the discretion of the distributor.

Under the book system the voucher clerk after making out a voucher prepared the delivery envelope as well, but with the card system this obviously cannot be done in the case of registered addresses. A better working arrangement is to hand over the telegrams, together with the prepared vouchers, to the addressing clerks at the respective boxes. The voucher clerk, therefore, does no amplification at all and is more occupied than formerly with preparing envelopes for the miscellaneous telegrams.

Specially printed envelopes provided for firms who receive a fairly large number of telegrams daily have an appreciable bearing on delivery work at large offices, and in order to ensure their use in conjunction with addressing from cards, a red ink line is drawn under the registered name at the head of the card, signifying that a printed cover should be used. Printed covers speed up addressing work generally, and the omission of this or some other indication would result in a serious loss of efficiency.

Convenient positions from which the addressing staff could obtain the printed envelopes was a matter for some consideration. The point has been met by placing between every two index boxes a small rack containing two or three days' supply of covers, corresponding to the letters of the adjacent boxes.

The addressing staff has been arranged to meet the variations in the amount of work hour by hour throughout the day. The maximum number is nine between the hours of 10 a.m. and 1 p.m., the time of high peak pressure. Of this number eight are for the index boxes and one for the reply paid vouchers.

In the evening, *i.e.*, after 6 p.m., when only two amplifying clerks are necessary, a system of what may be called concentration is carried out. All the boxes except four, containing a complete set, are put away in the cabinets. The remaining four boxes are placed together at a point as near as possible to the pneumatic tube which conveys the enveloped telegrams to the sending out department in the basement.

Registered Name M.—No. 205.

ABAFT

Business Address

JOHN SMITH AND CO.
27 KING STREET WEST.

Closing Time, Monday to Friday 5 PM. — Closing Time, Saturday 2 PM.

Address after Office Hours

THE FIRS
FALLOWFIELD.

[890] G131 10m 8/13v G & S 9630

SAMPLE CARD SHOWING UNDERLINED REGISTRATION AND OTHER PARTICULARS.

The same modified system obtains at all other times, one S.C. and T. usually working from the four boxes.

The general outline of the procedure followed in amplifying registered abbreviated addresses by the card system is for the addressing clerk first to find the relative card. This she raises slightly so that all the particulars are readable. No other card can be seen during the operation, and the risk of error is thereby considerably reduced, in fact to a minimum. No erasures or alterations appear on the cards; new ones being prepared whenever changes of address etc. are notified, and if a registration is cancelled the corresponding card is destroyed.

It is claimed for the system that

(*a*) Fewer errors are possible, and experience proves the fact.
(*b*) The output per addressing clerk is increased, and
(*c*) There is an appreciable saving in force.

In conclusion it may be stated that many officials highly placed in the Telegraph Service have seen, during a visit to the Manchester Office, the card system in actual operation. They have also conversed with the present writer on the majority of the points herein described, and in no case, so far as he is aware, have they left unconvinced of its efficiency.

THE TELEPHONE STATIONS OF THE WORLD AT THE BEGINNING OF 1913 (WITH SOME STATISTICS RELATING TO 1914).

BY W. H. GUNSTON.

(*Concluded from page* 19.)

II.

THE DEVELOPMENT OF THE GREAT CITIES.

Table VII gives a list of the cities in the world containing upwards of 10,000 telephones. The information is chiefly from official sources, but it has not been possible to obtain the latest figures for the North American cities. Estimated figures based on the increase of previous years have therefore been given. In some cases (Brussels, Sydney, and Melbourne) the information furnished gave the number of subscribers instead of the number of stations. The latter figure had therefore to be computed. No recent information is available for Mexico or Winnipeg. The estimate for Vancouver is based on the relation of the population and telephones of that city to those of British Columbia. From the statistics to hand for 1914 (shown in brackets) it appears that there are altogether 122 cities in the world with upwards of 10,000 telephones. Of these 72 are in America, 45 in Europe, 3 in Asia, and 2 in Australia; 63 are in the United States, 18 in the British Empire (London, Glasgow, Liverpool, Manchester, Birmingham, Edinburgh, Leeds, Sheffield, Hull, Bradford, Newcastle-on-Tyne, Ottawa, Montreal, Toronto, Vancouver, Winnipeg, Sydney, and Melbourne); 17 in the German Empire (Charlottenberg and Wilmersdorf being included with Berlin), and 3 each in the Russian, Austro-Hungarian, and Japanese Empires. No other State has more than two.

Table VII.—The Development of the Great Cities as at Jan. 1, 1913.

The figures for the North American cities are in all cases estimated.

New York	481,000	Tokio	42,637
Chicago	330,000		(43,234)
London (with suburbs)	*224,320	Glasgow	41,496
	(258,895)		(40,849)
Berlin (with Neukölln, Charlottenburg and Wilmersdorf)	195,699	Montreal	40,000
	(211,842)	Indianapolis	40,000
Boston (Mass.)	155,000	Omaha	38,000
Philadelphia	155,000	St. Paul (Minnesota)	37,000
San Francisco	112,000	Denver	35,000
Paris	†100,095	Columbus (Ohio)	33,000
St. Louis	95,000	Munich	32,737
Los Angeles	93,000		(34,323)
Detroit	85,000	Liverpool—Birkenhead	*32,170
Stockholm	79,959		(34,053)
Cleveland (Ohio)	76,000	Grand Rapids (Michigan)	30,000
Pittsburg	73,000	Sydney (26,370 subs.), say	30,000
Hamburg—Altona	71,222	Manchester—Salford	*29,453
	(77,322)		(31,443)
Kansas City	60,000	Newark, N.J.	29,000
Minneapolis	58,000	Warsaw	28,935
Cincinnati	57,000	Toledo (Ohio)	28,500
Vienna	54,888	Leipzig	28,245
	(64,438)		(31,176)
Copenhagen and suburbs	53,000	Louisville	28,000
Portland (Oregon)	52,000	Frankfort-on-Main	26,714
Buffalo	51,000		(28,932)
Seattle	51,000	Providence (Rhode Island)	26,500
Baltimore	50,000	Spokane (Washington)	26,500
Petrograd	46,842	Atlanta (Georgia)	25,500
Washington	46,000	Buda Pest	23,862
Buenos Aires	44,339		(26,998)
Toronto	44,000	Dresden	23,728
Milwaukee	43,500		(25,721)
Moscow	43,348	Cologne	23,158
Oakland (California)	43,000		(26,422)
		Melbourne (19,914 subs.), say	23,000

* March 31. † June 30.

Dallas (Texas)	21,500	Rochester (N.Y.)	13,700
Winnipeg (estimated)	21,000	Peoria (Illinois)	13,000
Osaka	20,622	Zürich	12,866
	(21,844)		(13,565)
Jersey City	20,500	Hull	*12,749
Duluth (Minn.)	20,500		(12,439)
Dayton (Ohio)	20,000	Gothenburg	12,736
Salt Lake City	20,000	Norfolk (Virginia)	12,500
Syracuse	20,000	Bremen	12,477
Stuttgart	19,953		(13,747)
	(20,929)	Wilmington (Delaware)	12,000
Brussels (15,954 subs.) say	19,200	Milan (estimated)	11,500
	(21,000)		(12,990)
Christiania (June 1912)	18,903	Nashville (Tenn.)	11,000
(June 1913)	(20,699)	Trenton (N.J.)	11,000
New Orleans	18,700	Scranton (Pennsylvania)	11,000
Breslau	18,533	St. Joseph (Missouri)	11,000
	(20,573)	Bradford	*10,759
Birmingham	18,055		(12,243)
	(19,780)	Leeds	*10,607
Albany (N.Y.)	18,000		(10,864)
Houston (Texas)	17,000	Sheffield	*10,605
Düsseldorf	*16,640*		*(11,354)*
	(19,133)	Rio de Janeiro	10,553
San Antonio (Texas)	16,000	Newcastle-on-Tyne	*10,512
New Haven (Conn.)	16,000		(11,561)
Worcester (Mass.)	16,000	Utica (N.Y.)	10,500
Springfield (Mass.)	16,000	Rome (estimated)	10,500
Amsterdam	15,942		(10,913)
	(17,212)	Essen	10,430
Vancouver	15,600		(11,342)
Richmond (Virginia)	15,500	Mannheim	10,327
Tacoma (Washington)	15,000		(11,078)
Des Moines (Iowa)	15,000	Springfield (Illinois)	10,300
Birmingham (Alabama)	15,000	Wilkes-Barre (Pennsylvania)	10,300
Mexico (estimated)	15,000	Ottawa	10,200
Fort Worth (Texas)	15,000	Havanna	10,000
Hanover	14,787		
	(16,194)	Chemnitz	(10,820)
Nuremberg	14,505		
	(15,354)	Kioto	(10,620)
Hartford (Conn.)	14,500	The Hague	(10,485)
Memphis (Tennessee)	14,500	Prague	(10,310)
Edinburgh—Leith	*14,299		
	(15,258)	Magdeburg	(10,201)

* March 31.

A further table shows the development of those cities of the world containing upwards of a million inhabitants.

	Population (thousands).	Telephones.	Population per telephone.
New York	5,270	481,000*	11
London (County Council area, March 31)	4,523	200,260	22
Paris (June 30)	2,888	100,095	28
Chicago	2,358	330,000*	7
Berlin	2,320	144,543	16
Tokio	2,186	42,637	51
Vienna	2,031	54,888	36
Petrograd	1,968	46,842	40
Philadelphia	1,614	155,000*	10·5
Moscow	1,481	43,348	34
Boston	1,417	155,000*	9
Osaka	1,227	20,622	59
Hamburg—Altona	1,207	71,222	17
Rio de Janeiro	1,130	10,553	108
Buenos Aires	1,026	44,339	33

* Estimated.

In addition, Calcutta (4,300 telephones), Canton (1,500), Peking (about 3,000), and Constantinople have populations of over a million. A telephone system has recently been inaugurated in the last-named city which, however, possessed no telephones at the beginning of last year. The Glasgow, Liverpool, and Manchester telephone areas also exceed one million in population. The areas, however, include so many adjacent boroughs and urban districts that they cannot strictly be considered as "cities" with over a million inhabitants.

It will be observed that in the above table the recognised geographical limits of London have been taken for the purpose of comparison with other cities, and not the extensive telephone area with its large rural tracts extending far into the counties of Essex,

Kent, Surrey, and Hertfordshire. The number of telephones in this area at July 30, 1913, was 247,833, and the population was 7,160,000, or 1 to every 31 inhabitants. It may be interesting to compare Greater London with Greater Berlin. In the latter area (including Charlottenberg, Rixdorf, Schöneberg, Wilmersdorf, Steglitz, Pankow, Gross Lichterfelde, and other places) at the same date there were 224,311 telephones and a population of 3,691,000, or 1 telephone to every 16 inhabitants. But to get a fair comparison with Berlin proper a central London area may fairly be taken comprising the district bounded by Stepney on the east, Kensington on the west, Newington and Camberwell on the south, and Marylebone and South Hackney on the north. In this by no means limited area there is a population of 1,950,000, and in October last there were 160,204 telephones, or 1 to every 12¼ inhabitants. This figure compares very favourably with the development of the majority of large cities.

Addendum.—A more correct estimate of the number of telephones in the world at the beginning of 1914 than was possible last month can now be given, further information having come to hand. It is 14,350,000, made up as follows:—

EUROPE.			3,910,000
Germany	1,420,888	ASIA (Japan 214,429, India 16,850)	303,000
Great Britain	774,045	AFRICA (South Africa 28,232, Egypt 17,307)	59,500
Russia, including Finland (estimated)	360,000	NORTH AMERICA (Bell Co. and systems in connexion 8,133,017, say, 9,150,000 for the United States, and Canada 516,000) ...	9,720,000
France (estimated) ...	310,000	SOUTH AMERICA (Argentine 74,296)	170,000
Sweden	235,373	AUSTRALASIA (New Zealand 47,711, Australia, say, 132,000, and Hawaii about 6,000	186,000
Austria-Hungary... ...	229,650		14,350,000
Denmark	127,144		
Italy	94,976		
Norway	83,850		
Netherlands	78,743		
Switzerland	69,621		
Belgium	51,009		
Spain, Portugal, the Balkan countries, Luxemburg (estimated)...	75,000		
	3,910,000		

THE TELEPHONE ON THE BATTLEFIELD.

THE following description of the use of the telephone to direct the operations of the gunners is taken from a report of the *Westminster Gazette's* special correspondent in Belgium :—

When I motored out to-day a terrific cannonade was going on ; in fact, the whole orchestra of battle was playing—brisk rifle fire, field guns, shrapnel bursting, the whirring scream of shells was constantly in the air, and the booming bass of the great German guns. All the ground is lined with trenches. The country in front is absolutely level and without a particle of cover. About twelve o'clock the German infantry advanced towards our trenches to attack. There was a very hot rifle fire from both sides, and the field artillery started to pour shrapnel on them. The guns were thoroughly covered with branches as a screen against the observation of aeroplanes. It is interesting to watch artillery in this absolutely flat country. Of course they seldom or never get a glimpse of their objective. To-day, for instance, the method was : the commander in the trenches kept constantly telephoning the movements of the enemy to the General, who had his headquarters in a building with a tower about two miles away to the right and rear, and he would telephone accurate orders to the batteries. Half a dozen yards behind the guns a man crouched, with his ear glued to the telephone, and protected by a light shield. The commandant of the battery stood beside the lieutenants between each two guns. It was interesting to stand beside the commandant and listen. "*Huit cent mètres,*" and you would then see the gunners depressing or raising the guns (the carriage or trail does not move), and turning round the points of the shells, like setting the hands of a watch, for timing the bursting of the shrapnel. "*Premier pièce tirez,*" bang ! "*Second pièce tirez,*" bang ! and so on. Then, perhaps in a few moments, the telephone man would communicate something to the commandant, and the order would ring out, "*Correction générale, cinquante mètres de plus,*" or, as when the Germans were advancing, "*Cinquante mètres de retard.*" The commandant showed me on his map, on which every single field was marked, where we were firing at, and where the enemy was. The gun-fire is practically smokeless, of course, and the German gunners, although searching for our batteries, did not locate them. They had no aeroplanes up to-day.

THE EFFICIENCY OF THE SUBSCRIBER.*

BY P. W. H. MAYCOCK.

AFTER the efficiency of the operator, the point next in order of importance in regard to which progress should be very carefully studied and continuously reviewed by Exchange Controlling Officers is the efficiency of the subscriber. To anyone accepting the argument "The Department is the servant of the Public, therefore each member of the public has the right to use the telephone as he pleases," the suggestion of a "servant" presuming to criticise the work of his "master" is something quite shocking. The point is of such importance that it should be clearly stated in any discussion of the subject of the efficiency of the Service, despite the risk of wearying some readers with matter which to them will seem very elementary.

It is a matter of common knowledge to all connected with telephone work that a successful telephone call can only be produced by the co-ordinated action of subscriber and exchange. But comparatively few realise to what extent the *degree of efficiency* attained in the operation of a particular call is affected by the *degree of co-operation* existing between the parties concerned ; and still less the extent to which efficiency of service as a whole depends upon the subscriber's standard of working. Broadly, the situation is that every time a subscriber works slowly or incorrectly the A operator must take a longer time to deal with his call ; and every instance in which an abnormal time is so taken means either delay or less efficient attention to other calls claiming the operator's attention. This reduced efficiency produces dissatisfaction on the part of the subscribers concerned, and causes friction between them and the operator—who is usually quite helpless in the matter—and still further reduces her speed. Thus the efficiency of her working with other exchanges is affected, and therefore the efficiency of B operators at those exchanges, causing a still further reaction against the A operator. It is very difficult to make clear from mere description the cumulative effect of lack of co-operation between operator and subscriber, but in actual fact the subscriber's working is everywhere so closely woven into the fabric of mutual effort which is called "Telephone Service" that the effects of a bad instance of lack of co-operation will spread far beyond the place of its occurrence, just as surely as the waves made when a stone is thrown into a pool of water. A careless operator, it is true, can nullify the best efforts of the subscriber ; but it is no less true, though far less realised, that the ignorant or careless subscriber can nullify the best efforts of the operator ; and there are something like one hundred times as many subscribers as there are operators.

RELATIVE EFFICIENCY OF OPERATOR AND SUBSCRIBER.

But it may be pointed out that accepted statistics show that, as measured by operating irregularities, the operator is far worse than the subscriber ; and that, therefore, it will be time to criticise the efficiency of the subscriber when the exchange has set its own house in order. This is too serious an objection to pass in silence ; the challenge of the accepted figures is insistent, and must be met. Briefly, the situation is this : taking the latest accepted figures covering an extended period, the percentage of irregularities on the part of operator and subscriber is as 30.1 is to 11.3. That is to say, as measured by percentage of irregularities, the operator is nearly three times as bad as the subscriber. But is this so ? After a few weeks' work in an exchange a shadow of suspicion as to the relative whiteness of the subscriber's record begins to pass over the mind of the observer, gradually darkening with increasing experience until he almost doubts. Should the bold sceptic push

* Extract from paper read before Post Office Telephone and Telegraph Society on Dec. 16, 1913.

his enquiries to the length of systematic criticism and analysis he will find something like what is shown in diagram No. 1.

This diagram shows graphically the relative efficiency of operator and subscriber : (*a*) as it is usually represented, and (*b*) as it really is. The shorter of the shaded blocks in each case represents the more efficient record. Looking first at the " nominal position," the only conclusion possible is that as compared with the operator from the point of view of efficiency the subscriber is practically perfect ; the diagram representing the " actual " position suggests a rather different conclusion. Nominally, the operator is three times as bad as the subscriber ; actually, the subscriber is twice as bad as the operator and six times as bad as usually represented.

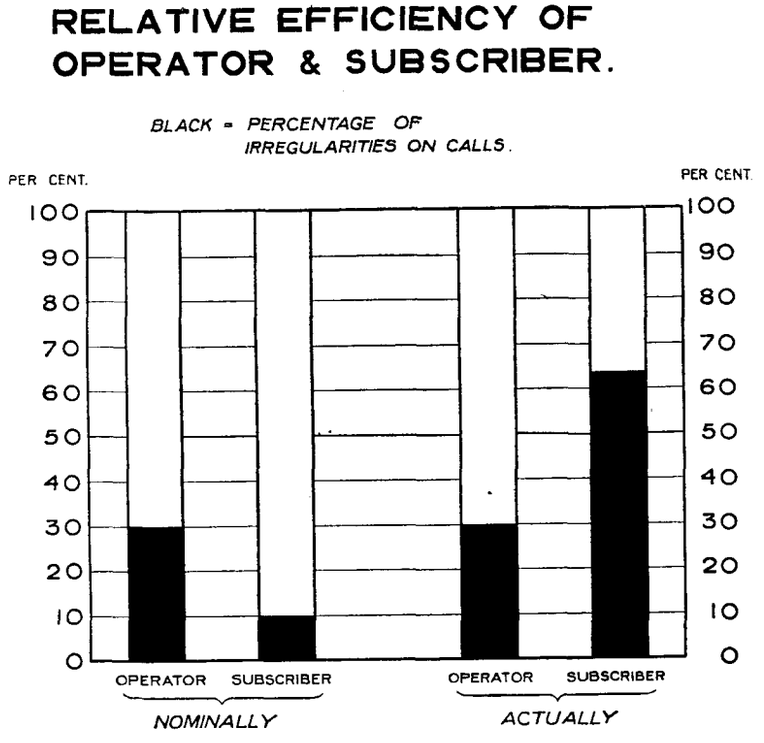


FIG. 1.

The diagram just shown is based on observations taken recently at four exchanges, City, Central, Mayfair, and Gerrard ; observations in which the observing officers were specially instructed to apply to the subscribers working the same standard of severity as that appropriate to an operator. Despite the fact that in the case of one exchange at least it was found impossible to prevent the observing officer following unconsciously the usual practice of taking a more lenient standard when criticising the subscriber, the percentage of subscribers' irregularities was 63.6 instead of 11.3. Instead, therefore, of the operator's record being nearly three times as bad as that of the subscriber, the subscriber s record is more than twice as bad as that of the operator, as already stated

PREVAILING IRREGULARITIES OF SUBSCRIBER.

It would be of interest to go fully into the question of the prevailing operating irregularities of the subscriber as shown by the observations referred to, and to discuss the various ways in which each may adversely affect the service ; but this would entail too large an encroachment upon the JOURNAL'S space—quite apart from the tax upon the patience of the reader. I will therefore mention just a few of the more important items, and then reproduce a diagram which illustrates graphically the relative magnitude of the various blots upon the erstwhile white shield of the subscriber

A very great deal has been heard of the frequency of ' wrong numbers." In this connexion it is of interest—and possibly some significance—to note that more than 20 per cent. of the 63 per cent. subscribers' irregularit'es are faults which either will result or may resuit in wrong numbers—without any fault on the part of the exchange. In 14.9 per cent. of the number of calls the subscriber passes the number in an incorrect manner ; in 6 per cent. he speaks indistinctly, and in 1.29 per cent. he actually asks for the wrong number.

Every thoughtful person who has studied complaints must have envied the high business efficiency which alone would justify the attitude so often assumed by the complainant. Here are some examples of that efficiency as applied to telephone practice :—

In 8.46 per cent. of the calls the called subscriber fails to announce his identity promptly.

In 5.86 per cent. the subscriber fails to clear or delays clearing.

In 3.81 per cent. he fails to give the number promptly

In 2.51 per cent. the called subscriber fails to return to the telephone before the caller becomes impatient.

In 2.23 per cent. he calls the exchange unnecessarily.

In 1.59 per cent. he fails to reply to the operator's question " Have they answered ? "

In 1.22 per cent the called subscriber fails to wait at the telephone until the calling subscriber or operator speaks.

Whether these figures betoken efficiency can be left to the judgment of the reader, but each of the items mentioned has a distinctly adverse effect on the efficiency of the exchange. Conversely, every improvement in the subscriber's working in these respects necessarily improves the efficiency of the exchange. The foregoing is sufficient introduction to diagram No. 2.

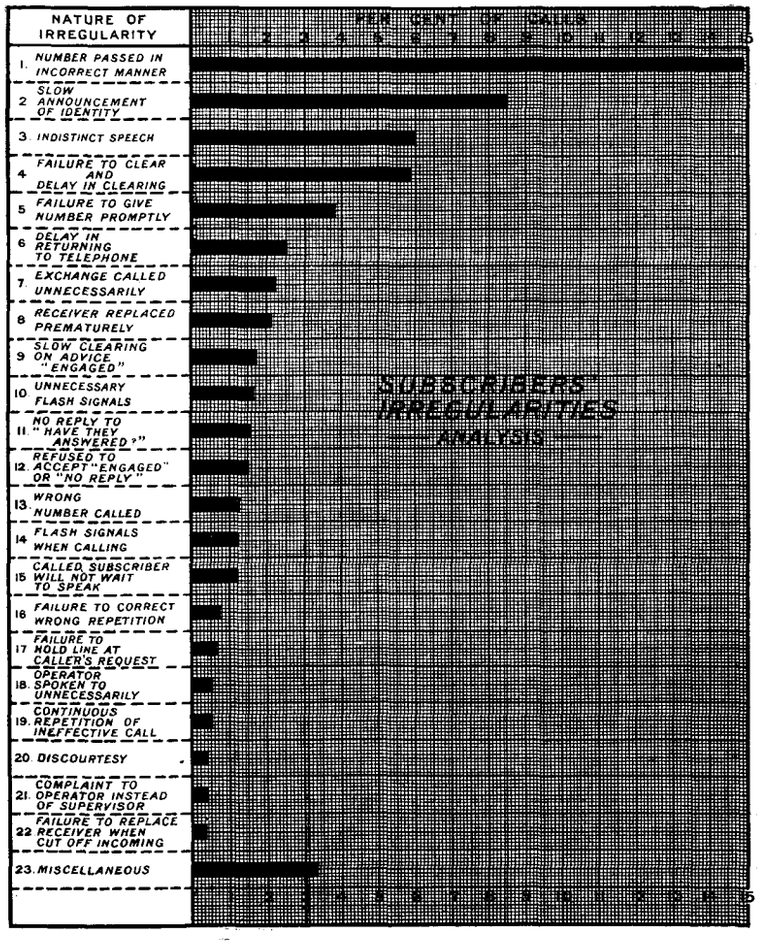


FIG. 2

Diagram 2 gives a pictorial statement of the relative magnitude of the chief misdeeds of the subscriber. The more prominent of these and their principal effect on the Service are :—

No. 1. Number passed in incorrect manner ... No. 3. Indistinct speech...	Cause wrong numbers.
No. 2. Slow announcement of identity.	Causes waste of junction time and unnecessary busy-backs.
No. 4. Failure to clear and delay in clearing.	Causes waste of junction time, unnecessary busy-backs, and unnecessary supervision.
No. 5. Failure to give number promptly.	Causes delay in answering.
No. 6. Delay in returning to telephone.	Causes complaints of "cut off."
No. 7. Exchange called unnecessarily.	Causes delay in answering and complete waste of operating work.

While the foregoing irregularities are the most numerous, all others shown in the diagram tend to prevent good service on the part of the exchange.

STANDARD TO BE APPLIED TO SUBSCRIBER'S WORKING.

From what has been said it will be clear (1) that it is essential to progress in efficiency that the working of the subscriber should be systematically studied, and (2) that the statistics used for such study should for the present be compiled at the exchange, *the greatest care being taken to apply to the subscriber's working precisely the same standard of severity as that applied to the operator's working.* The application of this standard is of the utmost importance. No allowance whatever should be made for the fact that the subscriber may not *know* the correct procedure. The purpose of the statistics is not to allocate blame for wrong methods, but to form an opinion as to the extent to which wrong methods prevail.

"SUBSCRIBERS' IRREGULARITIES" CURVE.

A curve for the systematic observation of the subscriber's work should be plotted monthly, from observations taken during the month. These observations should be in regard to both outgoing and incoming calls, and the results should be classified by means of a form enumerating the irregularities shown in Diagram 2. The monthly curve should be a curve showing the percentage of the total irregularities on the number of calls observed. Directly any distinct tendency to deterioration is noticed, the analysis forms of preceding months should be examined with the object of ascertaining whether the depreciation can be traced to any particular item. If, despite all the attention that can be given at the exchange, the percentage of irregularities continues to increase, the circumstances should be reported to the Traffic Branch in order that the points in regard to which the subscriber's working leaves most to be desired may be noted for incorporation in the series of instructional leaflets.

The "Subscribers' Irregularities" curve will have abundantly justified its existence if it does nothing but spread the true conception of the subscriber's place in the Service organism. Infinite harm can be done by quiet and implied insistence on these two ideas :—

(1) That the individual subscriber is a master, and the Telephone Administration is a servant, whom he may flout at will.

(2) That the Telephone Administration is a tradesman selling something to a customer to whom he must bow down and worship if he wishes to keep his custom.

If the matter be dispassionately considered it will be seen that both these views are untenable. That the Telephone Administration is a servant of the Telephone Public as a whole is of course a fact ; but this is a very different thing from a servant of each individual member. To perform its function as a servant of the public in its highest sense the administration must surely be prepared to protect the telephone public against its individual members. Again, though by a sometimes convenient fiction, the Telephone Administration may be regarded as a tradesman selling something to a customer, it differs from all tradesmen properly so-called in that the thing it sells is in part made by its customers ; and if the customers do not do their work well, the thing sold cannot be that for which they pay. So far as the relationship of the Telephone Administration to the subscriber is concerned, the analogy is not that of servitude, but of co-partnership. This is not the mere theorising that it may appear at first. The whole attitude of the Telephone Administration to the public is necessarily coloured by its conception to the relationship that exists between them ; and a Telephone Administration which insists on the "servant" theory—which finds its expression in the subtle though unspoken suggestion to the subscriber, "you lift your receiver and we *ought* to do all the rest" —simply encourages the subscriber to expect more than it has power to give ; and thereby makes a rod for its own back. All earnest students of telephone progress will welcome, as the affirmation of a sound principle, the Postmaster-General's decision to allow the systematic issue of Subscribers' Service Instructions, a decision which gives the deathblow to the ancient—even though unformulated—superstition of the infallibility of the subscriber.

There is ground for the belief that one of the main reasons why the London Service is less efficient than that of New York is to be found in the inferior telephone efficiency of its subscribers. The medium in which the operators work is made up of two elements, equipment and subscribers ; the first as perfect as the highest skill and the closest supervision can make it, but the second—just raw material, often in its crudest form. No worker—artist or craftsman—can realise his possibilities in an imperfect medium.

A TELEPHONE HEROINE OF LOUVAIN.

THE telephone heroine of Louvain, Mlle. Joostens, who, when all but she had fled before the invading Uhlans, stuck to her post, sending appeals for help from the burgomaster to the military authorities, is among a company of fugitives who have arrived in South Wales. With her mother she is sharing the hospitality of a home at Pontypridd.

Mademoiselle paid a visit to Cardiff yesterday, and when she called at the General Post Office and it became known who she was, the staff organised an impromptu levee. Mademoiselle was received with rousing cheers, and she was prevailed upon to give an account of the adventure which won her world-wide fame.

"The bombardment," she said, "began when I was alone in the exchange. Shells were showered like rain : house after house was struck, and the Cathedral adjoining the exchange was also damaged.

"I stuck to my post for some hours, but finally the burgomaster rushed breathlessly into the exchange and compelled me to leave.

"I spent the night in the church cellar, but next morning went back to the exchange in order to send messages that brought Belgian soldiers to our aid."

Mademoiselle's audience, particularly her British sisters of the switchboard, gave her another ovation at the end of her story. She was besieged by girls who wanted her autograph or wanted to give her boxes of chocolate.—(Abridged from the *Daily Sketch.*)

SMOKING CONCERT AT SHEFFIELD.

On Saturday Oct. 3 a very successful smoking concert under the joint auspices of the A.S.T.E. and the E. & S.A. was held at the King's Head Hotel, Sheffield.

Mr. Herbert, the Sectional Engineer, was in the chair, supported by Mr. Chambers, the Postmaster, Mr. Swithinbank, District Manager, Dr. Manton (Medical Officer), and other gentlemen representative of all sections of the Post Office.

The artistes, who were all voluntary, consisted of Messrs. H. Hinchliffe (pianist), S. Young, W. H. James, E. Raley, G. Edwards, G. Rigley, L. S. Bowring, J. Styring, J. A. Thomson, B. Marsden, Allen, and Cooper.

Mr. Chambers, in a speech very appropriate to the times we are now living in, proposed a vote of thanks to the artistes. He stated that although one might on first thoughts prefer to avoid anything in the way of entertainment or amusement, it must be admitted after the strenuous and responsible work which all sections of the Post Office staff had been called upon to perform some relaxation was absolutely necessary. He was pleased to be present and to testify that as on former similar occasions he was gratified to find so much variety and quality of talent displayed by the officers of the Post Office.

The concert closed with the National Anthem and Auld Lang Syne, and the gathering dispersed amidst expressions of appreciation and good will.

Two Belgian telephone girls, Valerie de Martinelli and Leonie van Lint, stood bravely at the switchboard during the destruction of Louvain. Shells burst around them, and their exchange caught fire. But still they remained at their post, switching through the orders of the Belgian General Staff directing the retreat. If they had failed the retreat might have been a rout. —*Reproduced by kind permission of the* DAILY CHRONICLE WAR BUDGET.

[*It will be seen that another account* (page 45) mentions Mlle. Joostens as the last telephonist in the exchange.]

THE TELEPHONE AND TELEGRAPH SOCIETY OF LONDON AND THE INSTITUTION OF P.O. ELECTRICAL ENGINEERS.

As previously announced members of the Society may attend any meeting of the Institution of Post Office Electrical Engineers. The meetings of the London Centre are held in the Lecture Hall of the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C., at 6 p.m., except in the case of the annual general meeting which commences at 5 p.m. The addresses to be delivered during the remainder of the present session are as follows :—

1914.			
Monday, Nov. 16 ...	W. T. Harris ...		"Stores Accountancy."
	W. T. A. Payne ...		"Cash."
„ Dec. 21 ...	S. C. Bartholomew...		"Power Circuit Interference with Telegraphs and Telephones."
1915			
Monday, Jan. 18 ...	C. Robinson ...		Telephone "Relays and their Application to Telegraphs and Telephones."
„ Feb. 15 ...	L. B. Turner ...		"Wireless Call Devices."
„ Mar. 15 ...	Harvey A. Smith ...		"Telephone Economics—Open Construction."
„ April 19 ...	... ...		Annual General Meeting.

PERSONALIA.

NEWS OF THE TRAFFIC STAFF.

Transfers— LONDON.

Miss A. E. GRIFFITHS (Assistant Supervisor, Class II) *from London Wall Exchange to City Exchange.*

Miss E. J. BRASH (Assistant Supervisor, Class II) from East Exchange to Central Exchange.

Miss A. N. JOHNSON (Assistant Supervisor, Class II) from City Exchange to Lee Green Exchange.

Miss M. E. MILLAR (Assistant Supervisor, Class II) from Holborn Exchange to City Exchange.

Miss E. ELLIOTT (Assistant Supervisor, Class II) from City Exchange to Finchley Exchange.

Promotions—

Miss A. E. CLEMENTS from East Exchange to Ilford Exchange.

Miss N. E. CLAYFIELD, from Victoria Exchange to Kensington Exchange.

Miss N. E. RICHES from London Wall Exchange to Battersea Exchange.

Miss E. NICHOLSON, *Tilbury Exchange*, promoted from Telephonist on Allowance to be Assistant Supervisor, Class II at Tilbury.

Miss G. BIDDLE, from Regent Exchange to Avenue Exchange.

Retirements—

Miss M. H. JOHNSTONE, London Wall Exchange.

Miss M. F. EAGLESTONE, Holborn Exchange.

Miss N. M. CUTTS, Holborn Exchange.

Miss J. EVANS, Ilford Exchange.

Marriages—

Miss J. E. GIBSON, Ilford Exchange, *has resigned in view of her approaching marriage*, and was presented by the staff with a cut-glass silver-plated breakfast cruet.

Miss R. DREWERY, Kensington Exchange, has resigned in view of her approaching marriage and was presented with cutlery, pictures, and other useful presents.

Miss L. A. RUSSELL and Miss E. M. STILL, London Wall Exchange, were each presented with a case of silver spoons and tongs by the staff.

Miss M. R. LUSTY, London Wall Exchange, Private Branch Exchange Telephonist at Speyer Brothers, Lothbury, received several handsome presents from the firm.

Miss N. R. NAPIER, Dalston Exchange, was presented with a silver cake basket by her colleagues.

Miss L. HARDY, Bank Exchange, was presented with a brass fire screen by the staff, and with other useful presents by her colleagues with whom she was very popular.

Miss M. J. SMITH, North Exchange, was presented with a silver teapot and other useful presents.

Miss E. M. TYRELL, Victoria Exchange, was presented with cutlery and other nice presents from personal friends in the Service.

Miss F. E. STANDEN, Hop Exchange, was presented with a set of oak trays and biscuit barrel.

Miss J. BALDIN, Trunk Exchange, was presented with a case of fish knives and forks and other useful presents.

Miss A. SIDGWICK, City Exchange, was presented with a dinner service and tea knives.

Miss M. L. LOEDON, City Exchange, was presented with a dinner service and fire screen, also other useful presents.

Miss E. A. DYER, City Exchange, was presented with a dinner and tea service and other useful presents from colleagues.

Promotions— PROVINCIAL.

Mr. G. PYBUS, Exchange Manager, Central Exchange, Sheffield, to be Assistant Traffic Superintendent, Class I, *from Sept. 24.*

Marriages—

Mr. DAVID THOMSON, Service Inspector, Sheffield, to Miss B. N. WARREN at Brightside Congregational Chapel on Sept. 3, 1914.

Miss M. WALSH, Exchange Clerk, Belfast.

Miss E. MINNIS, Telephonist, Belfast.

Miss M. DOUEY, Telephonist, Knock Exchange, Belfast.

[The Editor will be glad to receive—*not later than the 15th of the month*—information of promotions, marriages, and retirements of members of the Telegraph and Telephone staffs.]

OBITUARY.

The death is announced of Mr. R. HOPE-JONES who will be remembered by some of the ex-National Telephone staff. He was well known as the pioneer in connexion with the application of electricity to organ building. Mr. Hope-Jones has many associations with Liverpool and district, for he was born at Hooton in 1859. At fifteen he became voluntary organist and choirmaster at the chapel of Birkenhead School. Two or three years later he held a similar office at St. Luke's, Tranmere, afterwards becoming organist and choirmaster at St. John's Church, Birkenhead. For some time he was chief electrician of the Lancashire and Cheshire Telephone Company, but eventually resigned his connexion with the telephone company in order to devote greater attention to the organ. In 1903 he left England for the United States, where his organs have been extensively installed. He died on Sept. 13 at Rochester, New York.

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CONTENTS.

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THE ELOCUTIONIST IN THE EXCHANGE.

BY HORACE DIVE.

THE advantages of clear utterance are no discovery of recent date. At least as long ago as the year B.C. 445 the Prophet Ezra earned undying fame because "he read in the law *distinctly* and "gave the sense and caused them to understand the reading," and this, mark you, notwithstanding the fact that he was reading from morn till midday. So much were his hearers impressed by Ezra's elocutionary excellence that we read "they went their way "to eat and to drink and to send portions and to make great mirth "because they *understood* the words that were declared unto them." No doubt they had heard the same words time and time again, but probably rushed through and slurred over in the same hopeless manner as is the case to-day when the youthful curate of "uncertain words, erringly apprehended," can get no nearer to a correct rendering of the simple phrase "Thine everlasting kingdom" than is represented by the gross misinterpretation "Thy neverlasting kingdom."

But if when face to face it be desirable to speak *distinctly* and with understanding, how much more necessary is it so to do when one is conversing over the telephone. Apart from the fact that one loses the assistance afforded by watching the facial expression and mouth movements of one's correspondent, there is also the definite loss and distortion of sound engendered by the electrical conditions of the circuit. The limits of time make it impossible in this paper to treat fully of the electrical side of this question, even were I technically qualified so to do, and I make no claim to such qualifications. However, the fact that one's speech may suffer distortion in transmission is, it appears to me, an added reason for starting one's words on their journey in a form as nearly perfect as may be, so that the chances of their recognition by the hearer shall be of the maximum order possible.

What then are the points to which particular attention must be paid if we are to secure satisfactory elocution. They are :—

Pronunciation
Enunciation or articulation.
Pausing.
Emphasis or stress.
Fluency.
Volume, or fulness of voice.
Timbre, *i.e.*, the tone or character of a musical note.
Pitch.
Intonation or expression.
Pace.
Attitude.
Gesture.

For elocution as practised on the telephone, gesture may be ignored, save for the measure in which it serves as an unconscious aid to the attainment of correct emphasis, but we will consider each of the other points in detail.

Pronunciation.—There are no less than 36 typical sounds in the English language, and these sounds have to be represented by 26 letters only, hence either the letters must be so grouped as to distinguish one sound from another, or precisely the same letters or combination of letters must be used to represent different sounds. Both alternatives are made use of in our tongue.

There is no room for pedantry in the telephone world—the pronunciation to be accorded to words should be that which has the hall mark of general use and not necessarily that which is acclaimed academically accurate—for ours is a public service in the fullest sense. Gross mispronunciations display ignorance of fashions and are to be classed with extravagancies of dress and deportment. Extremes and exaggerations of any kind should be avoided, but a fair amount of latitude can reasonably be allowed in this matter of pronunciation without material danger of misunderstanding. I should probably start a violent controversy if I attempted to claim for any county or class the distinction of speaking the purest English, and at the conclusion we should be no nearer a settlement of that vexed question. We will, therefore, leave it where it is, simply restating the case that for telephone officials pronunciation should conform to those standards which find general acceptance amongst the average members of the community whose telephone needs have to be met by those officials.

Enunciation or Articulation.—Having knowledge of the proper pronunciation of any word or words we must exercise unceasing vigilance in our articulation, taking care to accord to each primary sound its due value, not slurring over or cutting out any letter which ought to play its part in a well balanced vocal reproduction of any word or group of words. There is a marked tendency, particularly in the South of England, to clip the endings from words. Such a tendency, ugly at any time, should be steadfastly resisted by the telephonist, whose ideal is that she may be able so to speak into her transmitter that her hearer will never have to ask for a repetition of any part of her message. It is the consonants which play perhaps the most important part in giving its distinctive character to each particular word, and we must therefore be very careful to give the true value to each, so that there may be no mistake whether we are asking for Mr. Johnstone or Mr. Johnson, Mr. Thompson or Mr. Thomson.

The pause judiciously introduced is a most effective aid to

a proper understanding of a spoken message, as it serves to emphasise a phrase or word to which special attention is desired. It may be possible at a later stage in this paper when considering certain of the officially authorised expressions to give examples of the effectiveness of the pause.

Emphasis or Stress.—The meaning of a sentence may be almost indefinitely varied by transferring the point of emphasis from one word to another; and in like fashion an incorrect stress on a particular phrase or sentence will serve to alter the sense of a whole message. This point lends itself to ready exemplification. If in the question "*Did* you call up Richmond 1320 yesterday?" we emphasise the first word as I have just done, the reply must state whether you did or did not.

Carry the emphasis to the second word, "Did *you* call up Richmond 1320 yesterday?" and the implication is that Richmond 1320 *were* called up, the only question to be settled being one of the personality of the individual who originated the call.

Lay stress on the expression "*call up*" and another meaning is brought out. It is now understood that *you were* in conversation yesterday with Richmond 1320, and the point on which information is sought is whether the call was originated by you or by the Richmond subscriber.

Again, emphasise *Richmond* and a doubt appears as to the name of the exchange to which the call was effected.

In like manner the number can be brought out as the detail for which verification is required.

Lastly, by transferring the emphasis to the final word of this question the date of the call is made the point at issue.

It will be apparent, then, how important it is that the emphasis should be rightly placed. It is also important that the degree of stress should be carefully considered; over-emphasis is often ridiculous.

Fluency.—So far as the telephonist is concerned, this factor in correct elocution, generally speaking, represents nothing more than an accurate and complete knowledge of the authorised expressions and the circumstances in which they should be used. She thus avoids any tendency to the hesitancy which irritates. "*Er*" *must be banished.* Think of what you are going to say before you commence to speak—don't start speaking and then set your mind working to supply you with subject-matter. Make these meetings a practice ground for acquiring readiness of speech, but strive to strangle every "er" before it develops into an error of speech. It is not easy so to do—some would-be wit has said that "to er is human," and if you will promise not to let it go further I may tell you in confidence that at an official conference not long ago one speaker was calculated to have made use of that particular interjection no less than 87 times. It was computed that he gave vent to one "er" for each four words spoken, but to his credit it must be admitted at no time did he utter more than three "ers" in succession without the intervention of some term of greater significance. Be warned then by his example, and if you feel you must say "er," don't—instead make an effective pause.

Volume or Fulness of Voice.—In speaking over a local telephone system, unless some special transmission difficulty be present, the operator should use no greater fulness of voice than she would if conversing quietly with a friend, and any variations should be of the slightest character. There might perhaps be a slight increase of volume when making use of some official expression of sorrow, but extreme care must be exercised to avoid anything like obtrusiveness in this respect, as it would be sure to cause offence.

Timbre is the tone or character of a musical note. It is that elusive quality which differentiates any note when produced by one instrument, from the same note produced by *any* or *all* other instruments. It is the soul, the essence, the individuality of a particular instrument, be that instrument a human voice, a violin, an organ, or what you will. Not only does the timbre of a note humanly sung differ from the timbre of that note as it floats from a fiddle or swells from an organ, but the timbre differs often largely, often almost indistinguishably, between one voice and another, or one fiddle and another. There are human voices which are essentially musical (I don't mean sing-songy) and to which one can listen oblivious of all considerations of time—one's only dread lest one should miss the slightest utterance. Such voices are frequently capable of a very wide compass and pass from the glorious rythmic resonance of full round tones to such as those which Walter Scott describes

> "So sweet, so soft, so faint,
> They seemed an Angel's whispered call
> To an expiring saint."

This quality is primarily the gift of the gods, and fortunate indeed is that individual on whom they have bountifully bestowed the blessing of a voice of the character described; yet even the least favoured of us has an individuality of voice and may do much to improve or mar its original qualities. Before all things it is essential to learn *how* to produce one's voice, and on no account should it be strained or overtaxed. The gentler sex more especially are known by their voices of which poets have sung since there were poets, and the characteristic most highly praised is that of gentleness.

> "Her voice was ever soft," says Shakespeare,
> Gentle and low; an excellent thing in woman."

Pitch.—You are all well acquainted with the necessity for suitably pitching your voice when speaking on the telephone. Opinion as to the pitch most suitable for securing satisfactory transmission is not unanimous. There are those who advocate a fairly high pitch, some are equally emphatic in claiming advantages for a decidedly low note, but the general body of experts seem to favour a pitch slightly below the middle register. This appears to secure a satisfactory transmission with the added advantage of a comparatively quiet switchroom. It allows of the introduction of a "rising inflection" without strain to the operator or annoyance to her companions. I recall amongst my most trying experiences as an Exchange Manager, listening to the outpourings of a Supervisor whose voice was always pitched in a high register and knew no modulation of any kind. I sometimes fancy a slight deafness from which I suffer may be traceable to this cause.

Intonation or Expression.—Each phrase or sentence officially authorised for use by the telephonist calls for the adoption of an all-pervading tone—one might describe it as an atmosphere or expression of mood. In the salutation "Number, please" (which we will examine in greater detail later), the intonation or atmosphere which it is sought to convey to the subscriber is one of "willing alertness" or, as the Press Bureau would put it, "a certain state of liveliness." In other cases it will be of "regret," as when it is not possible to afford connexion because the required number is engaged; of "apology" where some error has caused the subscriber inconvenience, or again of "pleasure" when a subscriber is offered connexion to a number the original request for which proved abortive. This intonation will govern also the *pace* at which set phrases or items of information are communicated to a subscriber. There should at no time be any tendency to snap instead of to speak. A second saved in sharply rapping out advice to a subscriber will often be ultimately lost to the Service over and over again by the sense of irritation and grievance engendered. The Telephone Service prides itself on the fact that it reckons time in "*seconds*," and there is, I fear, a tendency to forget that each second is succeeded by a second second, and that it is the second second which justifies the second "s" in seconds. Because we reckon time in seconds we need not seek to carry out each and every operation in *one second*.

Lastly *attitude*, that is, bodily position. The telephonist as a rule has to sit at her work. If she would obtain results favourable to herself and to her subscriber she must be able to assume a comfortable attitude and also be able to modify that attitude slightly from time to time. It should not be necessary for the head to be bent down in order to speak into the transmitter. Such a position strains the muscles of the throat and cramps the chest, preventing the natural and easy expansion of the lungs. Sit up then, but avoid anything approaching the typically rigid and wooden attitude always associated with the elderly maiden aunt. Try and reproduce the attitude in which you would whilst sitting easily (not reclining) carry on an interesting and animated conversation with a friend.

So much for the various factors which must all have attention if the elocutionist in the exchange is to be an actuality and not a phantom of the imagination.

The telephonist starts in her race for elocutionary laurels under peculiarly advantageous conditions—for her admittance to that class argues that she is free from all marked defects of speech. I was recently reading a fascinating volume entitled *Annals and Memoirs of the Court of Pekin*, and I was much struck by the close resemblance between the selective process undergone by a candidate for the London telephone operating staff and a candidate for the high calling of helpmeet to the Sun of Heaven. The volume in question contains a literal translation of the course pursued in A.D. 1621 when selecting an Empress for the then Ruler of China, a youth of sixteen. The translation runs :—

" The whole empire was notified that comely maidens between " the ages of thirteen and sixteen were eligible ; after which the " examiners made an eliminating inspection. Those whose height " or figure failed to reach the required standard were weeded out, " until the number was reduced to 4,000. On the following day " a much more careful scrutiny was conducted by the two head " examiners, who made copious notes of each damsels features, " size of nose, colour of hair, shape of waist and length of foot. " Each maiden was required to state clearly her name, lineage, and " age ; if the timbre of her voice did not satisfy the examiners she " was at once rejected. Stammering or thickness of speech was " regarded as an insuperable defect. As a result of this scrutiny " only 2,000 remained eligible, and on the following day further " physical measurements were made, in addition to which each " candidate was required to walk a hundred paces in order that her " deportment might be observed. Any slovenliness of gait or lack " of dignity disqualified the candidate ; after this test only 1,000 " remained. These were then taken into the Inner Palace where " they were subjected to a searching scrutiny by discreet and " elderly women. Three hundred were ultimately chosen to undergo " a month's probation as Palace handmaidens. Those amongst " them who showed signs of stubbornness or of frivolous disposition " were weeded out, until at the end of the month only 50 remained." The final choice was made by the Emperor himself.

For examiners read Miss Heap and Miss Madgshon, and for 1621 read 1914, and one has a most precise description of the process of the selection of telephonists. Were Britain to select a wife for the present Heir to the Throne by a similar process, one might safely predict the success of one of my audience, and, after all, what could be more appropriate than that let us say a " Miss Victoria " or " May fair as the dawn " should again become England's Queen. In any case I have no doubt that the lady in question will become, if she is not already, Ruler of *some* Kingdom.

There were several other comparisons between that far distant China and our beloved Department, but they would be out of place in this paper even would considerations of time admit of their recital now. Perhaps on some other occasion we may enjoy them together.

There is no doubt that the profession of a telephonist calls for the practice of the elocutionary art in its highest possible form, for has she not to repeat, day after day and all day long, groups of numbers relieved only by the interspersion of exchange names or the hard colourless phrases of officially authorised expressions. " Can these dry bones live ? " Yes I think so, but to effect such a miracle the telephonist must be complete mistress of herself and her voice at all times.

In addition to a comprehensive series of exercises in the repetition of numbers the school curriculum embraces lessons which are calculated to impress upon the student the whole art of correct utterance of the officially authorised expressions. The instruction is, I believe, entirely that of personal example, there is no attempt to provide written notes setting out the manner in which each expression should be voiced or the particular impression which it should in each case be the aim of the telephonist to make on her subscribers. The learners are also taken through an anglicised extract from an address before an American Telephone Society. This address is admirable, and an attempt is made therein to give life and vigour to certain of the more common expressions of the telephonist's repertory. It deals with these expressions in the only way possible if a useful effort is to be made to show the spirit in which an operator should seek to interpret them to her subscriber, it analyses them with a view to making clear the full message which it is intended to convey by the jerky contractions of the officially authorised expressions. The Telephone Service is essentially modern and practical. It knows nothing of the grandiloquence of old-fashioned courtesy. It takes the shortest road available on every occasion and, so far as officially authorised expressions are concerned, its only offerings on the altar of politeness are " please " and " I am sorry."

There has been no striving after rounded periods, nor any attempt to appropriate " apt alliterations' artful aid " in their compilation. If, then, a telephonist seeks to perform the miracle of putting life into bones so dry, she must, as I have previously stated, be at all times mistress of herself and of her voice, for so delicate and elusive is the degree of light and shade that can be introduced without risking a measure of exaggeration which would prove ridiculous. Let us examine that authorised expression which of all is most frequently on an operator's lips—" Number, please ? " To give to this a proper intonation, the right pitch and emphasis, one must realise precisely what it is intended to convey and exactly what expression we should use did a similar relationship exist between the telephonist and subscriber and were they speaking face to face instead of carrying on their communications by telephone. The subscriber lifts his receiver, and in order to acquaint him with the fact that she is *all attention* the telephonist says " Number, please ? " Framed as a demand or as a request if you will by the saving grace of a " please," the expression is not intended in any way to approximate to the order " Number," rapped out by an officer as he tells off his squad. It is rather the cry of the infant Samuel as he attends at Eli's bedside : " *Here am I for thou didst call me.*" Were telephonist and subscriber in one room the latter would say " Miss Central," and turn his gaze in her direction. " Miss Central " would look towards the caller and by the introduction into her visage of an expression of expectancy would indicate that she awaited from the subscriber a statement of his wishes in order that those wishes might be fulfilled with alacrity. " Number please ? " is then nothing more than advice to the subscriber that he has the attention, one might say the *active* attention of his operator. A telephonist who wishes justifiably to claim the title of the " elocutionist in the exchange " should not attempt to become merely a copyist. She must, of course, study the rules of pronunciation, articulation, and the other factors contributing to good results, but before all things *let her give personal thought to her work.* Let her set herself to examine each official expression and say—" What really is the spirit in which it is intended that this " phrase or sentence should be used ? " Suppose that, instead of serving this, that, or the other subscriber, I were performing a similar service for some individual for whom I had the highest possible respect and to whom I had the greatest desire to give pleasure, how should I voice these particular words if the circumstances were such as would demand their use as an authorised expression ? " Number, please ? " How shall I say that if my one and only desire is to advise the caller that I am simply awaiting knowledge of his or her wishes in order to give the earliest possible effect to them. If each and every telephonist would set herself to use official expressions in that spirit, there would be no need for any slavish adherence to rules. Each girl would interpret her own personality and she might well be proud so to do. This may sound like the idle talk of an idealist, but I would remind you that I have seen service an as Exchange Manager, and I am proud and happy to think that amongst my staff I have counted telephonists of this order. To watch them at their work was a pleasure indeed—difficulties seemed to disappear before those operators as cakes before a boy, and I never remember an instance where complaint was made by the subscribers who were lucky enough to receive service at their hands. At their hands did I say—I ought to add at their eyes, their ears, and every other faculty which could legitimately be pressed into the Service. Such a girl says " Number, please ? " in a tone that is reminiscent of mountain air on a summer Sunday morning—it is redolent of the fullest and freshest vigour of natural beauty. Such an one never repeats a number with the slightest obtrusiveness in the rising " inflection." I heard of an instance in which an operator when repeating a number to her

subscriber so exaggerated the inflection that the subscriber commented "Yes—isn't it a funny number!" I think he might be pardoned.

If I went through the whole catalogue of official expressions and analysed them in similar fashion I could not, I fear, present to you any clearer indication of the points to be kept in mind by the telephonist who seeks to excel as an exchange elocutionist. You must know by rote and by heart all the authorised expressions, so that you may be fluent, but you must not pour out your words in a torrent. You must adopt an easy attitude but sit up. You must pay attention to pronunciation, pitching your voice so that it may be subject to inflection without strain. You must give emphasis to the particular word or phrase which is as it were the key to the whole expression you are using, but you must carefully avoid anything like exaggerated stress. You must enunciate your words with the utmost care, bringing out all consonant values and remembering that the free movements of lips and tongue contribute largely to success in this matter. Your audibility at the other end depends chiefly on your clear articulation—don't be afraid of having an expressive mouth. *Above all* study the spirit of each expression of which you make use and endeavour to make your intonation the embodiment of that spirit. If you do this, the sincerity and earnestness of your work will be at once impressed upon those subscribers fortunate enough to enjoy your service, and you will find that they consciously or unconsciously will approach to your standards. The human race generally is very imitative. I know not if the trait is directly traceable to our immediate ancestry in the scale of evolution, but the fact remains, and I recall one or two striking examples of the force of this habit. A *lady* resident of Park Lane, with a name suggestive of a nationality entailing in these days immediate registration or the payment of a fine, had demanded from her Mayfair operator connexion with a number, which was at the time engaged, and the busy back was connected. It was in those days when verbal advice of engagements was not given in Post Office exchanges. The busy back was the only indication. The originator of the call being a constant complainant, I was myself keeping her circuit under observation, and I was amused to hear the following duet:—

Busy back: Um. Um. Um.
Subscriber: Um. Um. Um.

Who tired first I know not, as I had to leave the switchroom in order that I might vent my feelings without risk to exchange discipline.

I could quote other examples, but they are not necessary, as every operator here probably recalls some occasion on which a subscriber has been at pains to reproduce an exchange number in tone and manner as nearly identical with her own, as the relative capabilities of the subscriber and telephonist made possible. It is refreshing to know that any efforts you make to improve your own elocution will certainly be rewarded in securing for you improved utterance on the part of your subscribers.

THE CABLE ROOM AND THE WAR.

THE LAST HOURS IN THE ANTWERP C.T.O.

IT is hoped that other contributors may not commence to be uneasy at the continued prominence given to that comparatively small section of the Telegraph Service known as the Cable Room. It can with exceptional truth be confidently stated that the fact of a European War, in which our own country has become vitally involved, has naturally placed the latter department most conspicuously "in the limelight." It may also be stated and with equal truth, and for whatever measure of comfort it may bring to the bored reader, that not a tithe is likely to be written of all that *could* be written, were the recording pen left unrestrained by that virtue which is generally considered to be the better part of valour.

It is now a matter of common knowledge that about a score of Belgian refugee telegraphists variously from Liège, Brussels, Bruges, Ghent, Ostend, Antwerp, &c., have found a temporary home on the staff here, thanks to the departmental co-operation with the Belgian Government. Whatever suspicion may have existed—quite natural at the present moment—regarding the *bona fides* of their nationality, has by this time been dispelled by the assurance that each man's papers of identity have been carefully examined and several unfailing tests applied.

That the strain through which they have all passed was no mere work of the imagination, can be easily attested by a few minutes' conversation and an ear to their simply told yet graphic stories; not a word regarding personal heroism or personal self-forgetfulness, but tales of nights and days of dread, of hope, of fear, of disappointment, of struggling crowds with the weak and the old trampled under foot, no one daring to stoop to rescue—an act of mercy which in attempted cases only ended in the merciless crushing of victim and would-be rescuer alike—of the time spent jammed in immovable masses for 20, 30, and 40 hours at a stretch, waiting one's turn for train or steamer, while overhead the menace of a soaring *Taube* added to the tense agony of doubt as to what new horror could be added to the piled-up tragedy; of flights by steamer, tug, ketch, trawler, or grimy coal ships, sometimes foodless and

RAILWAY STATION, BERCHEM, NEAR ANTWERP.

waterless, only reaching the peace of friendly shore with just sufficient energy left to lie down anywhere and anyhow—to sleep!

Coming more particularly to the Telegraph and Telephone Service, thanks to the extreme courtesy of a Belgian telegraph official of superior rank, I have been favoured with an extremely interesting interview and upon this I have been able to base the following reliable account of the last 24 hours in the Central Telegraph Office at Antwerp.

On the morning of Oct. 7 as the bombardment was approaching more nearly to the city proper, the operating staff were released from duty by the Belgian Administration, they and their families, making the best of their way into more friendly territory by means

and under conditions already outlined. By arrangement, M. ——, Chief Technical Officer, had promised to remain, together with a small staff of unmarried telegraphists, as important despatches were likely to arrive at any moment. As, however, the staff of celibates remaining were for the most part inexperienced officers. M —— was forced to request several others to remain also, and these most willingly did so, despite the fact that they themselves had retired from the Brussels office some time previously under pressure from German "*Kultur*."

STREET IN BERCHEM.

The bombardment was becoming more and more intense, but in order to work the remaining wires to the very last minute, temporary installations of apparatus were fitted up in the *sous-sols* by about 1 p.m.

Just at this moment, unfortunately, some of the wires passing westward became interrupted, only two wires to London being left.

Subsequently the interruptions on the faulty wires diminished, the service became in further part resumed, and it was possible to dispose of much traffic of high State importance.

Three hours later news was received from several points that the bombardment was about to close in, whereupon M. —— and his gallant staff withdrew to their improvised instrument room in the cellars beneath. Telegraphic communication was yet possible with several minor offices on the outskirts of Antwerp, besides several wires to Flanders, one each to London, Amsterdam, and Rotterdam.

During the night the Antwerp office was completely without communication with the outer world, despite the continuous calls sent out into the bomb and shell and flame-lit darkness by the tired and nerve-racked telegraph staff from those, now historic cellars beneath the Antwerp C.T.O.

M. ——, with the shells now falling fast into the city, mounted once more into the old instrument gallery and, assisted by volunteers from his already over-taxed men, proceeded to take certain measures in order to render all apparatus perfectly useless to the enemy.

As during the night some military telegraphists had reached the office, and as it was understood that the last train would leave Antwerp at 6 a.m., permission was given at about 4.30 a.m. to the remaining civil staff to leave together with their chief.

At this time all the remaining Antwerp offices had been vacated, and information was received from the "pilotage" that the last boat would leave at 9 a.m.

At 5 15 a.m. the staff were actually on the point of leaving when telephone calls were received from Ghent, who announced that he had important Government telegrams.

The tired military telegraphists were sleeping, and, compassionately looking down at the war-worn operators, M. —— himself took up the apparatus and commenced to receive the State phonograms. The civil staff already released, finding they were not followed by their chief, returned to the "caves" and absolutely refused to quit the office until he could leave with them. This he could not then do as there was the possibility of other despatches arriving at any moment.

Such proved to be the case. As day dawned other telegrams were actually handed in. Telephonic communication with Bruges and Ostend alone remained, while transmission was exceedingly difficult and fatiguing, and only possible by the staff working in relays.

A RUINED HOME IN ANTWERP.

Later an officer of the British Red Cross, a British, then a Belgian officer of the headquarter staff each came in turn with urgent telegrams all of which latter were dealt with in the *sous-sols*, being transmitted to certain British headquarters by a means not now to be detailed. Suffice it to say that the transmission was conducted in absolute secrecy and, what is more, attained its end.

Soon after mid-day authentic information was received that the enemy was about to cut off all retreat from Flanders, and the simple account of a simple heroic telegraph superintendent ended with these words: "As messages had ceased to be handed in, and "since it was only at rare intervals that telephone circuits were "at our disposal, since telegraphic communication both with "Amsterdam and Rotterdam was again interrupted, I thought my "duty had ended, and handed over the office to the Belgian "military."

Requested to give his personal impressions of these last hours, with the unfeigned love of a master of his craft he told me that (his wife and child being in safe keeping) the sadness of being compelled to leave the office with all its equipment quite overwhelmed him, not even the smashed windows of his home in the suburbs taking prior place. Gripping my arm the last few tremulous words of my friend were:

"Au moment où je dépassai le seuil de la porte de sortie de "la salle des appareils, j'ai *senti un moment mon coeur faiblir*; "j'ai jeté un dernier coup d'œil sur ces installations modèles et "sur cette grande et belle salle, maintenant si tranquille, si morte, "et où nous avions passé des heures si actives.

"Comme dans une vision, les dernières jours se sont repré-"sentés à ma memoire, ces jours où nous ne comptions plus les "heures de service, où la pensée seule de pouvoir être utile à notre "pauvre pays, nous enlevait toute sensation de fatigue, tout idée "même de ce que l'avenir pourrait nous reserver de triste; cette "idée ne me preoccupait pas encore lorsque, le coeur gros, je "descendis, pour la dernière fois, les escaliers; je venais de quitter "un endroit où j'avais peiné et en ce moment je sentais que même "ces endroits-la vous deviennent bien chers."

One incident during the night deserves to be recorded. A specially important telegram arrived and had to be delivered almost to the edge of the German lines. They could not send the messenger lad. "Who will go?" was the query, to which three civil telegraphists almost simultaneously replied "I will." "But I don't want three of you," said M. ——.

"Pardon me, sir," interjected one, "the shells are falling "thickly, the matter is urgent, allow the three of us to go: at least "one of us is sure to arrive safely."

Happily all three returned. At a moment when such things as these are happening within easy touch of our own C.T.O., when all that is left of Anglo-Belgian telegraphic communication is one single wire to an almost unknown strategic village, how petty all present official and unofficial inconveniences should appear, our murmurs at an hour or two extra *in*side the office or our grumblings at the darkened London without. What said Whittier?

"Why ask for ease where all is pain?
Shall *we* alone
Be left to add our gain to gain
When over Armageddon's plain
The trump is blown?

J. J. T.

NEW TELEPHONE TARIFF IN HUNGARY.

THE *Zeitschrift für Schwachstromtechnik*, quoting from the *Pester Lloyd* of June 19, says:

"The Minister of Trade, M. Harkanyi, has energetically taken in hand the question of telephone tariff reform, neglected for some years. As already stated he has had the plan prepared by the Technical Director, Andreas von Kolosváry, revised, and the portion relating to the Buda Pest system has been the subject of an enquiry in interested circles. This important commercial problem has been thereby brought near a definite solution. The Minister of Trade allowed the debate at the enquiry an absolutely free course and reserved his decision until he was acquainted with the results. As we understand, he was not satisfied with the results in the previous week. At his instance fresh negotiations between the Administration and mercantile and industrial circles followed. In the course of these negotiations Herr von Kolosváry made several modifications, not yet accepted by the Minister, which were certainly acceptable to competent critics. How do matters stand after these proposals?

"An ordinary telephone with a direct line would cost yearly—

For 1,000 calls	170 kr.	(£7	1*s.* 8*d.*)	and 17 heller	...	(1¾*d.*)	a call.
.. 2,000 ..	220 ..	(£9	3*s.* 4*d.*)	.. 11 ..		(over 1*d.*)	..
.. 3,000 ..	250 ..	(£10	8*s.* 4*d.*)	.. 8.3 ..		(over ¾*d.*)	..
.. 5,000 ..	300 ..	(£12	10*s.* 0*d.*)	.. 6 ..		(over ½*d.*)	..
.. 7,000 ..	345 ..	(£14	7*s.* 6*d.*)	.. 4.9 ..		(about ½*d.*)	..
.. 10,000 ..	400 ..	(£16	13*s.* 4*d.*)	.. 4 ..		(under ½*d.*)	..

Above 10,000 calls, each call costs 4 heller (less than a halfpenny), therefore—

15,000 calls cost 600 kr. (£25 0*s.* 0*d.*).
20,000 calls cost 800 kr. (£35 6*s.* 8*d.*).

"If 20,000 calls are subscribed for, the subscriber receives two lines. If, however, the subscriber undertakes to use one line for outward calls only, so that the other line can be used for incoming calls, the price is reduced to 700 kr. (£29 3*s.* 4*d.*). Finally, for 740 kr. (£30 16*s.* 8*d.*), the subscriber has unlimited use of his two lines.

"Thus appears the reform according to Herr Kolosváry's alterations. From the above it will be seen that 5,000 calls is the limit which can be obtained for the present subscription of 300 kr. (£12 10*s.*). Whoever uses the telephone more than 5,000 times a year, *i.e.*, thirteen or fourteen times daily will pay more. For unlimited use of the telephone now allowed for the flat rate of 300 kr., 440 kr. more (£18 6*s.* 8*d.*) must be paid. The representatives of commercial circles in the capital find the reform even with Herr Kolosváry's amendments totally unacceptable. We give their views as follows:—

"The telephone will be noticeably dearer under the new system. This is quite clear. Where is there a merchant amongst us who uses the telephone in his business less than fifteen times a day—less than twice an hour? We have desired a reduction in telephone charges—and with every right, for according to authentic official data the depreciation of each line together with interest on invested capital amounts to 9½ per cent. The value of a line together with its relative portion of the exchange may be reckoned at 1,500 kr. (£62 10*s.*), of which cost 9½ per cent. is 142.50 kr.; the staff and actual expenses amount according to official estimates to 147 kr.; altogether 289.50 kr. (£12 1*s.* 3*d.*). To-day the State receives from the subscriber 300 kr. (£12 10*s.*), and if we are exact and include the charge for auxiliary apparatus, etc., the station yields 321 kr. (£13 7*s.* 6*d.*). From these results it is quite unjustifiable that just those classes which use the telephone for business and not as a luxury should pay dearer for it. Often it is said: If every call were paid for, the telephone service would be better, for people would speak less. This agreement, however, in the opinion of mercantile circles, is an illusion.

"If people who use the telephone as a pastime have to pay 10 to 17 heller for it (1*d.* to 1¾*d.*), they will certainly lengthen the call as much as possible. One need not be a prophet to declare that the exchange will more often give the reply "engaged" in future then at present. It is true that according to the scheme of Herr Kolosváry many people will pay less. But who are the people who will be contented with a moderate use of the telephone? The telephone is no luxury but an indispensable aid of modern commerce and civilisation. Its use must not be artificially limited. The price should not be dearer to anybody than that at present fixed.

"As opinions were given thus (the representatives of commerce took the standpoint of Herr Kolosváry as the basis for consideration), the representative of the capital, Councillor Vita, suggested a compromise. If the flat rate system must go in any case, the maximum number of calls should be raised to 15,000 instead of 10,000, and the present charge of 300 kr. (£12 10*s.*) be retained.

"The affair is at present at this stage. A decision from the Minister is awaited in wide circles with natural anxiety."

Thus far the *Pester Lloyd*. It will be observed that the objections to the proposed rates proceed entirely on the old well-recognised lines. The woes of the large users—a comparatively small minority of the subscribers—in having to pay proportionately for the immense use they make of the telephone are magnified. The moderate users—contemptuously classed with those who use the telephone as a pastime—are brushed aside as of no account. Of

what importance are people who originate only 1,000 calls a year? Where, it is asked, is the merchant who originates only thirteen or fourteen calls a day? We think that the number, if ascertained, would surprise the merchants of Buda Pest considerably. In London over 50 per cent. of the subscribers make less than 1,000 calls per annum. It will be seen that there is at present an all-round rate of £12 10*s.* in Buda Pest. The fact is quite ignored that all subscribers wishing to make less than 1,000 calls will obtain a substantial reduction in their subscription of over £5. When it is said that in London, for example, more than one-third of the subscribers originate only 500 calls it will be seen that a considerable boon will be conferred on a large number of telephone users and would-be telephone users, and the development of Buda Pest may be expected, when commercial affairs resume their normal course, to go up by leaps and bounds. Moreover the present rate will still cover the fairly liberal allowance of 5,000 outward calls. Subscribers desiring to make more than this number are not unreasonably expected to pay more for them and not to obtain their facilities at the expense of the moderate user, as they do at present. A proposal is made that the present subscription should cover 15,000 calls, which means 50 outward calls a day, a number sufficient to overload any line and to aggravate that "engaged" trouble which is the purpose of the measured rate to remedy. But this aspect of the rate question probably escapes the notice of the mercantile critics altogether. The principle of giving those who subscribe for 20,000 calls an additional line is a good one, and is similar to that adopted in Chicago. There, however, 7,200 is the number at which the subscriber is furnished with an additional line, and even this limit is more than that generally accepted as the maximum load which a line should carry.

We do not follow the argument that a charge per call will cause subscribers to retain the lines longer than at present. Presumably it is supposed that callers will wish to get their money's worth; but under the unlimited rate system it has been our experience that the longest calls are usually the so-called frivolous calls for which no specific charge is made.

It will be noticed that the principle of charging in accordance with use is described as artificially limiting the use of the telephone. If that is so the use of gas, electric light, railways, telegraphs, and all commercial commodities are being at present artificially limited in a precisely similar manner all over the world.

W. H. G.

ELECTRIC TELEGRAPH REFORM.*

[*Being a Plan for the Combination of the Telegraph with the Post Office in the United Kingdom, and for establishing a moderate and uniform Rate for Telegrams forwarded throughout Great Britain and Ireland.*]

BY SIDNEY MONTEFIORE.

IN submitting the following short paper on "Telegraphic Reform" in the United Kingdom, I have endeavoured to explain, as briefly as possible, the plan by which many great advantages may be obtained, both by the Government and the public, by the development of a properly organised and liberal system in conducting the arrangements of the electric telegraph.

The Post Office and Telegraph Departments have been partially united in this colony; but none of the other suggestions and reforms put forward in these few pages have as yet been promulgated here.

Many years' experience in the Postal Department, and also as manager of the largest combined office in the metropolis of Australia, have afforded opportunities of exercising a watchful interest—both in regard to the requirements of the public and the working of the Department—which enables me to speak with confidence as to the practicability of carrying out all the arrangements proposed, and the advantages which would be derived from their adoption.

SIDNEY MONTEFIORE.

Melbourne, Victoria, August, 1866.

* Reprinted from a Report of the Postmaster-General upon proposals for transferring the control of the Telegraphs to the Post Office, July, 1866.

ELECTRIC TELEGRAPH REFORM.

THE discovery and subjugation of electricity, and its application to the electric telegraph, are amongst the most useful and astonishing results of scientific research, and must have an important influence upon social relations and commercial prosperity. The facilities for intercommunication and rapid circulation of intelligence have always been essentially connected with the progress of civilisation. It is much to be desired that so important and serviceable a discovery should, by a judicious system, be made universally beneficial; and that its development into a great national good should no longer be retarded by partial, expensive, and disunited arrangements, which must necessarily be the case while remaining in the hands of a number of separate companies; but by following the enlarged, wise, and successful reforms which have of late years been adopted in the management of the Post Office, render the electric telegraph an institution of the utmost service and advantage to the general public

The telegraph has already become a most powerful and useful agent as the medium for the transmission of public and political information, and has in a measure been adopted as a means of communication by persons employed in commercial pursuits; but, owing to the want of proper arrangements and facilities, and the fact of the management of the lines being divided by several companies without unison in action or interest, the public generally have been debarred from benefitting by the immense accommodation and advantages the telegraph is capable of affording, and which should be rendered available to all classes. Up to the present time in England there has been no general principle recognised, consequent on want of a proper and uniform system; and from the circumscribed arrangements of each company, the high prices charged have almost prohibited the use of the telegraph, excepting as an expedient in cases of most pressing urgency.

It must be evident that great advantages would be derived by the nation were the system for almost instantaneous correspondence offered by the telegraph assimilated to the admirable arrangements of the present Postal Service. It has been admitted on all sides that a reform in the manner the telegraph has been hitherto conducted must ultimately be effected. It is, therefore, with the view of rendering the service thoroughly efficient, so as to afford a maximum of accommodation to the public, that the following reforms are suggested:—

1st. That all the telegraph lines in Great Britain should be taken over by the Government, and that the Telegraph Department should be placed under and combined with the Post Office.

2nd. That messages, containing a certain number of words, should be transmitted through Great Britain and Ireland at a *moderate* and *uniform* rate, say 6*d.*, or even 3*d.*, for each message; such rate to be prepaid by stamps.

3rd. By making available the post offices, post office receiving boxes, and letter pillars, render accommodation which would be equal to an infinite multiplicity of branches.

It would be necessary, to carry out these reforms, for the Government to purchase the interest of the present companies. This, there is but little doubt, could easily be effected; payment to be made by Government debentures, bearing usual interest, or by a special loan for the purpose, which could be made repayable in the course of a few years, it being for a reproductive establishment. Additional lines where required, and new lines to all places of consequence not within the present circuit, would have to be extended so as to form a complete network, interlacing and connecting the entire country. It will presently be shown that the revenue to be derived from the service will not only be sufficient to pay the working expenses, the interest, and capital borrowed for the first outlay, but ultimately a large and ever-increasing balance will revert from the Department to the general revenue of the country, enhancing that which is at present derived from the Post Office, and tending to alleviate direct taxation; while the indirect benefits to the fiscal resources of the kingdom, arising from the increased facilities afforded, would be very great.

The Telegraph, like the Post Office, cannot be so well conducted by any companies as by the Government. The latter alone can enforce regularity in all its branches, can make it reach every district,

and, when necessary, beyond the frontiers—and is in the best position to make favourable arrangements with foreign States, the telegraph being in the hands of the Governments throughout the Continent of Europe. Every argument that can be brought to bear in favour of the desirability of the Government retaining the control of the Post Office, must have equal weight in urging the propriety of placing the telegraph on the same footing, which should be considered as only a more rapid means of postal communication, wherein still greater confidence is necessary.

It would be necessary to map out the whole country into districts, having the head office in London as the grand centre with direct communication with all the principal and larger towns—through which, as main stations, the smaller towns and districts in their division would be connected, so that all the important lines would be direct, and the business of the minor lines would only require to pass through "switches" connecting at the main office in each district. At present, in all the principal towns, and in the several districts in London, post office establishments exist; but in many smaller places the office is under the charge of tradesmen, which is a system only adopted in consequence of the business done not being sufficient to justify the expense of a regular staff; but when the duties of the telegraph are added to that of postmaster, there are very few towns, with the exception of insignificant villages, where it would not pay at least to have a clerk in charge, who might also be a telegraph operator. Thus a boon would be afforded to the inhabitants of small towns, as it has long been felt most objectionable having the local post office in the care of a shopkeeper.

Every post office of sufficient consequence to be under the charge of an officer of the Department would also be a telegraph office; and all connected through their main centres with London and every other town in the kingdom.

Arrangements should be made that, in every large town, each sub-office, receiving box, and letter pillar should be cleared at least once every hour, or even half-hour. (This, it is presumed, is effected in London at present). Telegraph forms, upon which to write the messages, the reverse printed in large red letters, "To the Manager of the nearest telegraph station," so as to form an envelope with an adhesive corner for fastening, should be obtainable at every post office, post office receiving-house, and from vendors of stamps; so that any person wishing to transmit a message, after writing it on one of the forms, affixing stamp for payment (as hereafter explained), might then post it at any one of the receiving-boxes or letter pillars, with the certainty that within an hour it would be cleared, and the message immediately taken to the *nearest* combined office, and transmitted instantaneously to its destination. Thus would the electric telegraph, with all its wonderful advantages in rapidity of communication, be brought to the very doors of the people, as is at present the admirable, though slower, system of the postal service.

By the adoption of a moderate and uniform rate it is certain that not only the nature of the telegraphic business now in existence will be greatly increased, but an entirely new class of persons will recognise and make use of the advantages offered. The simplicity of the proposed arrangements, the uniformity of the charge, and multiplicity of branches will induce persons to avail themselves of the telegraph who have hitherto been deterred by the want of facilities and the uncertainty of the cost, as well as its high rates. Even under the present arrangements, in every case where a decrease in charge has been made a vast corresponding increase in quantity has been the result. Therefore it may be anticipated with certainty that the business of the telegraph will augment in accordance with the increased facilities afforded in a ratio equal to the increase to the Postal Department since the introduction of penny postage.

As an argument in favour of the uniform rate, it is urged that increased distance does not, as is the case in railways, involve additional outlays for land, rolling stock, &c., or, as is also the case in the conveyance of mails, where the contracts become heavier according to the length of the journey; for by the telegraph no greater cost is defrayed in proportion to the distance, it costing no more sending messages hundreds of miles than to send one mile, nor is any more time occupied in the transit, the increased amount of maintenance and inspection being compensated for by the short traffic between the stations through which the line passes.

The uniform rate should be one which would give to the public the greatest inducement to avail themselves of the Department, affording the nation a maximum of accommodation at the minimum cost consistent with rendering it not only self-supporting but also remunerative to the revenue. The rate is suggested of 6*d*., or even 3*d*., throughout the United Kingdom, for messages not exceeding twelve words (exclusive of address and signature). The latter sum would be urged as sufficient to afford an ample return; but it is possible that an immediate reduction to 3*d*. might so enormously increase the number of messages as to render it difficult to be carried out during the first year of the combination, though an ultimate reduction to that rate is a portion of the plan submitted. As brevity is of great importance in telegraphic correspondence, on messages containing more than twelve words it would be necessary to charge either at a small rate for every extra word, or one additional rate for every additional twelve words or portion of twelve words—all rates to be prepaid by stamps of the value being affixed to the message. By such an arrangement the expense of keeping the accounts of the Department is reduced to a minimum, and a large staff of bookkeepers rendered unnecessary. To prevent inconvenience through the inadvertence of senders, telegrams bearing one full rate—or, in longer messages, where at least three-fourths of the amount due has been prepaid—should be forwarded, and a double charge made on delivery, similar to the present arrangements with regard to letters.

Every care would, of course, be exercised to have all telegrams transmitted with the utmost despatch; but, to meet those cases where even a few minutes are of consequence, messages bearing stamps to the value of twice the ordinary rates, and marked "Urgent," should take precedence of other messages; also, persons forwarding telegrams requiring immediate answer, should be able to frank the reply, by placing a double stamp on the interrogatory message, and endorsing it, "Reply required."

With one of "Morse's" instruments, which combine the advantages of being the most correct, rapid, and easiest method of telegraphing at present in use, an average of fifty single messages per hour might be forwarded with only one connecting wire, and this number might be increased by the adoption of a well arranged code of abbreviations. An additional number of wires would, of course, multiply the power of sending to any extent. Instruments of this description would be amply sufficient for all minor and cross stations: but, probably on the main trunk lines, the number of telegrams would be so large that some other means would be necessary, by which a much greater pressure of business could be satisfactorily dealt with. Mr. Bain and Professor Wheatstone have both invented machines by which an average of twenty thousand words may be forwarded in an hour. Thus over ten thousand messages might be transmitted in a day on a single wire, by certain adaptations (suggested by the writer); the characters transmitted by this machine could be made similar to those in use with "Morse's" principle, so that the operators efficient in the one would be equally so with the other. The power of transmitting an unlimited number of messages, therefore, need not be doubted; and probably science, in the course of years, will effect still further improvements, so as to increase the celerity in forwarding despatches.

The approximate amount required for the purchase of all the lines, making the necessary additions to the present circuits and new lines to all important districts not hitherto connected, might cost from two to three millions. This amount if obtained on loan, could be repaid within ten years, indeed, it is confidently anticipated that in less than five the profits accruing would be sufficient to defray the primary expenditure.

By a late return, the number of letters passing through the Post Office in England averaged 22 to every individual in the United Kingdom. It is not, therefore, unreasonable to calculate, were the facilities for corresponding by telegraph equally obtainable at a moderate cost, an average of at least one message to each inhabitant would be an extremely moderate estimate. This, in round numbers, at a 6*d*. rate, and even taking all messages as single ones, would give a revenue of nearly eight hundred thousand per annum; but when all the arrangements are completed, and the

public become thoroughly familiar with the system, and able to appreciate the immense advantages of the telegraph—and the cost is reduced to a 3*d*. rate, an average of five to each person is by no means an extravagant estimate, but is one which will be attained within fifteen years after its establishment, yielding a gross revenue yearly of about two millions. These calculations may appear visionary and extravagant; but, should the plan be adopted, the result will prove the contrary, and that they err rather in moderation than otherwise. Similar doubts were urged against the introduction of the penny postage reform, the success of which is now universally acknowledged.

The working expenses of the establishment would not be so great as might at first be imagined. The cost of maintaining the lines in working order is very small, while the annual consumption for the batteries and miscellaneous contingencies of a similar nature would be less than 2 per cent. of the income, salaries and wages for the staff being the only important item of cost; and here the economy of combination with the Post Office is at once evident. The postmaster being also the manager of the telegraph office, and the offices connected with the Postal Service being already supplied with a sufficient body of responsible and superior clerks, a very small addition to the clerical staff would be necessary. With the exception of a few thoroughly efficient travelling inspectors, the majority of the staff required would be "operators"—youths obtain efficiency in the manipulation with more readiness than men. The class of operators best suited for the purpose would be well paid on salaries varying from 15*s*. to 40*s*. a week. Probably most of those employed by the several companies would be transferred to the Government Service; but there would be no difficulty in instructing, under proper direction, any number of persons, so as to enable them, after a short period, to become competent operators. It would be necessary, also, to have a much more complete means of message delivery without additional charges being made on the telegrams. In some large districts ponies might be provided, so as to accelerate the delivery.

The cost to the Post Office for the collection and distribution of letters, including the expense of an immense establishment, and heavy contracts for conveyance of mails, does not exceed an average of a halfpenny a letter. There is no reason, therefore, with an increased number of telegrams, that the cost of collecting and delivery only should exceed that amount. The value of the time employed in transmitting the message—say, two minutes for two operators (one at despatching and one at receiving office)—at 5*s*. per diem, would be under a halfpenny. Thus the whole cost would be less than one penny, leaving a balance of more than 60 per cent. on messages even at the rate of 3*d*. In country offices, those engaged in the post office could soon gain proficiency in the telegraph; while, at the same time, the operators when unemployed at the instrument could be made available for other duties; and so, economising the labour, render the combined Departments as inexpensive as possible.

By adopting the plans explained in the few foregoing pages, the Government would obtain the control of a system of vast importance to the State; and by placing every branch of the Government Service throughout the kingdom in immediate connexion with the head Departments, enable the government of the country to be carried out in a more efficient manner, and at a material reduction in cost. At the same time, an ever-increasing source of revenue would be established, and to the public a means of almost instant intercourse would be made available between every part of the country—the spread of intelligence extended—the facilities afforded by the *uniform and moderate* rates charged for the most rapid means of correspondence and interchange of thoughts and desires, increasing the social happiness, prosperity, and welfare of the nation—would be also an additional safeguard to life and property, and render an impetus for the advancement of trade and commerce second only in its effects to the results obtained from the introduction of Sir Rowland Hill's scheme of Post Office reform. Let England, foremost amongst nations, be the first to acknowledge and to place on a proper and popular footing the Department of the Electric Telegraph, as it has already been in presenting to the world a new and perfect system of postal communication.

PRESS-THE-BUTTON TELEGRAPHY.

By DONALD MURRAY, M.A.

(*Continued from page* 31.)

No. II.

ANOTHER high speed printing telegraph that was being developed in New York after I arrived there in 1899 was the Buckingham automatic. This was a system with some very original features, but the chief fundamental, the Buckingham alphabet, was bad. Not only did it average five and a quarter cycles or reversals per letter, compared with four for the Morse and two and a half for the Baudot or five-unit alphabet, but it was an alphabet in which the letters varied in length, like the Morse. The alphabet had the advantage that the ordinary Wheatstone transmitter could be used, but the varying length of the letters introduced complexities of construction into the keyboard perforator, and the alphabet, double as long as the Baudot, was a grave handicap. The printer was of very peculiar construction, and the message forms had to be perforated and gummed together so as to form short tubes. During October 1902, about a year after I arrived in London, an installation of the Buckingham was sent over from New York for trial by the British Post Office. It was set up between London and Glasgow, and for some time there was a neck and neck race between the Murray automatic working between London and Edinburgh and the Buckingham working between London and Glasgow. Finally, in August 1903, the Buckingham was rejected, and no further attempt was made to exploit it outside of the United States. When Colonel Clowry came into power in the Western Union, Barclay became Chief Engineer and Assistant General Manager, and Buckingham went out. Barclay, with the assistance of the Western Union engineers, started improving the Buckingham, substituting a Blickensderfer electric typewriter on the Buckingham printer, and improving the keyboard and other parts. The Buckingham-Barclay system was manufactured in quantity and installed on about 60 of the Western Union circuits in the United States, and it gave fair, though not brilliant service. It is still in use, but arrangements are being made to replace it by the multiplex.

In May 1901, a few months before I left New York for London, one of the visitors to inspect my apparatus at the Postal Telegraph Company's head office in New York was Dr. Raps, from Siemens & Halske, in Berlin. He was much interested and he told me that Siemens & Halske were busy trying to develop a system of their own, using photographic paper. Later on this system proved to be an automatic printing telegraph of a very ingenious character, printing by means of an electric spark on photographic paper tape. It had the advantage that the printing was silent, but the cost of the photographic paper was serious, and the alphabet used was the Rowland (two-units in eleven different positions). Unlike the Rowland arrangement, employing seven cycles or reversals per letter, it only used six, the minimum permitted by the alphabet. Compared with the two and a half cycles of the five-unit alphabet, there was not much hope for the Siemens & Halske photo printing system. It was tried by the German, Austrian, and British Administrations for some time, but the fundamental defects were too great for the system to achieve practical success. The Siemens & Halske Company at last recognised this and re-cast the system. It will be noticed that all these systems suffered from the fundamental defect of a bad alphabet. The clear, logical French mind of Baudot adopted the five-unit alphabet as a matter of course. I adopted it because I had studied logic and knew nothing whatever about telegraphy. The use of the five-unit alphabet seems now to be such an obvious condition of success that it is a matter of astonishment to remember that the very distinguished electrical and mathematical professor, Henry A. Rowland, adopted a much inferior alphabet, and that a great and enormously wealthy company like Siemens & Halske, with access to the knowledge and experience of the German Telegraph Administration, should have adopted the wretchedly bad Rowland alphabet. It is an illustration of the fact that the things in front of our noses are the most difficult to see. In my paper on "Setting Type by Telegraph," read before the Institute of Electrical Engineers in

London in February 1905, I went at great length into this alphabet question and pointed out the advantages of the five-unit alphabet. That was the first time that special attention had been drawn to it, and from that date the five-unit alphabet was accepted as a matter of course as the best machine telegraph alphabet. It was not, however, until some six or seven years afterwards that the Siemens & Halske people were forced to abandon the Rowland alphabet in favour of the five-unit alphabet used by Baudot more than 30 years ago and used by me for the Murray automatic more than 15 years ago. The Siemens & Halske Company also followed my example by introducing correction from the signals themselves. In two respects they improved on the Murray automatic: they provided for direct printing instead of indirect printing from a perforated tape, and they used cross-perforated instead of length-wise-perforated transmitting tape. A logical necessity for direct printing at high speed by mechanical means is alternate switching of the signals to gain time by setting the receiving signals and printing the letters simultaneously. I believe this very ingenious device was used first by Kirk Himrod about fourteen years ago. He showed me his printing telegraph in New York about the year 1900. It was working on short circuit. He used an Oliver typewriter, and his system was remarkable also because it stored up several letters in transmitting. For instance, if you typed the word "Paris" very rapidly on the keyboard, you saw the Oliver typewriter at the other end of the room type the word "Paris" a moment or two afterwards. Also, Kirk Himrod knew something about the Baudot system, and had adopted the five-unit alphabet. Unfortunately he used zero intervals between the signals, and that was fatal. As far as I know, the Himrod printing telegraph is no longer in existence.

The Siemens & Halske system, although it now employs the five-unit alphabet and has shaken itself free from the fundamental defects already described, remains an automatic system. I shall deal fully later on with the grave disadvantages of automatic systems compared with multiplex systems, except in the case of very long aerial lines.

In 1901 Mr. F. G. Creed saw my automatic system at the General Post Office. He had obtained some success at the Post Office with a keyboard perforator for preparing Wheatstone tape, and he conceived the idea of making a reperforator for reproducing Wheatstone paper tape at the receiving end of the telegraph line. The idea was ingenious and in practice it has worked out well. On the suggestion of Mr. A. Eden, then head of the Telegraph Branch of the Engineer-in-Chief's office at the General Post Office, Mr. Creed came to me in April 1902 with a proposal to apply the differential feed of his keyboard perforator to my automatic printer, so as to enable it to print messages from the perforated Wheatstone tape produced by his reperforator. I told him I did not think there was much in the idea, as such a printer would be too complicated. We arranged terms, however, and he went ahead, the result being the Murray-Creed printer. The Post Office thought it would be useful for news work and a number of the machines were ordered. They were not a success, however, and after a time they were sold as scrap Mr. Creed then developed his pneumatic printer, with a type-bar typewriter of his own design, and he contented himself with tape printing. This machine was gradually perfected, and in conjunction with the Creed reperforator has met with considerable success, chiefly in connexion with the cable companies. The general remarks that I shall make later on in regard to the advantages and disadvantages of multiplex and automatic systems, will apply to the Creed equally with other systems. I shall, therefore, content myself at this stage by drawing attention to one fundamental point which will enable readers of this JOURNAL to get a proper perspective view of the Creed system, showing its present position and future prospects. The point is that the Creed system uses the Morse alphabet. That gives the Creed a distinct advantage for work in connexion with ocean cables. In such cases there is only one wire in the cable. There is no inductive interference from neighbouring wires, and zero units can therefore be used, as well as positive and negative impulses. In that case the Morse alphabet can be arranged so as to be quite as short as the five-unit alphabet. The latter, therefore, offers no advantage to the cable companies at present, and in any case the difficulty of introducing a new alphabet on a world-wide network of cables such as those belonging to the Eastern Telegraph Company would be very great. Hence the cable companies, retaining the cable Morse alphabet, naturally find it convenient to retain the Morse alphabet on the land lines connected with their cables. It is for this reason that the Creed system has met with considerable and well-deserved success amongst cable companies. This is a condition that will probably endure for many years to come: but it is not permanent, and there are grounds for believing that the five-unit alphabet will eventually be employed for ocean cables as well as land lines, at first on the shorter cables and then on the Atlantic cables, and eventually on all. The diagram, Fig. 1, makes the point quite clear about the advantage of the cable Morse compared with the land Morse, due to the employment of zero intervals. This enables a Morse dash to become a negative dot.

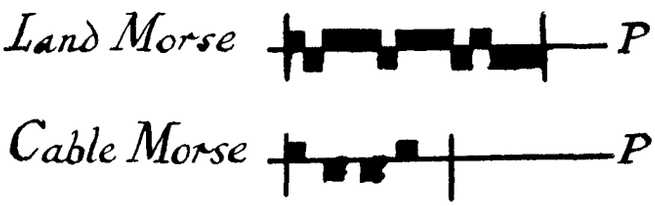


FIG 1.

COMPARISON OF CABLE AND LAND MORSE.

In practice the results are even more favourable to Cable Morse. The squares represent units or half-cycles.

In the case of wireless telegraphy also, under circumstances in which machine telegraphy can be employed, the Creed system has an advantage, at present, through its use of the Morse alphabet. The chief reason for this is that the wireless operators have often to sort out by ear the telegraph signals from atmospheric disturbances, the human ear being better adapted for this purpose than any mechanism at present in use, and the Morse being the only suitable alphabet for the human ear. The Morse alphabet is therefore indispensable at present in connexion with wireless. In time, electric and acoustic methods of sifting out the signals will be applied that will obviate reliance on the human ear. It will then be possible to use telegraph systems for wireless employing the five-unit alphabet, the incentive being the important increase of speed in the ratio of 5 to 8. That is to say, a speed of 150 words a minute with the Morse alphabet will be increased to 240 words a minute with the five-unit alphabet. This, of course, applies only to cases in which machine telegraphy can be utilised in wireless work. The great bulk of wireless work must, of course, be handled with the Morse key. For cable companies and for the automatic operation of wireless, the Creed system has a fairly secure monopoly for some time to come, provided always that some rival Morse printing telegraph, printing direct from the line signals, does not make its appearance.

In the case of land lines, apart from wireless and cable companies' lines, the position is different, and when I come to deal more particularly with the fundamental principles of printing telegraphy, I shall refer fully to the disadvantages for land line work of the Creed as well as the Murray and other automatic systems. Meanwhile, I shall merely point out that on land lines where there is inductive interference between neighbouring wires, zero units or intervals between signals cannot be used, and the Morse alphabet for land lines is therefore longer than the Baudot five-unit alphabet in the ratio of 8 to 5. That is one reason why there are already about 400 Baudot circuits scattered all over the world, to say nothing of other systems using the Baudot five-unit alphabet.

An interesting practical illustration of the correctness of these arguments is to be found in the United States, where, I understand, the Western Union is using the Creed apparatus in connexion with its Atlantic cable work; but rejected the Creed for ordinary land line work after trying it between New York and Chicago. Instead, the Western Union purchased the United States' rights to the

Murray multiplex, and with the assistance of the Western Electric Company developed it into the Western Union multiplex, which uses the five-unit alphabet as arranged in the Murray multiplex. As an illustration of what the multiplex can do I may mention that the New York—Boston eight channel multiplex installation was recently worked by the Western Union via Buffalo, the length of the line being 923 miles with a repeater at Buffalo. The speed was 35 words a minute per channel, or in all 280 words a minute (140 words a minute in each direction). It was operated for about two weeks via Buffalo with satisfactory results. This circuit is longer and probably more difficult to work than a straight New York—Chicago circuit. A number of new installations of the multiplex will be ready for operation by the Western Union in the near future, and within a year or two it will be in use all over the United States. It should be borne in mind that this remarkable extension of the use of the five-unit alphabet is taking place in the classic land of the Morse alphabet, the land of its birth, America. The Morkrum printing telegraph, which has come into considerable use in America, also uses the Baudot alphabet and so does the printing telegraph developed by the Union Switch & Signal Company, another American system. In fact developments in this country as well as America render it probable that the five-unit alphabet will in time completely supplant the Morse alphabet on all circuits not worked by the telephone. The one condition required to ensure universal dominion on land for the five-unit alphabet is a really cheap and simple and reliable and durable printing telegraph for the great majority of circuits which have not at present sufficient traffic to support the luxury of high capacity printing telegraph systems. At least one such printing telegraph, the Harrison system, is being developed and gives promise of success at an early date.

(To be continued.)

THE above illustration, a curiosity in telegraphy, is a reproduction from the *Illustrated News* of 1851 of the Comic Electric Telegraph by G. R. Smith. It was exhibited at the Great Exhibition of that year. Besides producing the actions of the eyes and mouth of the face, the instrument represented all the letters of the alphabet by means of combinations of the signs shown on the keys.

QUEEN MARY'S NEEDLEWORK GUILD.

MRS. HOBHOUSE requests us to publish the result of the efforts made by the women of the Postal Service for the benefit of the sufferers from the War. In order not to increase the unemployment of seamstresses and others a considerable portion of the articles sent in have been made through the Central (Unemployed) Body for London. It will be seen that, in response to requests received by Mrs. Hobhouse, a large number of articles have been distributed into channels where the necessity for them was immediate.

	No.
ARTICLES OF CLOTHING *sent to* QUEEN MARY'S NEEDLEWORK GUILD *from*	
The Accountant-General's Staff	598
Central Telegraph Staff	624
Made by the Blind	26
Returned Letter Section	169
Savings Bank	44
Telephone Operating School	54
Telephone Exchanges:	
Avenue 91	
Bank 70	
Barnet 9	
Battersea 79	
Dalston 10	
East 73	
East Ham 30	
Finchley 15	
Gerrard 62	
Hammersmith 34	
Hampstead 176	
Holborn 119	
Hop 131	
Hornsey 33	
Kensington 46	
London Wall 190	
Loughton 1	
Mayfair 113	
Museum 26	
North 36	
Paddington 67	
Park 51	
Putney 11	
Regent 37	
Romford 8	
Streatham 32	
Stratford 105	
Tilbury 8	
Victoria 73	
Willesden 13	
Wimbledon 45	
	1,822
Sent to POST OFFICE HOSPITALS *from the same sources as above as well as from* Mrs. Hobhouse, Miss King, Mrs. Newlands, Mrs. Preston, Mrs. Ferard, Mrs. Davies, Mrs. Coke, Mrs. Roberts, Mrs. George Morgan, Mrs. Walkley, Mrs. Slingo, Dr. and Mrs. Sinclair, the Hon. Mrs. Dunne, Mrs. H. E. Awdry, Mrs. Buckwell, and the Engineering Department, Newcastle-on-Tyne	800
Sent to POSTAL WIDOWS *with more than three children*	193
Sent to No. 2 FIELD HOSPITAL AT THE FRONT	20
Sent to CAPTAIN PARKER, 1st Battalion London Regiment	168
Sent to PRISONER OF WAR IN GERMANY	6
Sent to BELGIAN REFUGEES	100
Total	4,924
MISCELLANEOUS GIFTS (*furniture, glass, books, tobacco, games, flowers, &c.*) *sent to the* POST OFFICE HOSPITALS	over 300

REMARKABLE USE FOR THE TELEPHONE.

The telephone is 38 years old and has been the servant of mankind for nearly as many years. One would imagine that by this time mankind would have ceased to find new duties for it to perform. On the contrary, every day we hear of a new task.

For many years it has played a part on the stage, but always a silent part—the actor always monopolising the conversation. Miss Annie Russell, the well-known actress, with Mr. Oswald Yorke, recently at the Little Theatre, Philadelphia, conceived a new role for the heretofore silent little member of their cast. In *The Lady in the Case* the telephone "spoke right out in meeting," sustaining its part of the dialogue, thereby avoiding the heretofore one-sided conversation which has always left the audience to supply the other side, as it saw fit.

The effect was artistically carried out, the telephone repeating its part as any well-trained telephone should, without the slightest suggestion of stage fright at hearing its own voice for the first time before the footlights, and oblivious of the prompter behind the scenes.

The audience was convinced that there really was someone at the other end of the line. The effect was produced by special loud-speaking equipment furnished by the A. T. & T. Co. Telephone connexion was established between the instrument on the stage and the loud-speaking equipment behind the scenes and a real conversation carried on.—(*The Telephone News, Philadelphia.*)

The Telegraph and Telephone Journal.

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

Editing and Organising Committee - - { MR. JOHN LEE. MR. J. W. WISSENDEN.

Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

As the object of the JOURNAL *is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications, together with photographs, diagrams, or other illustrations, should be addressed to him at G.P.O. North, London, E.C. 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. I.] DECEMBER, 1914. [No. 3.

TWO KINDS OF SHOP.

Shall I confess it? When the project of this JOURNAL was gently broken to me I assumed that wan, defensive smile that in official moments is the nearest permissible equivalent for a groan. More shop! Oh yes, I know the curiosity of man is what Montaigne called himself, undulating and diverse. I know there are fellow-citizens apparently, brethren perchance, anyhow ostensibly human beings, who like shop. Technical journals, far from boring, arride them. There are who revel in the "frightfulness" of the *Lancet*. Elderly clubmen have been seen to toy delicately with the *Bankers' Magazine*. Even the *Hardware Journal* is said to have its hard and wary readers. You cannot account for this. It is like what song the Sirens sang or what name Achilles assumed when he dwelt among women: a family secret. But we who are not of the family, we the compact majority of plain people who are striving to be of good cheer in the war and wondering what it will feel like to be paying double income tax, we, in short, who are summoning all our fortitude for inevitable burdens—we, I am confident, are all steadfastly purposing not to endure the extra, gratuitous, and impertinent burden of shop. Impertinent, I say, because shop is by very definition just that: a thing inopportune, irrelevant, out of place. *In* the shop, of course, shop is not shop but business. By all means let us do the business. Let us go for it (with most elderly Civil Servants this is unfortunately more than an American figure) bald-headed. But, the business over and done, the prolongation and echoing and repercussion of it becomes merely abhorrent. The natural man, in these islands, cannot stomach it. Even Napoleon never called us a nation of shop-talkers. And if the conductors of this TELEGRAPH AND TELEPHONE JOURNAL fondly aim at cheating my leisure with a bare repetition of the elegant problems in telegraphy and telephony which supply the fascinating exercise of my working-day, I hereby promise them that, while going on paying my subscription—for well I know what irresistible means of persuasion are open to an Organising Committee and a Managing Editor in the same building—I will leave them as diligently unread as Mr. Wegg (until he had finished Mr. Boffin's veal-and-ham pie) left Gibbon.

But is that their aim? A close and sturdily prejudiced scrutiny of their first numbers tends, I admit, to reassure me. I think I discern signs of grace, enough at any rate to warrant the belief that they are not out for mere shop. I am already encouraged to suppose that telegraphs and telephones mean much more to them than a matter of wires and relays, concentrator switches, and sextuple duplexes. The fact is, there are two kinds of shop. There is the shop which is a mere obsession, the *idée fixe* of a man hypnotised by the technicalities of his theme, the hobby-horse which runs away with its rider. And there is the shop which, while still fixing the idea, lets the mind play freely round it, sees the wider vision of it, hopes the larger hope, links it up with the cosmos. What indeed if not cosmic is the scope of telegraphy and telephony? Sometimes, in official correspondence (when a coy landlord has to be cajoled into granting a free wayleave), they are described as "necessities of modern life like gas and water." The illustration is surely too humble. To consider telegraphs and telephones is to penetrate every corner of the country, to travel its railroads and its waterways, to perlustrate its coasts, to study all its business and all its pleasures, to be in the secrets of its press—ouf! it would need a Walt Whitman to complete the catalogue. The matter has called up a new science of economics, yet in its infancy. It has raised a whole host of new social ideals, some of them dreams perhaps, but none ignoble. And apart from all these questions about the innumerable contacts of telegraphy and telephony with the world outside them, there is the question, always burning, always delicate, always needing to be handled with wisdom and sympathy, of the world inside, the world of men and women who work the machine, the question of the best direction for their energies, the question of the best provision for their welfare. As Mr. Squeers observed, here's richness! Here's ample verge and room enough for the right sort of shop!

It is with that sort, I like to think, the conductors of this JOURNAL purpose to entertain us. Not that I would have them too entertaining. This is, and must be, a serious organ. They will remember Sancho Panza's warning about mixing up *berzas con capachos*—cabbages with baskets. I mean they will resist the temptation of relieving their essentially serious theme by romantic anecdotage. That should be left to the novelists. Yet what a joy to remember how the Count of Monte Cristo once bribed a telegraphist (of course, a semaphore-telegraphist), and thereby confounded his enemies with a devastating slump in the Spanish Rente! Very pleasant, too, the heroine of Mr. Henry James's tale, "In the Cage," a counter-clerk in a West End T.S.O. She mastered all the amorous secrets of the fair customers, which they entrusted to A forms because they knew that the C forms would not give away their handwriting to the hoodwinked husbands who, it would seem, simply pullulate in that quarter of London. . . . But I perceive that I am myself lapsing into shop.

A. B. WALKLEY.

HISTORY.

IN this issue we reproduce one of the earliest reports which led to the State ownership of Telegraphs in England. From time to time, further reports shall be reproduced, so that the readers of the TELEGRAPH AND TELEPHONE JOURNAL will be able to study the history of the nationalisation of Telegraphs and Telephones from the original documents. Examined in the light of later knowledge and of later experience these documents are of surpassing interest. Nearly half a century ago there were acute minds which were able to forecast some of the later developments. There were other minds which were able to leap across the intervening years and to forecast developments to which, even now, we can only aspire. It is a singular fact that the report which is reproduced in this issue argued the desirability of the change from the basis of experience in Australia. Other reports quoted the success of the experiments in Belgium and in Switzerland. To-day we find that certain publicists in the United States are quoting the Post Office experience in England as justifying a monopoly of telegraph and telephone enterprise to be vested in the Government of the Great Republic. It is possible that the discussion of this question will be renewed in England as an overflow from the discussion in America, and if it is to be handled intelligently the full story must be frankly and fully stated. To do this fairly and without bias the only course is to reprint the original documents and by this means to discover the reasons for the change, and also to picture the state of the Service in the United Kingdom before the Post Office was entrusted with the responsibility.

In this way we are attempting a philosophic consideration of the principles which underlie the public service. Such a philosophic consideration presumes no particular conclusion. It would be a sorry day for the enthusiastic performance of the duty if all of us agreed, in every detail, as to the proper relation of the State to such enterprises. As telegraphists and telephonists we are members of a State Service, trying our best to make it as efficient as possible. As citizens it is open to us to have this or that opinion as to the functions of the State. There must be no such thing as the discipline of opinion. Nor is it the case that only two views are possible, that of private ownership and that of Government operation. This is a false dichotomy. A huge limited liability company is only private ownership by a very loose use of language. There may be many other intermediaries between private ownership and direct Government operation. We may have quasi-private ownership with a State charter of monopoly; we may have public utilities worked by corporate enterprise under State control, or under the control of public bodies with special functions. The Port of London Authority, the Metropolitan Water Board, the Pacific Cable Board, the semi-State Railways of India, are examples of corporations fulfilling special functions and having varying relations to the State or the States which control them. They are mentioned here because it is necessary to insist that the history of telegraphs and telephones can be given in the form of original documents, without having any controversial axe to grind. We are out for the statement of plain facts, which may or may not adorn an argument or point a conclusion The trouble is that so often we find arguments set forth and conclusions drawn, and meantime the cold facts slumber shyly in the background. So it is that if at this later stage of telegraph and telephone development we are to understand exactly where we stand in respect of responsibility to the public, we must begin by tracing, deliberately and carefully from the beginning, the process by which that responsibility has been evolved.

If it does happen that we arrive at the conviction that State ownership and State operation are essential for the full efficiency of telegraphic and telephonic communication, that conviction will be all the more enlightened and enthusiastic when it is reached by careful and deliberate study of the influences which have brought about those methods of control. The State will be a model employer, *in the fullest sense of the word, only* when we have adopted every means of understanding what is included in the term. To do our day's work, earn our pay, obey the regulations and so pass on for pension is " employment " only in that sense of the word which has not shaken itself free from feudalism. We may be unprofitable servants when, lo, we have done our duty—and only our duty. Fifty years in the development of State operation is a brief span after all, and we cannot find the full fruition in that brief span. Many of the characteristics of the older methods still find their place. The process of evolution is revealing to us the potentiality of a deeper conception of service—something more akin, in a rough way, to the Craft Guilds. As this process of evolution makes itself felt we look at the question in a different way. We are ourselves members of the corporation, not underlings beneath it. There are leaders, of course—and there always must be leaders—but the spirit of true leadership is not the spirit which would confine and monopolise either knowledge or thought. The day has gone by when the many are contented to let the few think on their behalf, and in their stead. It is all for good that we should all be thinking. The community of reflection will find its articulation through its leaders, but that is altogether a different matter from surrendering its power of reflection to those leaders. And many of our difficulties will vanish when, without surrendering the proud principle of individual freedom of thought, we recognise the reality and the rich possibilities of community of thought, with its fuller tolerance and deeper trust. It may be that in striving to that end we are achieving something in respect of the progress of the world which is of much more moment than we realise.

MARE'S-NESTS.

SOMEWHAT akin to the " Rumours of Wars " which we discussed in our last issue are the " mare's-nests " which are occasionally discovered in the columns of our contemporaries. No doubt the pressure on the editorial staff, when extra and special editions follow one another so rapidly, accounts for their publication. We propose to pillory any such yarns which we may come across in future.

It may be that some of these occasional paragraphs are written in all simple-mindedness; but certainly others are inspired by a desire for a free advertisement of some commercial article. The latter type of paragraph is exemplified by the correspondence which appears from time to time in the Press about the danger of

infection from telephones. The originator of such correspondence—or his partner behind the scenes—generally has an antiseptic appliance which he wants subscribers to purchase at a fancy price. If the initial letter provokes any comment, the correspondence is followed up by an advertising campaign. The man in the street, who fails to see why a telephone should convey infection any more than a railway carriage or the many other inanimate objects with which he comes into more or less intimate contact every day of his life, pays very little attention to this campaign; and the easily gullible person fears that a Government Department is too hide-bound by tradition to take the obvious course and install antiseptic shower-baths over every public telephone. Then comes the Post Office contradiction and its explanation of the steps taken by eminent bacteriologists and analysts in search of the militant microbe, who apparently detests telephones where rubber and coke are his only victuals. After that we have a lull and then the old campaign starts over again. Thus the mares-nest raises its brood.

Another form of mare's-nest is the description of something which never happened, with all that wealth of corroborative detail which is "intended to convey verisimilitude to a bald and unconvincing narrative." The paragraph with the stirring heading "Public Telephone Peril," which we print in another column, is a sample of this type. It appeared in a prominent contemporary with a wide circulation. It narrates, as by an "Eye-Witness," how a subscriber got caught in a telephone box and narrowly escaped with his life. Five men, after a breathless hunt, selected a screwdriver as the most handy weapon to break glass with, although the assistants outside and the man inside had twelve elbows between them. Headquarters, in a spirit of curiosity, tried to trace this story to its origin, but without success. The glass door remains broken so far as we are aware: and strange to relate the injured party has failed to demand any compensation for mental, moral, and physical damage from the Post Office. After all the whole story is so obviously absurd that one wonders why it was worth while to print it, and whether the author was pulling the editor's leg, or merely suffering from visions of mouse-traps conjured up by meditations of the telephone facilities of mouse-world.

IMAGINATIVE STATISTICS.

IN these stirring times, when the columns of the Press are almost exclusively occupied with the all-absorbing subject of the War, we escape most of that chastening criticism which is doubtless for our good: we escape also those erratic comparative statistics which are the delight of the cynic and the despair of the trained mind. Our immunity, however, is not complete; for in a recent issue of the *Electrician* we observe a long letter by Mr. F. M. DENTON on "Our Trade and German Methods." We will only concern ourselves with the last paragraph which reads:

> On our trade methods in telephony nothing need be said except that our backwardness in the use of the telephone makes us a source of amused amazement to other nations. When I find that the Telephone Directory of London, with its 9,000,000 nhabitants, is no bigger than that of a city of less than one-tenth the size in the United States, I conclude that something is wrong with our methods.

We can only say that, as regards the actual size or bulk of a telephone directory, this must depend on the type used, on the amount of space devoted to each subscriber, and on the thickness of the paper. It can be expanded according to fancy, and a directory of 100,000 subscribers can easily be made much larger than one of 200,000. If, therefore, Mr. DENTON'S criticisms mean anything, we take it that they mean that London has no more telephone subscribers than a city of the tenth of its size in America.

Now what are the facts. In the first place, the population of London is put at 9,000,000. We wonder if Mr. DENTON is aware that the population of the *whole* of the counties of London, Middlesex, Essex, Herts., and Surrey, is not more than eight millions and a quarter, and we think that not even the greatest of Greater Londons is assumed to include within its boundaries Harwich, Colchester, Southend, Saffron Walden, Hitchin, Tring, Farnham, Guildford, and Dorking. The population covered by the Telephone Directory is naturally that of the telephone area, and this, as we happened to point out in our last issue, is an area far exceeding in extent any recognised geographical boundary of London. Its population is about 7,160,000, and the number of its subscribers' stations is about 270,000. The only American cities whose telephone stations exceed this number are New York and Chicago. The population of the former is three-quarters and of the latter one-third of that of the London telephone area. In Boston and Philadelphia, respectively, one-sixth and one-fifth the size of London, there are probably by now something like 175,000 stations in each case. The most favourable example of an American city one-tenth the size of London is St. Louis, with about 100,000 stations—not, it will be agreed, quite as large as the London system We are very well aware that the telephone development of American cities is higher than that of this country, but we do not require the fact to be driven home by wholly fantastic figures.

PUBLIC TELEPHONE PERIL.

WE reprint the following imaginative effort from a weekly contemporary in the hope that it will instruct and interest our readers:—

> Having used a public telephone box at a West End hotel, a man on trying to open the door found that the lock had jammed. For fifteen minutes the proprietor and four assistants tried to force the lock, and then, unscrewing the casement of the door to remove the glass, found there was a second sheet. The man inside, who was in a state of collapse, was afterwards rescued by an assistant, who broke the glass with a screwdriver and, administering brandy to the man, succeeded in liberating him.
>
> Suggestions as to the ventilation of air-tight call boxes have been submitted to the Postmaster-General.

EFFECT OF THE WAR ON THE BERLIN TELEPHONE SYSTEM.

It is reported from Berlin (says the *Globe*) that at the outbreak of war many telephone subscribers asked for a lower tariff.

Their request was refused by the Administration, but the number of subscribers has now fallen off to such an extent that lower rates will be necessary.

From *Electricity* we learn that it is stated that the cancellations of telephone contracts in Berlin alone which took effect on Oct. 1 numbered 10,000.

HIC ET UBIQUE.

MR. DIVE in his paper on "The Elocutionist in the Exchange," which we reprint in this issue, says: "I should probably start a violent controversy if I attempted to claim for any country or class the distinction of speaking the purest English," and proceeds to leave the question of pronunciation resting on those standards which find general acceptance. We are duly thankful for this consideration: indeed, had he wantonly provoked such a discussion we should have been compelled to excise the passage editorially. We have seen the columns of respectable papers filled with correspondence of the most blighting and nugatory description, laying down such exasperating principles that even the most inoffensive and least bellicose people have been tempted to rush into print to refute them. For instance, there is the terrible kind of person who suggests that to the *really* subtle ear a faint echo of the b in *debtor* can be detected when the word is enunciated by some *really* cultivated elocutionist.

THE truth is that in many cases we are so accustomed to the sight of the printed word, that we get into a habit of imagining that we make a distinction between two sounds which are pronounced alike, but spelt quite differently, when, in fact, we do not. Numerous instances could be given but would only provoke that controversy which we are so anxious to avoid. These imaginary subleties which do not exist, and the real subtleties which do exist but for which our alphabet provides no symbols, are probably the most effective hindrances to the general adoption of any system of phonetic spelling.

A SCOTTISH correspondent sends us the following story with the comment "and yet some people insist that a Scot is devoid of a sense of humour":—A subscriber in a Scottish provincial town, not a hundred miles from Glasgow, disputed a trunk charge, and the sub-postmaster at the distant subscriber's end was requested to obtain his subscriber's version of the case. In due course the following reply was received:—

> "... I will make enquiries as soon as I have an opportunity. Since the memo. was received by me, the subscriber has died, so in the circumstances I do not think it would be judicious for me to push an interview. ..."

THE following is an extract from a draft letter which happily was not despatched from headquarters:—

> "Several faults occurred in connexion with your telephone circuit, which appear to have been chiefly due to bad weather. ... Arrangements are being made which it is hoped will obviate any similar difficulty in the future."

Such faith as has not been found since the days when King Canute got his feet wet.

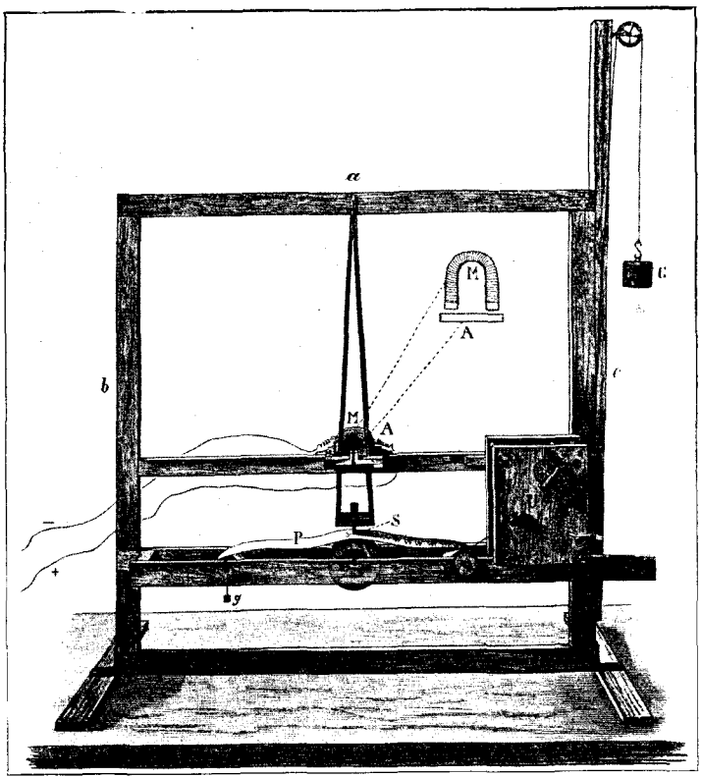
THE *Liverpool Daily Post and Mercury* says:

> One of the side effects of the war is the partial interruption of telephonic communication with the Continent. A Liverpool firm of corn merchants lay claim to having had the latest conversation with Berlin. They were speaking to a firm in the German capital only three days before the war between England and Germany was declared, and were surprised to learn that all the three principals had been summoned from business to military duty. Since the outbreak of war, of course, England and Berlin have not been on speaking terms.

This paragraph will be of absorbing interest to our readers. We can assure the Liverpool firm of corn merchants that the telephone call which they claim to have had on this historic occasion was not only the last but also the first commercial telephone call to Berlin. Perhaps, however, the last sentence refers to the War of 1870, in which case it is, telephonically speaking, strictly accurate.

THE MORSE.

How does it come about that the Morse is the characteristic telegraph instrument in English-speaking countries and that in other countries printing telegraphs are looked upon with more favour? It is by no means an easy question and it has to be admitted that historians have not treated the subject quite as fairly as they might have done. Some day we may attempt a history of the subject in these pages, and we shall strive to indicate the various influences which operated in the Morse versus Hughes struggle in America and in Europe in the 'fifties. On this occasion it suffices to say that the struggle was a bitter one. It gained in asperity from the fact that in the United States it was something of a financial struggle. The American Telegraph Company was in possession with the Morse. The usual American attacks were made, just as they are made to-day. It was said that the rates were too high, that there was a virtual monopoly, and that there was discrimination. So the Hughes instrument became the weapon of offence. A rival company took



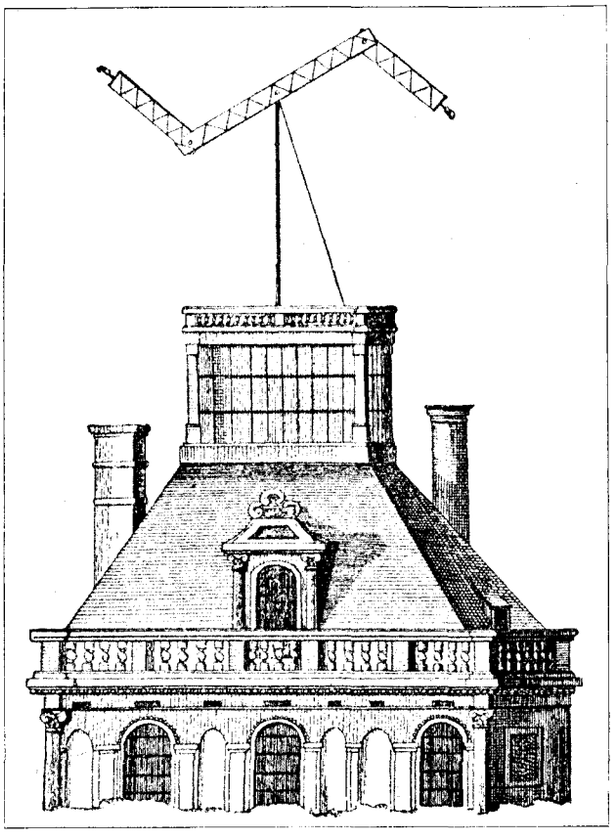
MORSE'S FIRST INSTRUMENT.

it up and established it securely in America, so much so that Professor Hughes brought it to Europe and the French Government (but not the English companies) received it kindly. Then something happened in America, the full interpretation of which I cannot discover. Probably finance had something to do with it. However, the fact remains that Professor Hughes' marvellous instrument is not easy to find in the land of its first adoption. And the Morse is everywhere.

The Morse has had a long reign. One wonders what sort of man Morse really was. At the time of Waterloo he was at the Art School in London, studying under Benjamin West. He combined a love for art with a love for science. He won the gold medal for statuary in 1813 when London was thinking precious little about statuary. Just as we are occupied with another subject to-day London was occupied with another subject then. It did not worry Morse, probably because he was not irritated by a rapid succession of last editions. He found his surcease from sorrow in making science a hobby. It was a secondary hobby, just as it was a

secondary hobby to Professor Hughes. Morse came to telegraphy from statuary; Hughes came to telegraphy from music. Both of them were professors in their art, Morse indeed was president of the National Academy of Design, New York. Had the American Government selected him, as he hoped, to design one of the historical panels in the Capitol at Washington, he would never have turned his attention to telegraphy. In 1832 Morse hit on his idea. There was to be a code of long and short signals. He explained it to friends—among them Messrs. Vail, a name destined to be famous in American telegraphy and telephony—who in turn pleaded for it with other influential friends. Congress did the rest and voted £6,000 for a line between Washington and Baltimore. Eighty years afterwards Morse is still the predominant system in the United States and in England. It is a question if anything else has stood so bravely the lapse of time. Locomotion, lighting, sanitation—all have changed enormously. Morse is still Morse.

Indeed, it is in our blood. Our minds awaken still with enthusiasm to hear a sounder going with clear crisp notes, having



CLAUDE CHAPPE'S OPTICAL TELEGRAPH ON THE LOUVRE, PARIS, 1794.

neither the sharp mechanism of Wheatstone signals nor the long loose lack-form hammer-hammer of conventional signalling. In those days, we say, they were giants. There was C. of T. S., S. of Leeds, P. of Belfast, and countless others. How exquisitely they gave us the dots, firm and clear; how firmly came those regular dashes, as if they impressed us by a psychological difference and not by the mere sense of duration. We had friends who were "pretty" senders; others who were "beautiful" senders; others who were "rushers"; others who were "dragglers." Within the compass of the dot and the dash were all manner of subtle shades of difference, psychological, temperamental, ethical, and aesthetical. It was a strangely elusive and subtly attractive mystery. How was it, we asked, that some of the best senders we knew could never be read on the "B" side of a Quad? We did not know. We do not know now. We never shall know. Morse brought us to the very verge of a mystic kingdom of mind and left us there wondering.

The first quad came to us at Liverpool from America. It was a weird business. It lived apart, socially superior on a table to itself, like a detached house in the middle of a row. Strange apparatus was heaped on stranger apparatus. There were complications of keys on the receiving sides for RQ's, and mysterious arrangements where now an apparently simple relay seems to suffice. At times it worked. True the exquisite telegraphists who delighted in their perfect formation of Morse symbols complained that the machine distorted their product. True there was an occasional cataclysm, when everyone seemed to run round the table to regulate something which someone else already had regulated. But I have seen similar cataclysms with very modern apparatus, and of that lonely and complicated, mystic and marvellous quadruplex I would say no word of disrespect.

For we must remember that the wonderful improvements which our own engineers have put into the quadruplex have done more to keep Morse pre-eminent than anything else. Divided and extended quadruplexes have achieved so much in the economy of wires that even the wildest optimist cannot conceive of their entire abolition in our day. Maybe some modern theories of multiplex with extended arms will achieve more than the fourfold Morse. Even admitting this to the fullest extent, there is still room for the Morse quadruplex. But, alas, that room is a narrowing circle. I lay down my pen and sadly look at my villainous handwriting, and I come to this pathetic conclusion: If Morse is to triumph, it must be Morse with the typewriter. The plumber in the suburbs, having put a washer to the water-tap, types his bill neatly, and it pays him to do so. We cannot go on much longer writing our telegrams as we do write them, not so badly as this article is written perhaps, but still a little less than creditably. But other problems enter. Typing with conventional sending has especial difficulties, and it seems to be illogical to reduce typing to that speed. I confess I am not an admirer of the American solution, with its greater rapidity obtained by the use of "vibroplex" and "autodot" keys. These keys to me seem to rattle the dots as if those same dots were running to catch a train. The American code lends itself to this sense of rushed dots, and it is as far as one could imagine from the balanced music of the dear old sounder. The machine sending which is nearest, to my mind, to the human quality is that which Mr. Gell devised, but even so, I doubt if it would grow on the affections. So here we have a sort of paradox. It is not in the deficiencies of the Morse code itself that the destruction of Morse seems to lie. It lies rather in the matter of script. Shall a telegraphist type his messages from the sound of the instrument, or shall we look for a machine which will do the typing?

This is rather more than a rhetorical question. Let us not forget that other causes are operating to establish the Morse code more securely than ever. Cable working and wireless working are exercising their influence. To-day the Morse code is known to thousands who have never touched a Morse key, and have never yearned to touch one. The lamp-signalling from the decks of ships turns at once to Morse. The flag-signalling one sees on the commons of London is legible to the naked eye, even of a Traffic Manager. I have heard the code worked into a whistle in Sheffield, when a boy in the gallery of a music-hall (I am not sure if it was not a variety theatre) tried to attract the attention of a superior friend in a superior seat. The lady who accompanied the friend recognised the symbols—the makings of a love-tragedy, maybe, though this is not the place to write of such things. Still the sad incident is of worth as proving my point. The printing telegraph may come. Possibly the printing telegraph may go. We shall have the Morse for ever.

J. L.

BRIGHTON TELEPHONE SOCIETY.

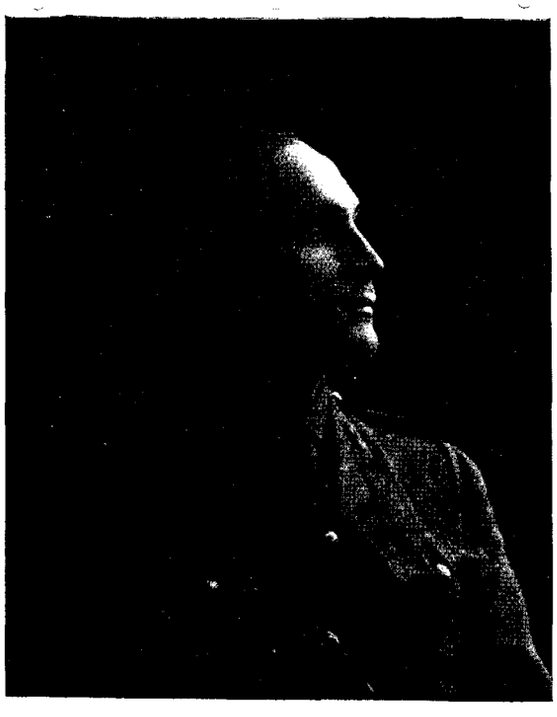
A very interesting meeting was held on Nov. 2, the programme being "Questions and Answers on Knotty Points." There was a large attendance, presided over by the District Manager, Mr. Moorhouse. Eight questions in all were submitted and were replied to by selected members. The replies in some cases were particularly good, and most of them involved a good deal of trouble to elaborate. Small prizes had been offered for the best question and the best answer. These were awarded to Mr. Jenkins for the former and Mr. Calcutt for the latter. A discussion took place on a suggestion to start a social side to the society. As the meeting was unanimously in favour of this, a committee was appointed to carry out details. The total membership of the society has increased from 79 to 92.

WITH THE EXPEDITIONARY FORCE.

By LIEUT. A. A. JAYNE, R.E.

PADDINGTON Station is a holiday station. There one sees men in flannels and women in white frocks bound "up river," or honeymoon couples for the West of England. Holborn Viaduct Station is provincial. I used to go there when I felt homesick. Sometimes when lucky I saw a train getting ready to start for a place in Kent reminiscent of apples and strawberries. But Waterloo—is Waterloo. People fight battles with porters and platforms in times of peace, but in these times they depart thence to the War. On one beautiful morning I was amongst that number.

Upon arrival at the port of embarkation the mystery of one's destination deepens. One is simply told to go by a certain boat at a certain time and take "so many days' rations" with one. Shed number "?" is the place to obtain rations, and this is situated in a very obscure spot. If my readers know anything of docks they will understand something of my mission at eleven o'clock



LIEUT. A. A. JAYNE, R.E.

on a dark night. However, I eventually secured an orderly and threaded my way through piles of timber, coals, and miscellaneous heaps of material. At the Army Service office I was much relieved when Colonel "X" said, "Don't you worry. Everything will be put on board for you. Come and have some hot coffee." The Colonel's room gave some indication of war time. A primitive wooden hut, a "Roarer," which, unlike those met with in picnic experiences, really did roar, and biscuit boxes for chairs. And excellent coffee the Colonel made—he was an expert. When he took up active service again it must have been assuredly a labour of love, for presently other officers arrived and he played the part of father to us all. It was a splendid trip across to the Continent, but far too short for me. The telegraph arrangements at the base are very efficient, but I should have liked to see more fast-speed apparatus. The conditions are, however, quite different from the Home Service, as will be explained later.

Have you ever been in a supply train? If not, you have not lived. I had orders to proceed to the Front by supply train, but first of all to report to the Railway Transport Officer with my kit at 11 a.m. Capt. Owen, R.E., very kindly placed his motor car at my disposal, and I never ceased to bless him for that. Upon arrival at the Railway Transport Depot the officer has to be found. Everybody knew him and where he was, but although we drove through miles of sheds stacked with provisions, the R.T.O. could not be traced. I have never seen such sheds anywhere. It takes at least ten minutes to walk down one, and if I went down one railway siding the R.T.O. had just gone over to another. After wandering down many sidings I succeeded in losing my motor car. I began to get anxious about my train and conceived the brilliant idea of finding the R.T.O.'s office. It appeared that the office was shifted to meet the incidence of the traffic, as we say at home. First it was an enclosure formed by cases of Nestle's milk, but that had been evacuated in favour of a palatial shed composed of railway sleepers. I never found it, but I picked up other officers who were on the same quest as myself, and we joined forces. After many scouting and flanking movements we discovered the R.T.O. arranging in voluble French the make-up of a train for the Front. A most comfortable carriage was assigned to me and I went in search of rations for the journey. The search for these was similar to that for the R.T.O., only more so. The rations consisted of raw beef, potatoes, cheese, tea, bread and sugar, all placed together in a cube sugar box in the most friendly manner possible. At last I was installed in my new home just in time to catch the 1.15 p.m. train the departure of which was, however, deferred until 2.59 p.m. "2.59" sounded suspicious, and I asked an employee why we had become so meticulous in regard to the time. "Well, you understand if it does not start punctually it will be behind the slow passenger train all the way, and it will be nine o'clock to-night before you get to 'X'"—a place a few miles off. I saw the reasonableness of this, but at 2.59 the train was still being "made up." I have always been interested in railways, but after four hours I felt that I should live quite contentedly if I never saw a railway train again, except of course the one that will take me home. The trucks were being shunted with such terrific collisions that I began to have grave doubts about the safety of the tins of condensed milk and motor spirit, certainly the milk must have been churned to cream. At length, four o'clock, my train was moving and we were off, or so I thought, but the idea was presumably to give the writer a shake up. Like the condensed milk I became the innocent victim of "railway shunts." I eventually started at 5.30 p.m. after a preliminary of six and a half hours.

Fortunately for me the officer in command of the train, 31 trucks, had an excellent cook acting as servant, and Colonel Newcomen invited me to throw in my lot, including rations, with him. This arrangement suited me admirably, for judging by the start I did not know how long it would take me to arrive at my destination. What a dismal aspect from the train! Drizzling rain and pitch darkness—for all lights on the countryside and stations were out—and the monotonous "joggity-jog" of the train. At 8.30 p.m. we were running into a large junction and suddenly in the sky, apparently a short string of faint lights! An aeroplane, of course, and antagonistic to us without doubt, especially when we saw a large spark of blue light from the moving object! We approached closer—and our aeroplane became a tramcar running along a road above us.

We stopped amongst numberless goods trains and, as nothing else seemed to happen, we decided to go to "bed" on the seats of the carriage. The reveille was sounded by the clank of shunting at 6 a.m. and soon after our train started.

Shaving on a goods train is principally a question of balance. One makes a stroke with the razor whilst the lurch comes on the "starboard" leg. Sometimes the lurch is short and one must wait for the next. I had just got into my stroke when the train ran very slowly into a tunnel, and although I can shave in the dark and could just manage in the light on the swing of the right leg, I did not feel sufficient confidence to perform both feats at once. And so I waited in the dark, hoping that neither the Colonel nor his cook would run into me while I stood with my razor drawn.

Ration bacon and tea are very acceptable on cold mornings, and the Army rations generally are to be preferred to the expensive food procurable at railway stations in these times. "Bully beef" is a most handy person. He provides soup for the first course,

makes an excellent stew with vegetables, and failing fresh meat he can be used as a joint. Ration biscuits and cheese are quite good and so is the coffee. With the assistance of the Colonel's cook changes on the foregoing were rung quite successfully during the two and a half days I was on the train. I had one more night in an unknown junction before I could report myself.

I cannot help thinking what a change it must be for a quiet little country town to be suddenly converted into a great military centre. An almost endless procession of troops, wagons, gun carriages and motor lorries lumbered over the cobble-stoned streets.

I understand from the people here that the English troops have behaved in a most honourable manner all the time and have earned the respect and admiration of everyone. The people seriously thought of leaving the place owing to the German advance, but upon the arrival of the English they were reassured and things go on normally.

TELEGRAPH AND TELEPHONE COMMERCIAL ACCOUNTS.*

BY SIR CHARLES KING, C.B. (*Comptroller and Accountant-General*).

As all Post Office Accounts are prepared in forms prescribed by the Treasury, are examined locally in the offices where they are prepared, are checked in the Accountants' offices in London, Dublin or Edinburgh, and again subjected to a test audit by the Comptroller and Auditor-General, it may be asked why are Commercial Accounts required.

Briefly the reason is that Government Accounts are really only Cash Accounts, and although a Cash Account may suffice for private individuals like ourselves, they do not adequately meet the needs of a commercial undertaking, whether that undertaking be carried on by the State or by a private company.

Government accounting does not pretend to do more than show correctly how money voted by Parliament or granted to a Department by an Act of Parliament has been spent; it is true that in Government Accounts of voted money the sums spent are classified under headings such as, salaries and wages, travelling, stores, conveyance of mails, &c., but this is not nearly sufficient when one is dealing with a commercial department like the Post Office, whose duty it is to convey letters and newspapers, to transmit telegrams, to provide apparatus for telephonic conversations, to issue and pay money orders and postal orders and to conduct Savings Bank business, operating at some 23,000 post offices in the kingdom, and collecting payment from the public for performing these various services.

As showing the summary way in which Post Office finance is laid before the House of Commons, the following figures are extracted from the balance sheet submitted to the House for the current year by the Chancellor of the Exchequer; on the revenue side the figures are shown in three totals, viz :—

Postal Service	£21,750,000
Telegraph Service	3,100,000
Telephone Service	6,900,000
A total of	£31,750,000

On the expenditure side a grand total of £26,227,000 is shown: the difference indicating a net revenue of about 5½ millions.

From the point of view of the Chancellor of the Exchequer on the night of the Budget these summarised figures are perhaps sufficient, but they do not tell us whether the revenue of 5½ millions is to accrue from the Postal Service, the Telegraph Service or the Telephone Service; and they make no reference to expenditure voted to other Departments of the State for work to be done for the Post Office by those Departments; or to the charge on the Consolidated Fund for interest on the Telegraph purchase money; the large capital expenditure granted under Acts of Parliament for the extension of the Telephone Service does not directly affect the Budget, and is only referred to incidentally.

The most serious default in Government accounting from a Commercial Account point of view is its treatment of capital. Our capital funds for Telephone purposes are supplied under the authority of various Acts of Parliament by the National Debt Commissioners out of various monies entrusted to them for investment, but directly the money is handed to the Postmaster-General an annuity is set up for a term of years chargeable on the Post Office Vote, which brings about the anomaly that in Government accounting we frequently begin to repay our capital before any revenue is earned and the repayment goes on even if no revenue accrues. I think it may be said that not even a gold mine can do this—certainly Telephones cannot.

This anomalous system of dealing with capital does not apply to Telegraphs In the case of Telegraphs—there being no hope of either reduced telegraphic charges or of a dividend, and there being few or no extensions, the capital sums required are voted annually as part of the expense of carrying on the service. In the Postal Services the capital expenditure is comparatively small and can be easily met out of current revenue, but even in this service the annuity system is being adopted for the new Tube Railway in London for mails.

*Paper read before the Telegraph & Telephone Society of London on Nov. 23.

I think we all understand what is meant by Commercial Accounts. Their object is to show periodically, say half-yearly, or annually, how the undertaking or enterprise has fared up to the end of the period of account; in other words, to show whether the invested capital has been preserved and what profit (if any) is available as dividend on the money invested. The primary duty of the Directors of a Company is to preserve the capital entrusted to them by the shareholders, and I venture to press this point on the minds of those present to-night, as we are the Directors of the Post Office.

Officers of the late National Telephone Company will fully appreciate both the difference between Commercial Accounts and Government Accounts, and the supreme importance of preserving shareholders' capital. During the recent Arbitration the Post Office sometimes thought the Company's Accounts might have shown more detail, but that is happily at an end now. The fact remains that the National Telephone Company did publish Commercial Accounts, and the final account of the Liquidator of that Company showed that the Directors, whilst paying a heavy royalty to the Government and a reasonable dividend to their shareholders had succeeded in preserving, or nearly preserving, the capital entrusted to them which, as I said before, is the main duty of the Directors of a Company.

Another fault in Government accounting is its treatment of depreciation of plant. When an undertaking is dependent on perishable plant for its working, as is the case with Telephones, it is clearly necessary not only to treat its capital properly, but also to provide adequately for the depreciation of that plant from year to year. The sum to be set aside half-yearly or yearly for depreciation must be sufficient to provide the cash required to replace the plant when it is worn out; but the repayment of capital under the annuity system, briefly referred to in the earlier part of this address, is an unscientific method of dealing with so complicated and important a matter as that of depreciation of wasting assets, especially as the capital is repaid without any regard to the question whether there is any revenue available for the purpose. The repayment also includes the cost of any land purchased, but land in our cities and towns does not depreciate in value.

A further indictment of Government accounting is found in the fact that those accounts do not attempt to show what rate of dividend has resulted from the year's work. Here again I refer only to Telephones. In the case of Telegraphs no one cares to enquire what is the rate per cent. of loss—the deficiency of over £1,000,000 a year bars the way.

The foregoing remarks will perhaps suffice to show that the Government system of treating capital in its accounts is not on commercial lines, and if not supplemented by other accounts might in the result be very unhappy to its investors, viz., the general public.

Having thus indicated the unsuitability of a Government System of Accounts from the point of view of a Revenue Department like the Post Office, I think it may be of interest to show as briefly as may be what the Department has done in the direction of the compilation of Commercial Accounts. In the following historical paragraphs I am quoting freely from a recent memorandum prepared by one of the two able Secretaries of the recent Telephone Finance Committee.

APPENDICES TO THE ANNUAL REPORT OF THE POSTMASTER-GENERAL.

For many years past the Postmaster-General has published in his Annual Reports tabular statements showing in a summary form a much more extensive view of the financial transactions of the Post Office than is shown in the Finance Accounts of the United Kingdom. I do not wish to suggest that these tabular statements were anything more than a modest attempt to improve on the Finance Accounts of the United Kingdom.

Then I would refer to

THE OLD COMMERCIAL ACCOUNTS, 1902-1907.

For the Telephone Service, which is in the most need of a proper account, the first attempt at preparing a Commercial Account was the account relating to the London Telephone Service from March 1, 1902, to March 31, 1903, which was published as Appendix O to the Postmaster-General's Annual Report for 1903.

The account showed an income of	£29,443
and an expenditure (excluding renewals) of ...	23,278
leaving "balance available towards meeting depreciation, interest, &c."	£6,165

Three footnotes gave three alternative ways of calculating depreciation and interest, viz. :—

(1) Depreciation, *i.e.* $\frac{\text{cost of plant}}{\text{years' of life}}$ plus interest on (gross) capital expenditure	£60,870
(2) Terminable annuities under the Telegraph Act, 1899	82,178
(3) Annuity to repay capital with interest at 3 per cent., during the life of the plant	56,784

It was explained that the annuities (under the Telegraph Act) provide for the repayment of the capital in twelve to fifteen years, while the estimated life of the plant, which then consisted largely of underground plant, averaged 36 years.

In 1904 a Capital Account was added, and in 1905 similar accounts for the other component parts of the Post Office Telephone system, viz., Provincial Exchanges and Trunk lines, were given.

A much more serious attempt was suggested by

THE COMMITTEE ON TELEGRAPH AND TELEPHONE ACCOUNTS, 1907-9.

In 1907 the Postmaster-General, in fulfilment of a promise which he had made to the House of Commons that the Telegraph and Telephone Accounts

should be put before the House in a more clear and lucid way, appointed a Committee on Telegraph and Telephone Accounts, whose report was presented to Parliament in 1909 (Cd. paper 4520).

The Committee recommended a new Form of Account which was used both in the statement laid before Parliament with the Statutory Account, and in the Appendices to the Postmaster-General's reports from 1907-8 to 1911-12. In these accounts the balance from the Revenue Account was carried to a Net Revenue Account; this Net Revenue Account was then debited with the annuity paid to the National Debt Commissioners, and credited with the royalties received from licensees. In the specimen accounts for 1906-7 prepared by the Committee (Appendix D to their report) a surplus balance resulted and was shown as "Balance unappropriated included in the amount of Revenue paid into the Exchequer." There was also a surplus balance (of £37,119) in 1911-12; but in the years 1907-8 to 1910-11 inclusive there was a deficit on the Net Revenue Account, the item being described as "Balance being repayment of Principal of Loans to March 31, 1911, in excess of the Net Revenue available for the purpose." This deficit was carried forward from year to year. The new accounts differed from accounts previously published in making no allowance for depreciation (on the ground that prior to the Telephone Arbitration it was not desirable to formulate an estimate of the life of the plant); on the other hand the Revenue Account bore the charge for expenditure on all renewals of plant as well as the charge for repayment of the loans raised within the comparatively short period of the annuities (twelve to twenty years).

Further changes were suggested by

THE ENGINEERING ACCOUNTS COMMITTEE, 1910-12.

This Committee was appointed to consider the allocation of the cost of spare wires and several other more or less technical and special questions, but certain recommendations made in its report have an important general bearing.

(i) The Committee pointed out that "owing to (i) the absence of an allowance for depreciation, and of machinery for writing off displaced plant, and (ii) the close connexion between the telegraph and telephone services, there is now no guarantee of correspondence between Capital (plant) Assets and Capital Liabilities," and recommended that the valuation of Post Office Telegraph and Telephone plant as new on March 31, 1908, which was being made by the then Engineer-in-Chief, should be used for the purpose of setting up Plant Accounts in the Commercial Accounts of both Telegraphs and Telephones for the year 1912-13. This valuation was completed in July, 1913.

(ii) The Committee recommended that, in view of the impending completion of the Telephone Arbitration and of the Engineer-in-Chief's valuation of Post Office plant, a Depreciation Account should now be set up. The following paragraph is important enough to quote verbatim :—

"Section 20. As regards the future we recommend that the "plant assets should stand in the books at current prices as new, "accrued depreciation being shown in a Depreciation Account. "A rate of depreciation should be calculated on the basis of the "cost and the average working life of the several classes of telegraph "and telephone plant. This amount should be charged against "revenue year by year and carried to a Depreciation Account, "and to that account all renewals would be charged in the Commer- "cial Accounts. In the Commercial Accounts the balance to credit "of the Depreciation Account should appear as a deduction from the "value of the plant as new, *i.e.* not as a liability, but as a reduction "in the value of the asset. As regards the Telephone Accounts, "the annuity paid to the National Debt Commissioners would be "disregarded, except that in a footnote to the Commercial Accounts "a comparative statement should be given of the expenditure shown "therein, and the actual payment to the National Debt "Commissioners as shown in the Appropriation Account."

(iii) The Committee recommend that a rent should be charged against the Telegraph and Telephone Services in respect of all buildings occupied (whether provided from Loan or from Votes) calculated as a percentage on prime cost to cover interest and depreciation. It followed that the value of buildings provided from Loans should be deducted from Capital Liabilities (Sections 24 and 25).

The Committee reported in December 1911; but it was not possible *to prepare the Commercial Accounts for 1911-12 on the new basis, owing* to lack of time. Moreover, the Telephone Award was not given till January 1913, and the Engineer-in-Chief's Valuation was not complete till July 1913.

The Committee under whose supervision the new Commercial Accounts were prepared is the

TELEPHONE FINANCE COMMITTEE 1913.

This Committee was appointed in July 1913 as a preliminary step towards the revision of telephone rates of subscription promised by the Postmaster-General as the result of the transfer to the State of the National Telephone Company's system. Its terms of reference were :—"To ascertain and consider the financial results of the working by the State of the Telephone system of the country and to advise the Postmaster-General what surplus, if any, might be available for an alteration of the existing rates."

The problem to be considered by the Committee may be stated as follows :—What alterations, if any, were required in the "Commercial Accounts" of the Telephone system in order that these accounts might be sufficiently reliable for the purposes of framing a tariff? In order to realise the nature of this problem it is necessary to examine the nature of these accounts somewhat fully and especially to point out to what a large extent they are based on hypotheses, differing in this respect both from Appropriation Accounts, which represent concrete cash facts, and from the accounts of an ordinary business, which may be expected to show a definite profit or loss.*

In the first place, the Telephone Service is not a self-contained unit; it is administered as an integral part of the Post Office and, though revenue can be earmarked, much expenditure can only be apportioned between Postal, Telegraph and Telephone Services on a percentage basis by way of estimate. The necessary percentages are revised annually by the "Common Service Apportionment Committee," on which the Treasury is represented. *In addition to this there is the further complication that, to a large extent,* Telegraph and Telephone plant (*e.g.* wires, cables and poles) is interchangeable and frequently interchanged, and is also sometimes jointly used.

Moreover, it is only since 1904-5 that Telephone Revenue has been separately accounted for; whether the Telephone system had by then accumulated a surplus or a deficit must remain a matter of conjecture, and when the "old" Commercial Account was started in 1906-7 it began with an opening balance of *nil*. (See Appendix D to Report of the Committee of 1909, Cd. paper 4500.)

The accounts showed a surplus of £37,119 on March 31, 1912 (H. of C. paper 378 of 1912-13, p. 11). But before this figure can be accepted as telling the whole story of Telephone Finance during these years, it is necessary to consider whether adequate allowance was made in these accounts for certain items peculiarly difficult, in the special circumstances of the case, to assess, viz. :—(i) Depreciation and interest. (ii) Rent. (iii) Pensions. Incidentally *it may be noticed that the above balance is only obtained by crediting* to the State's Telephone system the proceeds of the royalties paid by the licensees including the National Telephone Company). The justifiability of this might clearly be questioned; it was recommended by the Committee of 1909 on the ground that the royalties were "derived from business which, but for the grant of the licence, would have come into the hands of the Post Office."

Among the most difficult points considered by the Telephone Finance Committee was the question of

DEPRECIATION AND INTEREST.

It is convenient to consider these two items together, since both are concerned with the Capital Account. The great difficulty in reaching a satisfactory settlement of the questions involved is the result of the peculiar way in which Telephone capital expenditure is financed. Since 1892 the money required has, under successive statutes, been borrowed by the Treasury from the National Debt Commissioners, and repaid by means of terminable annuities charged on the Post Office Vote which are calculated so as to repay the sums borrowed with interest in a prescribed period. Both the period of repayment and the rate of interest have varied. The period of the annuities from 1893 to 1901 was twenty years from the date of the first annuity (in 1893), *i.e.*, it gradually decreased from twenty to twelve years. From 1901 a uniform *period of fifteen years has generally been adopted. The rate of interest is* fixed in accordance with the rates at which the National Debt Commissioners can borrow; it was 3 per cent. from 1893 to 1911 (except during the years 1896-7, when it was $2\frac{3}{4}$ per cent.), and since 1911 it has been raised to $3\frac{1}{2}$ per cent.

In the previous Commercial Accounts the annuities paid each year were debited to the Revenue Accounts before the net balance was stated. This method of providing for the payment of interest on capital and for the repayment of capital within a term of years had the two great merits of simplicity and correspondence with the transactions recorded in the Appropriation Account. It could, however, only claim to be correct on the suppositions that (*a*) the *period* of the annuities coincided with the life of the plant, and (*b*) the *amount* borrowed from the National Debt Commissioners accurately represented the Capital Liability of the undertaking. It was accordingly necessary to consider how far these suppositions were in accordance with the facts.

In 1909, when the "old" Commercial Accounts were devised, it was obviously inadvisable to give an authoritative estimate of the life of the plant in view of the impending Telephone Arbitration. But when the matter came to be considered by the Telephone Finance Committee, the situation had been radically changed by (i) the promulgation of the Arbitration Award in January 1913 and (ii) the completion of the valuation of Telephone capital plant by the Engineer-in-Chief of the Post Office in July 1913.

The Engineer-in-Chief estimated the equated average life of Post Office plant was about twenty years. Accordingly the period of repayment hitherto allowed (fifteen years) was considerably too short and the charge to revenue accordingly had been unduly heavy.

It was suggested that the difficulty might be solved by the extension of the period of the annuities so as to coincide with the estimated life of the plant; but this would have made it necessary to alter the arrangements made with the National Debt Commissioners on the occasion of every revision of the estimates of the plant's life. Accordingly, in order to secure a more elastic system, it was decided to write-off the value of the plant (exclusive of its residual value) in equal annual instalments during the currency of its

*Note.—It should, however, be remembered that the accounts of a business firm contain many hypothetical elements, *e.g.*, the value of investments, the proper rate of depreciation, the proper amount of reserve and the proper allocation of expenditure between branches. Ultimately, however, the business firm conducted on unsound lines will become insolvent, while a State undertaking is subject to no such definite criterion.

life, since these payments could easily be recalculated, if it was considered desirable to diminish the period of repayment.

After this brief history of the evolution of Commercial Accounts of the Post Office Telephone Service I now turn to the new Commercial Accounts which are designed to meet the following needs :—

(1) To apportion its gross expenditure of 26¼ millions between the three main branches of business, Postal, Telegraph and Telephone.
(2) To deal on commercial lines with its capital expenditure past and current. This includes the compilation of a Land and Buildings Capital and Revenue Account.
(3) To set up a formal Depreciation Account to provide for the renewal of expired plant.
(4) *Incidentally, the opportunity is being taken to assess the real* liability incurred by the State in the matter of pensions and other non-effective payments.
(5) To show in the case of Telephones what rate of dividend is earned year by year.

I propose now to show briefly how, under each of these five heads, the items of expense are dealt with in the new Commercial Accounts.

1. The apportionment of the gross expenditure of 26¼ millions between the three main branches of business—Postal, Telegraph and Telephone—is now effected annually on bases laid down by the Common Service Apportionment Committee. On this Committee my deputy and myself are assisted by a representative from the Treasury, and the composition of the Committee was framed by a former Secretary to the Post Office with a view to avoid having on the Committee anyone specially devoted to one of the three Services mentioned—in other words that the Committee should deal with these large sums of money concerned without favour or prejudice.

Some of the heads under which the Post Office expenditure is shown in the Parliamentary estimate do not concern the Common Service Apportionment Committee, because they are clearly proper to one of the three Services, but a very large sum is left amounting to about 18½ millions which has to be apportioned between the Services mentioned.

The primary basis for the apportionment of common service expenditure is the value or cost of the time devoted to each of the three Services, and in the grand result, combining common service expenditure with direct service expenditure, the following percentages are arrived at :—

Postal	59.94 per cent.
Telegraphs	15.05 ,,
Telephones	25.01 ,,

In this calculation the cost of the Post Office Savings Bank is ignored as the Savings Bank is financed by the Post Office Savings Bank Fund, and does not affect the Post Office Vote.

The expenditure incurred on behalf of the Post Office by the Office of Works, Great Britain, and by the Board of Public Works, Ireland, in connexion with the erection and maintenance of buildings belonging to the Postmaster-General is also apportioned by this Committee, together with the expenditure incurred by the Stationery Office in supplying us with paper, books and records. Thus the new Commercial Account includes the whole expenditure incurred by or on behalf of the Post Office whether the sums are included in the Post Office estimates, in the estimates of other Departments or are chargeable on the Consolidated Fund, as in the case of the interest on the Consols created in the 'seventies for Telegraph purposes.

2. The treatment in the new Commercial Accounts of past and current capital expenditure involved very serious trouble.

To begin with, following the recommendation of the Engineering Accounts Committee of 1910-12, we have eliminated from these new Commercial Accounts all capital expenditure in respect of land and buildings belonging to the Postmaster-General, and have substituted therefor a rental charge calculated to cover the interest on the original capital cost of the land and buildings, and also the loss by depreciation of the buildings. We are not quite at the end of our difficulties in connexion with this Land and Buildings Account, but with the assistance of Sir William Peat we hope to have this account on a sound basis before the Statutory Telegraph and Telephone Account for 1913-14 is laid before Parliament in February next.

It may be of interest to members of this society to know that the unexpired capital value of Post Office land and buildings on April 1, 1913, was in round figures 12¾ millions, that the annual depreciation of the buildings &c. was about £100,000 a year, and that the rental charged in the new Commercial Accounts in respect of owned premises was as follows :—

Postal	£278,000
Telegraphs	119,000
Telephone	114,000
Total	£511,000

In addition, annual rentals for rented premises amount to £317,000, the charges being apportioned according to the accommodation used respectively by the three Services.

There are some cases in which the land is held under a lease whilst the building has been erected at the cost of the Government, and affect therefore both the amounts just mentioned, *e.g.* King Edward's Building erected at the cost of the Office of Works' Vote whilst the land itself is held under a perpetual lease from Christ's Hospital.

Having thus eliminated the land and buildings capital expenditure, we then took the valuation of the Telegraph and Telephone plant completed by the Engineer-in-Chief last year. This valuation was then compared with the recorded capital expenditure ; in the case of Telephones the difference between the recorded capital expenditure and the value of the plant as new was not very serious ; it amounted to £653,000, part of which is no doubt due to crossings between Telegraphs and Telephones, and to different processes followed in the course of years in dealing with displaced plant. After making due allowance for accrued depreciation it resulted that on April 1, 1912, we started with a capital liability of 22 millions ; this figure includes plant purchased from the National Telephone Company, at the price fixed by the Court, and this is the figure chargeable with interest in the net revenue account of the Telephone Service in the year 1912-13. On March 31, 1914, the total capital liability of the Telephone Service was about 24¾ millions.

In the case of Telegraphs, the balance sheet as on March 31, 1912, showed, as was to be expected, a huge loss of about 21¾ millions. This loss has been duly reported to Parliament and has not been carried forward as a debit *to the undertaking since April 1, 1912. The account for 1912-13 opened with* the certified value of plant and stores in the hands of the Postmaster-General on that date, but in spite of this cleaning of the slate the current Telegraph Revenue Account shows a loss in the year of over a million pounds.

The meeting may perhaps be interested to know how the interest on these Telegraph and Telephone capital sums is calculated. In the case of Telephones the Revenue Account is first charged with the interest portion of the annuity paid to the National Debt Commissioners ; it is then charged with interest on the excess of the value of the plant over the recorded amount of loans not yet repaid to the National Debt Commissioners. On March 31, 1912, the excess of the liabilities amounted to about 3¼ millions, and on this 3¼ millions the Telephone undertaking is charged with interest at the rate current in the year for Treasury Bills.

There is one other item which has to be allowed for in the interest calculation, the Exchequer Bonds issued in connexion with the purchase of the National Telephone Company's plant carry interest of only 3 per cent., and until Jan. 1, 1930, the Telephone undertaking is to be charged with interest at 3 per cent. only on that portion of the purchase money which was paid in Exchequer Bonds.

On the other hand the undertaking is credited with interest on the amount of advance subscriptions held by the Exchequer ; in the result the charge for interest to the undertaking in the current year amounts to about £680,000.

The payment of interest on the liability to the Exchequer in excess of loans at the rate fixed for Exchequer Bills may require revision in a time of war like the present, but this is a matter which will have to be considered when we are preparing the account for the year 1914-15.

In the case of Telegraphs, although we may be said to have passed through the Bankruptcy Court when we wrote off our loss of 21¾ millions, it was considered proper to charge Telegraphs with the interest actually payable on the capital stock created in respect of the money raised for the purchase of Telegraphs in the early 'seventies. It is a question whether when we reduced our capital from an uncertain amount of many millions to the 5 millions (depreciated value) on March 31, 1912, we should not also have substituted interest on the capital value as new for the actual interest on the stock, but on the whole it was considered that as the State does pay a sum of £271,691 in respect of the interest on the stock, that that amount was the proper sum to be charged to Telegraphs in the new Commercial Account.

3. The setting up of a Depreciation Account is a striking feature in the new Commercial Account. Depreciation is reckoned on the "straight line" basis, allowance being made for the scrap value of the plant.

The Depreciation Account is also charged with the cost of all renewals in the year and with the cost of displaced plant. The credit balance of the Depreciation Account represents the estimated amount available in the *case of Telephones for the repayment of capital. If this credit balance* exceeds the amount of capital repaid in the form of annuities to the National Debt Commissioners, the liability to the Exchequer in excess of loans outstanding is reduced accordingly, and conversely if the credit balance of the Depreciation Account is less than the annual payment made to the National Debt Commissioners, the liability to the Exchequer is increased accordingly. This complication does not arise in the cost of Telegraphs because there is no possibility of repaying any Telegraph capital ; as mentioned previously there is a huge loss incurred every year.

This treatment of the balance of the Depreciation Account has the same effect as the payment of the money into a special fund : the alternative of maintaining a *pro forma* reserve fund was rejected by the Committee as being an unnecessary complication.

4. As regards the pension liability very considerable difficulties were met with, and we are not yet sure that the estimates made are on a safe basis. The whole question is extremely difficult and has now been referred to an Actuary of eminence who will, it is hoped, report to the Postmaster-General in the course of a few months. It is however abundantly clear that the actual pension payments charged to the vote in a year do not nearly represent the liability which is being incurred by the State in respect of such pensions.

In the case of the Postal Service the pension payments are about £700,000 ; *the liabilities are estimated at* £1,170,000.
In the case of Telegraphs the representative figures are, payments £184,000, liabilities £290,000.
In the case of Telephones the payments are £69,000 ; and the pension liabilities £385,000.

For the three Services together the pension payments are £952,000, whilst the pension liabilities are estimated at £1,800,000.

Members of this society may perhaps like to know that, whereas many commercial firms try to run a modest pension scheme on the basis of a 2½ per cent. contribution by the staff plus 2½ per cent. contribution by the company, it is believed that the cost of the Government pension scheme will be as much as 12½ per cent. for women and 15 per cent. for men throughout the period of active service.

RESULTING BALANCE.

The new Commercial Accounts prepared on these lines for the years 1912-13 show a surplus balance of over £300,000, the whole of which must be credited to the Exchange Service—the Trunk Service is not at present remunerative owing to the large amount of capital which has to be expended before revenue can be earned. This balance of £300,000 is described as "Net Revenue contribution to the Exchequer in the year." This description was adopted in view of the fact that it is not intended to carry forward the balance from year to year. To do so would be undesirable inasmuch as, if the Telephone undertaking continues to make even a small percentage of profit, a fund of several millions of "balance" would soon appear to have accumulated, which would lead to claims for the reduction of rates, though, in fact, no such fund would be in existence, as the net profits of the Telephone system would have been spent from year to year as part of the ordinary revenue of the State. It was also considered desirable to avoid showing an accumulative deficiency in the case of Telegraphs, since the annual deficit on the Telegraph undertaking is over £1,000,000.

There are two further questions which might be asked with regard to this balance:—(*a*) How far is it normal? and (*b*) how does it compare with the results obtained under the National Telephone Company?

(*a*) *Abnormal Items.*—In the course of the Telephone Finance Committee's discussions, allusion was made to several factors which might be regarded as making 1912-13 an abnormal year. The chief of these was the fact that the year was not affected by the concessions granted to the Staff under the report of the Select Committee of the House of Commons presided over by Mr. Holt; it was estimated that these will increase the expenditure of future years by about £136,000. Also, the personal maxima reserved to certain of the transferred staff, and the probable increase in the average "service age" of telephonists (now only five years) were mentioned as likely to increase expenditure in the near future. On the other hand, the year 1912-13 contains some non-recurrent items, especially that of preliminary expenses in connexion with the purchase of the National Telephone Company's system (£91,517).

The Committee mentions in its report that the year 1912-13 is unaffected by the Holt revision. It was felt that no reference need be made to other abnormal items, since there are liable to be some such items in any year, *i.e.*, the class of "abnormal items" is itself normal.

To compare Post Office results with those of the National Telephone Company, it is necessary first to add the net sum charged as interest in the Post Office Accounts to the net revenue contribution to the Exchequer of £300,000, which results in a dividend of 4.85 per cent. on the capital. The Company paid on an average just over 5 per cent., but there are very important differences to be accounted for.

1. The Post Office does not have to pay a royalty of 10 per cent. on its gross receipts.
2. The Post Office is exempt in many cases from the payment of wayleaves.

On the other hand

3. The Post Office has to pay higher wages to large numbers of the staff, and
4. The Post Office is incurring a very heavy liability in respect of the pensions, &c., allowed on the Superannuation and other Acts of Parliament.

It seems to me that if the Telephone undertaking can continue to pay about 5 per cent. on its capital, both the Exchequer and the Telephone subscriber may be content, provided always the service rendered to the public is satisfactory.

CORRESPONDENCE.

PUBLIC SERVICE.

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

I have read with interest, no doubt in conjunction with many others, Mr. Hare's paper on "A Public Service," and it is with further interest I note his views are that the public confidence must be gained. In obtaining this object there is no section more involved than the Contract, the members of which are in daily touch with a criticising and capricious public, and if confidence is to be fought for and gained, the present armour of long delays in supplying the commodity (pardon, Mr. Editor, the commercial term), and the non-use of businesslike methods to a business public, will not capture the citadel of "public confidence."

I also read that the one man who achieves distinction by initiative is most worthy, but then, how many in the Service could not but conscientiously admit that even wise initiative is and must be "nipped i' the bud," making way for that stereotyped docility which is the death knell of individuality.

D. WALLACE, Contract Manager.

Brighton, Nov. 6, 1914.

[The long delays in completing installations were inseparable from the shortness of plant in all districts at the time of the transfer.—ED., "T. & T. J."]

STANDARD EXPRESSIONS FOR TELEPHONISTS.

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

I beg to point out, through the medium of THE TELEGRAPH AND TELEPHONE JOURNAL, what appears to me to be unnecessary restriction regarding certain expressions that are mentioned as being forbidden on Card T, No. 194 (Telephones)—Expressions for Local Telephonists.

To quote a specific case. An operator when establishing a call made by a caller from a call office or automatic box, must have the called subscriber waiting before she asks the caller for the fee, which necessitates the use of two pairs of cords. After the fee has been obtained and the two subscribers are connected on the one pair of cords, it often happens that each will wait for the other to speak. Now the operator who is waiting in circuit to hear the conversation commence, knows both subscribers are waiting, but is not allowed to say "Call out," or "You're through," or to use a *similar expression* which would of course introduce the subscribers to each other. What is the operator to do? Is she to allow the called subscriber to go away and occasion the delay of ringing a second time, or to ring in the subscriber's ear and so induce him to speak?

The expression "Are you there" is also necessary at times. I admit such expressions as "I say, don't ring like that," "Hello," and "Finished," do sound bad, and ought not to be used.

Also with reference to Standard Expressions 15 (*d. e.*) and 27. In the former case an extra burden is placed on the operator by the expression rendering it necessary for her to ascertain particulars of the required number, which necessitates remembering, or writing down, the name and address of the firm required, and after ascertaining the number from the monitor, ringing the subscriber to advise him of it—meanwhile occasioning unnecessary delay. In the latter case, "Two (three) pennies please, one at a time." Before the operator has had time to say "one at a time," the caller has placed the money in the box. It is surely obvious to the caller that he can only place in one at a time.

Trusting these lines will meet the eyes of someone who experiences the same difficulty, as they have been written with the idea of saving the operator and improving the Service.

M. A. DAVIS, (School Teacher).

Birmingham, Nov. 7.

LONDON TELEPHONE SERVICE NOTES.

THE London County Council were recently—if they are not even now—engaged upon the difficult task of selecting a suitable motto to emblazon on the County Arms. An evening paper which called for suggestions finally awarded a prize for the alliterative phrase "Let London Lead." County councils are slow-moving bodies, and it may well be that years will elapse before a final decision is come to on a point so vital to the wellbeing of the community. In the meantime, the London Telephone Service has adopted this motto as its own. Should any express surprise at this information, it will only be necessary to remind such an one that "actions speak louder than words," and that in Telephone activities "*London leads*"—Long lead London! The latest evidence in support of this assertion is the fact that the London Telephone Service took about 25 per cent. of the whole of the first number of this JOURNAL; the London telephonists alone subscribed for 20 per cent. of the issue.

Everything is at the moment dominated by "War," which overtook us with the suddenness and force of a whirlwind at the beginning of August. It seemed then as if this horror must be a dream from which we should shortly awaken, but weeks lengthen into months and the actualities of the supreme struggle are borne in upon us with unmistakeable force. The Post Office has released over 28,000 of its male staff in order that they may take an active part in protecting all that Britain holds dear. The London Telephone Service has not been behind in answering to the call for fighting men, and has alas already to mourn the loss of some who will never again "resume duty." We are justly proud of these men, and probably every one of us desires that adequate provision shall be made for their wives and little ones. The *Post Office Relief Fund* which seeks to secure that end has received generous support throughout the London Telephone Service, but it is essential if the fund is to meet the demands which are likely to be made upon it that yet greater sacrifice should be made by those who cannot bear the heat and burden of the actual fighting. This conflict is waged for the honour of us all, and if for one reason or another we cannot render personal service in the field, we can at least secure peace of mind for the warrior by creating a fund which will, in any event, secure for his dependents the necessities for a healthful life. If any reader of these lines is not already a contributor to the Post Office Relief Fund, will they please at once take steps to advise their official chief that they wish to make regular subscriptions thereto. Let your subscription be as large as you can possibly afford—not the least with which you can salve your conscience—*Let London lead.*

We are once more in the throes of Telephone Society Meetings. Apart from smaller bodies, there are three prominent societies meeting each month during the winter and covering a very wide range of telephone interests. The Institute of Post Office Electrical Engineers, whose doings are fully reported in their own excellent journal, have already held two meetings. At that on Oct. 19 they discussed a paper on the "Ethics of Supervision," read by Mr. A. S. Renshaw, whilst at the November gathering they had presented to them two short papers on different aspects of "Engineering Accounts." It is commonly reported that there is a favourite riddle frequently propounded in Departmental Engineering circles. It runs "When is an engineer not an engineer." The answer is of course, "When he is an accountant."

The other Service society holding its meetings at the Institute of Electrical Engineers is the Post Office Telephone and Telegraph Society of London—known by way of contraction as the "Potato" Society. This body, under the presidency of Mr. Newlands, opened its session with a paper by Mr. Eustace Hare. The paper was entitled "A Public Service," and lengthy extracts therefrom appeared in the last issue of this JOURNAL. As everyone who has

read the paper will know, it afforded abundant evidence that its author is given to deep reflection, and greatly is it to be regretted that the audience was not numerically stronger. Several members took part in the discussion which followed the reading of the paper, but all the Chairman's charm of manner failed to secure from any of the ladies present an expression of their views. It is to be hoped that the later meetings will be attended by numbers more in consonance with the merits and interest of the papers.

The last of the three larger societies is that devoted more particularly to the interests of the exchange staff and known as the "London Telephonists' Society." This society's opening meeting was held in the Sunday School Union Building on Oct. 13, with Mr. J. F. Edmonds, the London Superintendent of Traffic, in the chair. Mr. Horace Dive, the President, read an address on the "Elocutionist in the Exchange." An abridged version will be found on another page of this issue. The attendance which was well over 400 constituted a record for the society, but this record was easily beaten on Nov. 10 when over 450 members attended to listen to or take part in two debates. The subjects discussed were :—(1) Whether or not it is possible to justify the present policy of recruiting the Trunk Exchange by selection from Local Exchanges, and (2) Whether or not the life and occupation of a Telephonist tends to fit her to assume the responsibilities of home life. In the first debate the leaders were Miss A. E. Cox, Chief Supervisor of the London Trunk Exchange, and Mr. Beck, Manager of the Museum Exchange. In the second passage of arms Miss A. N. Johnson, of Lee Green Exchange, found herself pitted against a *mere man*. "The world knows nothing of its greatest men," and the Telephonists' Society was as the world till such time as a mere man stood unmasked as the Exchange Manager of Dalston, the energetic Secretary of the society. In both debates the leaders acquitted themselves with skill and, as it is reported, not without marked traces of humour at times. A lively discussion followed in each case, and it was extremely pleasing to see the large number of Telephonists and Supervisors giving expression to their views in a manner at once so lucid and of great personal charm. It is clear that the members of the London Telephonists' Society count amongst their numbers a large body who would be justly entitled "Elocutionists from the Exchange," as well as "Elocutionists in the Exchange." The society which has now nearly 800 members (more than 30 per cent. in excess of all previous records) is still growing. The next meeting is on Dec. 8, when two papers will be read. Of these Mr. Maycock will be responsible for one on "Ideals." Mr. Maycock is an "Idealist," and he is also by official command and by personal taste a seeker after truth. Every member who can do so should make a point of being present to hear Mr. Maycock's paper, for

"To hear him speak, and sweetly smile,
You were in Paradise the while."

The members of this society hope to hold a Social Meeting during January. It is intended that the members should themselves undertake to provide all the refreshments and entertainments as well as the responsibility for the distribution of the former. It is hoped thus to spend a really delightful evening and at the same time secure a considerable sum to swell the Post Office Relief Fund. Fuller details will appear in this column next month.

Amongst the smaller bodies the Croydon District Telephonists' Society takes a premier place. The first meeting of the present session was held on Oct. 8, when the President, Mr. A. L. E. Berlyn, read an address on "Many Things—including the Lack of Initiative in Women." The title seems somewhat reminiscent of Lewis Carroll,

"The time has come, the Chairman said,
To talk of many things."

Miss Manning also read a paper on "The Different Scales of Pay for the Operating Staff in London." An animated debate followed each paper.

The second meeting was held on Nov. 5, Mr. Berlyn being in the chair. Miss Heap, Female Superintendent, gave an address entitled, "The Telephone Operator of the Past, Present, and Future," and Mr. Brown, Chief Inspector, read a paper on "Faults—Causes, Effects." Both proved very interesting and instructive, and were thoroughly appreciated by the 80 members present.

In order to spread the interest, the next meeting on Dec. 3 will be held at the Sutton Exchange, when Miss Pyne, Supervisor, Purley Exchange, will discourse on "Imagination." The winner of the competition for telephonists under two years' service will also read the prize paper.

The society is in a flourishing condition, and has an attractive programme. Membership is open to the whole of the Post Office staff. The subscription is 6*d*., and intending members should communicate with the Secretary, Miss A. E. Carpenter, Croydon Exchange.

The debates which follow the reading of papers at the meetings of these Societies, show that we number among the many subscribers of this JOURNAL officers who have ideas and ideals, and who doubtless also hunger after knowledge. We shall, therefore, be glad if any of these officers will submit articles on subjects of interest to the Operating Staff, or suggest subjects which would prove interesting. Any correspondence of this nature should be forwarded to the Managing Editor.

ANOTHER CLAIMANT.

"While I was in the *Thunderer* (1876-7) I made one of the first working models of the telephone used in this country and had the honour of presenting it to H.R.H. the Princess of Wales. The invention was first exhibited before the British Association by Mr. W. H. Preece on Aug. 23, 1877, and it was shown to Queen Victoria at Osborne on Jan. 15, 1878. The Telephone Company was established during the same year."—*The Memoirs of Admiral Lord Charles Beresford.*

PERSONALIA.

NEWS OF THE TRAFFIC STAFF.

Promotions— LONDON.

Miss M. F. BUTLER promoted to be Supervisor, Holborn Exchange.

Miss K. E. WINTERHALDER promoted to be Assistant Supervisor, Class II at Hampstead Exchange.

Miss F. S. VINE promoted to be Assistant Supervisor, Class II, City Exchange.

Miss D. M. ROWLAND, Miss L. G. M. FOX, Miss A. N. HART, Miss G. DIXON, Miss A. J. SKILLEM promoted to be Assistant Supervisors, Class II, Trunk Exchange.

Miss E. A. COWLEY promoted to be Assistant Supervisor, Class II North Exchange.

Transfers—

Miss E. NURSE, Supervisor, from City to London Wall.

Miss K. BUTCHER, Supervisor, from London Wall to City.

Miss M. MCCALLUM, Supervisor, from Central to Gerrard.

Miss B. NEWMAN, Supervisor, from Holborn to Central.

Miss A. BUCKWELL, Assistant Supervisor, Class I, from Battersea to Kensington.

Marriages—

Miss J. E. HARRIS (Hampstead Exchange), who has resigned on account of her approaching marriage, was presented with a dinner service and cut glass salad bowl.

Miss M. E. FABIAN, Western Exchange, was presented with cutlery and numerous other presents.

Miss H. A. I. FORD, Putney Exchange, was presented with a tea service and other useful presents.

Miss W. A. FLYNN, Putney Exchange, was presented with a dinner service and other nice presents.

Miss K. ILSLEY, Trunk Exchange, was presented with cutlery.

Promotions— PROVINCIAL.

Mr. R. H. DAVID, Exchange Manager, Liverpool Central, to be Assistant Traffic Superintendent, Class I, Liverpool.

Mr. F. C. BURSTALL, Exchange Manager, Liverpool Royal, to be Assistant Traffic Superintendent, Class I, Liverpool.

Mr. H. A. HINCKS, Exchange Manager, Liverpool Bootle, to be Assistant Traffic Superintendent, Class I, Dundee.

Mr. T. W. WICKHAM, Exchange Manager, Liverpool Liscard, to be Assistant Traffic Superintendent, Class I, Southampton.

Mr. W. H. KYNASTON, Night Exchange Manager, Liverpool, to be Assistant Traffic Superintendent, Class II, Liverpool.

Mr. J. MOYES, Service Inspector, Liverpool, to be Assistant Traffic Superintendent, Class II, Liverpool.

Mr. S. N. AICKIN, Exchange Manager in training, Liverpool, to be Assistant Traffic Superintendent, Class II, Manchester.

Mr. H. B. CARROLL, Male Clerical Assistant, Liverpool Traffic, to be Assistant Traffic Superintendent, Class II, Liverpool.

Mr. S. J. SWINNERTON, Sorting Clerk and Telegraphist, Liverpool, to be Assistant Traffic Superintendent, Class II, Liverpool.

Mr. W. L. EVELEIGH, Exchange Manager in training, Bristol, to be Assistant Traffic Superintendent, Class II, Liverpool.

Mr. F. S. MCGRAW, Exchange Manager in training, Leeds, to be Assistant Traffic Superintendent, Class II, Liverpool.

Miss A. LARGE, Clerk-in-Charge (Ex. N. T. Co.), Waterloo, Liverpool, to be Assistant Supervisor, Class II, Anfield, Liverpool.

Miss E. M. HALL, Supervising Telephonist, Garston, Liverpool, to be Assistant Travelling Supervisor, Liverpool.

Miss A. E. WHITE, Telephonist, Trunk Exchange, Liverpool, to be Assistant Supervisor, Class II, Trunk Exchange, Liverpool.

Miss A. E. WALKER, Telephonist, Central Liverpool, to be Supervising Telephonist, Garston, Liverpool.

Resignation—

Miss E. A. THOMPSON, Assistant Supervisor, Class II, Central Exchange, Swansea, has resigned to take up missionary work in Central Africa.

PRESENTATION FOR LIFE-SAVING.

An interesting ceremony took place in the large room of the Contract Department, Glasgow, on Oct. 8, when Mr. J. T. Hutchison of the Contract Staff of the Glasgow Telephone Service was presented with the Royal Humane Society's parchment for life-saving. Mr. E. Williamson, District Manager, made the presentation and in the course of his remarks referred to Mr. Hutchison's gallantry, and congratulated him on being fortunate enough to render assistance to a fellow-being. Mr. Hutchison suitably replied.

The rescue was effected during the holiday season in July, when a gentleman, residing in Ballantrae, on the Ayrshire Coast, while bathing was carried out to sea by the back-wash, and was in imminent danger of drowning. His cries attracted the attention of Mr. Hutchison who had, a little while previously, been bathing in the vicinity, and he at once went to his assistance. The drowning man was unable to swim, and owing to the heavy back-wash Mr. Hutchison experienced great difficulty in bringing him ashore.

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CONTENTS.

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STANDARDISATION OF CONTRACT DEPARTMENTS.

BY J. R. BROWN (*Contract Manager, Glasgow*).

THE purchase of the National Telephone Company's business by the State raised, among other questions, the continuance of Contract Departments in so far as these were maintained for canvassing purposes. It was quite realised that canvassing and advertising were not usually resorted to by Government Departments, and rumour not infrequently reached us that such methods would sooner or later be discontinued.

Since the inauguration of the telephone business in this country, and in some if not all foreign countries, its development has been promoted by a steady canvass, a persistent education and moderate though spasmodic advertising. Our State Department no doubt realizing both the need and the advantages of these methods has maintained and perhaps slightly increased the canvassing methods and has also done some little advertising since its purchase of the National Company's undertaking. Whatever foundation there was therefore for the report circulated by the "lying jade," there is no evidence in the speeches at different times by successive Postmasters-General or in the actions of those in authority at Headquarters that there will be any slackening of the "commercial spirit" or that the ambition of contract men will not be realised, *i.e.*, that every person down to the man of even moderate means should be the happy possessor of a telephone service.

To attain this end, something more is needed than the general impression that in certain walks in life and in certain businesses a telephone service has its advantages.

It is freely admitted that some articles in the market sell themselves, so to speak, their use and their advantages being obvious, but it is contended that even these articles become more widely known and consequently sell better by the adoption of commercial methods. Telephone service does not sell itself. To the great bulk of people the advantages of the service have to be explained, its various uses detailed, and this process of education has to be continued and the advantages reiterated from week to week and from month to month. The Department has evidently realised this, at least to some extent, and is prepared to continue this process of education; and it might be suggested here that it would be money well spent if such remuneration were given as would lift the contract officer out of the rut of the common canvasser and thus secure the best possible class of man to represent the Department.

Serious consideration has lately been given by Headquarters to standardising methods, forms, and returns throughout the country with the view of making Contract Department work more efficient. The danger is, however, that "standardisation" of letters and standardisation of methods are liable to rob the individual office and individual officer of their initiative and resourcefulness, and make them become mere pieces of human mechanism to carry on their work, hedged round on every side by forms and instructions.

It is in no spirit of insubordination or of captious criticism that the writer finds himself at variance with some of the findings of the Committee on contract working. It is hoped that the Committee whose decisions we are loyally endeavouring to carry out will be quite prepared to hear the views of any one imbued with the desire, as the Committee itself was, to get the best out of contract work.

Take first the numerous forms. One is prepared for nearly every aspect of Contract Department correspondence. It is assumed that the contract branches throughout the kingdom are in charge of men who know their business and whose very training has made them alert, resourceful, and suave, also that they are able to dictate a letter according to the needs of the case. Now in this respect, I think we Contract Managers are being spoon fed. We have been supplied with printed forms of letters, as I have said, for almost every conceivable case; all we have to do is to fill in details. Printed forms in my opinion are too formal and too cold.

Take for instance, Notice to Cease form D.M. 4, and here let me say that it is thought there is no more important branch of contract work than that of retaining existing subscribers. Well, when a subscriber sends in his notice to cease, which may have been prompted by a trivial affair such as a supposed overcharge in calls, by his not being able to get some number he called for, or it may be by some misfortune, financial or otherwise, he gets in response our printed acceptance form, soulless, cold, official. As a result no desire exists in that subscriber's mind to meet us; but if instead, after ascertaining the cause for his notice to cease, we send him a letter (which he can look at as a personal thing) accepting his notice and at the same time telling him that we are sorry he has decided to dispense with the service and that we hope he will see his way to withdraw his notice to cease, we have made a point in our favour. If he is in financial difficulties, and in consequence wishes to cut down his expenditure by giving up the service, we could in our letter acknowledging his notice, hope that things

would so improve before the due date that there will be no necessity for his ceasing the service, and say that an officer could call before taking the line away. This personal letter reaches the subscriber just when he needs it, and he is our friend.

Take again form D.M. (c) 1 acknowledging receipt of notice to cease and asking payment. This is a small form and I quote it in full.

> .....
>
> I have to inform you that your letter of the..... is accepted as formal notice to terminate your agreement for a.....between.....and.....on the.....
>
> As the rental is paid only to the....., I am to ask that you will be so good as to forward to this office the sum of £....., being rental for the period from the.....to the.....inclusive.
>
> I am, ...,

In this case notice is accepted with perfect indifference, and in the same breath the subscriber is asked to pay up. "All right" we say, "We'll take the telephone away, hand us over the charges." Leaving the question of the cold acceptance out of count—and it is cold enough—the demand for payment by a printed circular loses its point, because so many printed circulars are received nowadays that they are often unread, whereas a nicely worded typewritten letter showing the subscriber that we wanted to continue doing business with him would be more effective even in getting payment.

Very few business firms, if they get a letter from a client intimating his desire to close his account, would write back "All right, send on what you owe."

It is admitted that some of the forms are all right, but many of them look as if Contract Managers had to be led by the hand and could not be trusted to walk alone, and it need be no surprise if this "standardisation" of forms produces in the future a feeble and stunted race of contract men. It reminds one of the case of a man who, having a leg broken, was visited by a clergyman. He took out his prayer book and turned over page after page (we don't read prayers in Scotland, we pray) but not finding a prayer to fit in with a broken leg, the clergyman said, "I'm sorry, my friend, I have no prayer for you." One of these days some Contract Manager will be giving as his excuse for not answering somebody's letter that he had no form to suit the case.

Space does not permit me to deal with the other printed forms; the Standardised Note Book would need an article for itself. My contention is that a letter, while it may cost a little more, would have the personal touch and would in the long run be more effective.

We come now to another and perhaps to the original idea of Contract Departments; that is: getting new business, and in this too we are up against laws written and unwritten.

We have heard much lately about close formation of soldiers in the field, of iron discipline and its defects—the regulations which deprive men of their initiative and individuality. In much the same way, Contract Departments all over the country are in close formation and Contract Managers are kept on the straight path by regulations and rulings depriving them of their discretion in taking the best out of the material they have and insisting in some cases in putting round men in square holes at no matter what cost to efficiency.

In every walk of life there are to be found men more suitable for one thing than another, men who can grasp big things and men who cannot, men whose very boldness carries conviction and men of a temperament so timid and pessimistic that no matter how they try they never rise above commonplace things. The contract staff is no exception to the general rule, and I think I am safe in saying that in every Contract Department throughout the country it will be found that some officers are more capable in one class of work than another, and that in every department there is at least one strong and capable man for every branch. This being recognised, is there any reason why advantage should not be taken of a man's special abilities to get the most out of him by keeping him as far as possible on the work for which he is most suited and at which he has been most successful? To that question we get the answer, "in the interests of standardisation that would not do." But to standardise standardisation, you would have to face the impossible task of making all telephone areas alike. Glasgow, for instance, so compact that every contract officer may be on his district within twenty minutes of his leaving the office, has the same standard, so far as working is concerned, as the area where the canvassing districts are scores of miles apart.

One can see the force of asking a contract officer, no matter what his special abilities are, to work a scattered district or a district some distance from his office, overtaking removals, cessations, enquiries, new business, private branch exchanges, and every other phase of contract work. It might be foolish to have any other arrangement, but why should that standard be stringently applied to an area which is compact and thickly populated and where there is another officer better adapted and more capable to deal with one or other of these matters. There is no reason that I can see outside the desire to standardise, with the exception of the bogey of "overlapping" which in very few instances would happen. A case comes to my mind just now of a contract officer who had a remarkable genius for obtaining single line orders; he could pick them up in most unlikely places, and for years his working expenses to revenue secured was the lowest in the office, yet send that man to somebody's place to work up a private branch exchange or to straighten out a complicated system, and he was lost. No amount of explaining, drilling, or teaching could get that officer to rise above a £5 or £10 order, yet for pushing his way among small users he was like the Highlandman's wife—"more than passable." On the other hand, some officers by their sense of the needs of the people and their natural optimistic disposition are always contemplating great things; they think large, they talk large, and they always push matters to the utmost limit of extension. This class of man is by nature a teacher and a leader, and he will pull off private branch exchange orders while the other man referred to would be dreaming over them.

In an ordinary business firm what would be done with a man of the go-ahead stamp referred to? He would get encouragement and he would be put in the position for which training and nature had adapted him, and in a position that would make his services most remunerative to his employers. It is thought that an officer of this type may be found in every large Contract Department whose special abilities could be used with advantage to the department, and that he should have the run of the whole area doing the higher artistic work which the district officer has been unable to accomplish. I see nothing to prevent a specialised man of that stamp taking smaller districts one by one and giving the Contract Managers the benefit of his abilities and experience to extend private branch exchange installations. In this connexion it has to be borne in mind that, in negotiating a private branch exchange, the principals as a rule deal with the matter, and the services of a capable man with good address are essential. Many a good order has been delayed or lost by a bad first interview. The special man builds on his experience, has at his finger ends the systems of other subscribers, and is able in a single interview to give as much information as is required and to tell the subscriber on the spot what other firms of their standing have and what they themselves require.

I am sorry to refer to cessations again, but its importance impels me. I am of opinion that in a compact area and where cessations are heavy, as in Glasgow, with approximately 400 per month, the best, most experienced, and suavest man in the office should be deputed to deal with these. He should show the figures every month of the number dealt with and the number he prevailed on to continue, and he should be encouraged to show increased percentages of retentions month by month. This would keep the ordinary contract officer at his post, devoting his time to what he may be best suited for—obtaining orders—and it would also be an impetus to a cessation officer to show good results.

In brief my contention is that, as the Contract Department is the business end of the Telephone system, greater latitude should be allowed to large centres, not only in their internal arrangements, but in dealing with the public. Contract Managers are all asked to play the same tune in unison and contract officers are asked to keep step not only with each other, in their own district, but with

all other districts, no matter how differently placed. Power might be given the District Manager to decide many minor questions that have now to be referred to Head Office and the power to waive charges "up to a limit of say 10s." in certain cases of hardship might also be vested in the District Office. It is these little matters which sometimes cause delay and friction, and their removal would give the District Office a more businesslike tone and tend materially to harmony between the department and the public. It has to be recognised that large districts are mostly composed of business people who are accustomed to doing things and settling things quickly, and a certain amount of come and go is a necessity for giving our office a businesslike reputation.

A District Manager, or for that part of it a Contract Manager, in these large districts has, it is thought, sufficient experience and discretion to prevent his "coming" or "going" too far, or taking advantage of his power to give an unwarranted concession, and if each concession were reported it would not weaken Head Office control. If this authority could not be given all over the land, and if differentiation were necessary, the method of the conductor of the Highland coach might form a basis in the matter. This man made no difference in the accommodation for first, second, and third-class passengers, although charging different fares, but when his horses came to a hill he shouted :—

"1st Class passengers sit still."
"2nd Class passengers get oot and walk."
"3rd Class passengers get oot and push."

In the same way all may be classed as District or Contract Managers, but in the matter of authority on minor matters it might, owing to greater experience and local needs, be said to

1st Class Districts use your discretion and act.
2nd Class Districts use your diplomacy and shelve.
3rd Class Districts use your instructions and wait.

PICTURE TELEGRAPHY.

FROM time to time attempts are made to discover a system of transmitting pictures by telegraph which will be simple in construction, swift in operation and capable of being worked over considerable distances by means of the ordinary telegraph and telephone wires. If those conditions are not fulfilled, the system cannot be regarded as commercially sound. We are, I fear, still a long way from the magic mirror which, according to a contemporary, would enable one to see the features of one's telephonic correspondent.

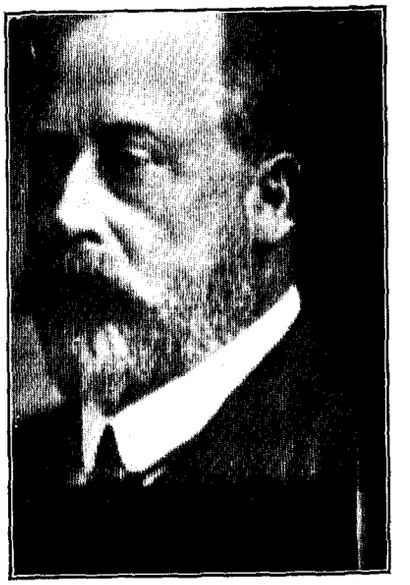
The first apparatus of the kind to attract much public attention was that brought to this country by Professor Korn in 1907. A photograph of King Edward VII was successfully transmitted by this system over the London-Paris telephone circuits in November of that year, and a print of the photograph as received is reproduced in Fig. 1. The following is a description of the apparatus :—

The picture at the transmitting end was on a film which was wrapped round a glass cylinder in which was a lamp throwing a ray of light through the semi-transparent film. This cylinder rotated with a spiral upward movement with the result that each part of the film was exposed to the light in rapid succession. The light, after passing through the film, was received by a selenium plate which formed part of the electrical circuit. The changing amount of light on this plate, due to the light and dark parts of the film, gave rise to corresponding pulsations in the electrical current on the line. At the receiving end there was a dark box with a small triangular hole at the bottom behind which a roll of sensitised paper rotated in the same way and at the same rate as the film in the transmitting apparatus. A larger or smaller quantity of light was admitted to this box by a very sensitive galvanometer, the oscillations of which were caused by the electrical pulsations on the line.

The difficulty about this apparatus was that its speed depended on the activity with which the conductivity of selenium responded to more or less light ; and as the response was not instantaneous the rate of transmission was strictly limited. The reception of Fig. 1 took twelve minutes. This slowness of transmission is probably the reason why the "Korn" system has not come into general use.

The Thorne-Baker Telectograph was introduced to the Post Office in 1912 and has been used experimentally as late as May last.

The apparatus consists essentially of two metallic drums revolving in synchronism at the sending and receiving stations. A metal pointer traces a path spirally over the surface of each drum in such a way that each pointer is in a similar position at the same time. If the pointer is in contact with the metallic drum, a current is sent to line. At the receiving end a chemically prepared paper, slightly damp to ensure good conduction, is wound on the drum, and this paper changes colour when an electric current passes through it. If at the sending end, a sketch is drawn in insulating ink over the surface of the metallic drum, the pointer ceases to make an electrical contact each time it passes over the insulating line of the sketch, and an outline of the sketch in negative appears at the receiving end. If a negative be used at the sending end, a positive is reproduced at the receiving end. If, however, the apparatus at the receiving end is so arranged that a mark is made electrically when no current is passing over the circuit and the current received over the line neutralises the marking current, then a positive print can be obtained from a positive picture at the transmitting end, and *vice versa*.



The actual method of sending photographs is as follows :—The photograph is pinned on to a board, and fixed vertically in the copying apparatus, and a "half-tone" screen is fixed between the photograph and the sensitive plate on which the negative is to be taken. The half-tone screen consists of glass ruled into lines—so many to the inch—30 to 35 for coarse work, and 120 and upwards for fine work. The screen has the effect of splitting up the photo. into a number of fine lines varying in width according to the density of the photo. A print is prepared from this half-tone negative by printing with an arc light on a sheet of thick lead foil covered with a thin coating of fish glue, rendered sensitive to light by means of a soluble bichromate. When printed, it is held under a tap and all the unexposed parts dissolved away (*i.e.*, the parts between the lines). The print is next dried, and put into a press between plates. This causes the glue image to sink into the soft lead foil, and a smooth surface is obtained which the pointer can readily traverse. The lead foil with the photograph image is now placed upon the sending cylinder in such a manner that the pointer moves *across* the lines. It is a negative in this case, and as the pointer passes over the lines alternate dots and spaces are sent to line, and these come out in the form of a positive or a negative at the receiving end according to the type of apparatus there.

WITH THE EXPEDITIONARY FORCE.

By LIEUT. A. A. JAYNE, R.E.

No. II.

MILITARY Telegraph offices or "Signal" offices, both as regards the apparatus and the class of traffic dealt with, differ in many respects from those of the Home Service. The "Signal" office at General Headquarters has to keep in communication with all the forces acting in the field, and the responsibility for anticipating and meeting the requirements from the fighting line to G.H.Q. rests with the Director of Signals, Brigadier-General Fowler, R.E., and Lt.-Colonel Godfrey-Faussett, R.E. Consequently the movements of the troops along the entire Front, the best routes possible for communication purposes, and the material available have to be matters of constant and skilful study by the Directors. Obviously the rapid exchange of tactical messages between the various Army Corps and Divisions as well as with General Headquarters is a matter of the utmost importance and a very heavy responsibility. Formerly the service of intercommunication in our Army was carried out by the following branches working more or less separately :—

(*a*) Telegraphy and Telephony, by the Royal Engineers.
(*b*) Visual signalling, by regimental and battalion signallers.
(*c*) Orderlies.
(*d*) Postal Service.

The first three branches have now been combined into what is now called the "Army Signal Service." The Army Postal Service remains a separate organisation, but it works in co-operation with the Army Signal Service.

The Army Signal Service units are made up as follows :—

A signal squadron for the Cavalry Division.
Signal troops for Cavalry and Mounted Brigades.
Signal companies for Divisions.
Air line, cable, and wireless companies.

The signal squadron carries out intercommunication between Cavalry Divisional Headquarters and Cavalry Brigades. It also keeps in touch with General Headquarters by wireless telegraphy.

Signal troops carry out intercommunication within Brigades, with Cavalry Divisions or General Headquarters, as may be necessary.

Signal companies with Divisions are intended for intercommunication.

Air line, cable, and wireless companies carry out intercommunication between General or Army Headquarters and lines of communication.

The whole of the Army Signal Service is administered by the Director of Army Signals who has a representative in the Deputy Director of Army Signals, Major Turner, R.E., at the Headquarters of the Inspector-General of Communications.

As far as possible the existing Telegraphic and Telephonic systems are utilised, but the supplementary construction and maintenance carried out by the Royal Engineers is on quite an extensive scale and is growing rapidly.

General Headquarters were connected with the advanced bases by permanent lines borrowed from the French Government, but additional "Royal Engineer" lines have since been erected and are at present being utilised. On such lines Wheatstone automatic apparatus is in use. On the forward lines, *i.e.*, those connecting Headquarters with the various Armies, ordinary double-current sounder duplex is in use. From General Headquarters to Cavalry Divisions aerial lines are used for a portion of the way and for the remainder cable. At present the Cavalry Corps is connected by cable to an intermediate transmitting centre and vibrators are in use. Wireless also connects the Cavalry Corps with Headquarters. Cable and despatch riders connect the Divisions with their respective Corps Headquarters.

The following points may be of interest in connexion with the various methods used for intercommunication.

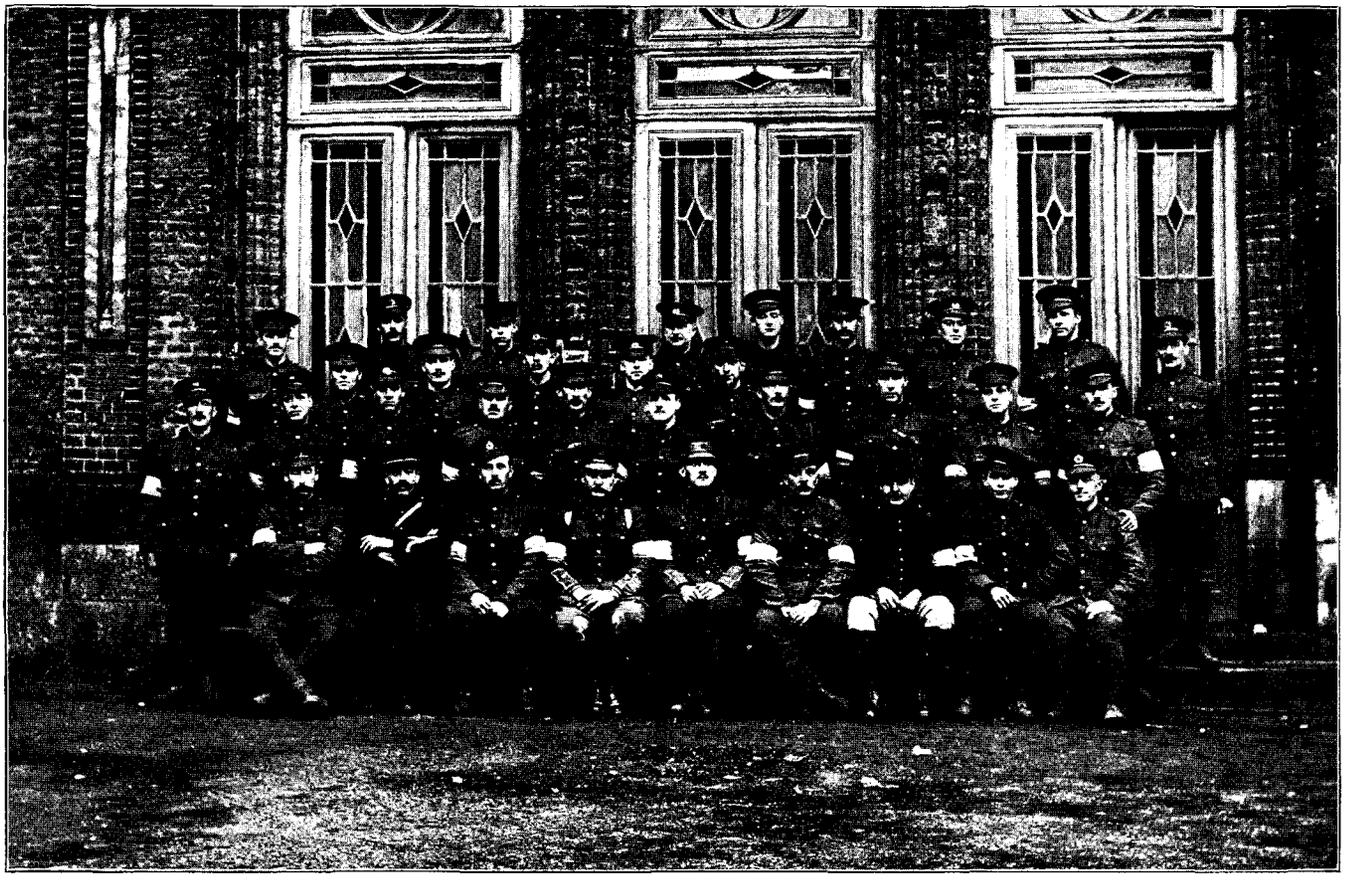
Air Line.—Field air line can be erected at the rate of about five miles a day by a small detachment of non-commissioned officers and men.

Field Cable.—An insulated wire can be laid on the ground at the rate of about four miles an hour.

The arrangements and organisation of the Military Telegraph rooms in war time are not so rough-and-ready as many people would imagine. That everything in use is designed for the purposes of dismantling and setting up again at a moment's notice is true, but order prevails throughout. Improvements in apparatus, in devices in the instrument rooms, and in the working are being made almost daily. The double-current Wheatstone duplex sets are now being placed on a baseboard, so that when the time arrives for moving the apparatus can be carried away *en bloc*, and as the internal wiring is fixed it will be only a matter of a few minutes to join up at the new office. Similar arrangements are made in regard to the other apparatus. Formerly the test boards, known as commutators, were connected and simply placed on a table. These are now fixed to baseboards.

Upon arrival in this little town I found General Headquarters located in a large college. The telegraphs occupy quite a large room and conditions are fairly comfortable. When the number of chairs proves to be insufficient, boxes are used. No sounder screens are to be found, and again boxes, used for packing instrument sets, are brought into action for keeping contiguous sounders at a respectful distance. The staff come on duty in full marching order, and while at work room has to be found for neatly stowing rifles and equipment away. It is difficult to recognise telegraphists during war time, for when they parade for duty they look as good and as keen soldiers as one would wish to meet. They are drawn from T.S., the London Postal District, and from Provincial Offices, and while excellent soldiers they are no less expert telegraphists. They take their business seriously and their ready response to all calls made upon them reflects credit on both Services. When business is brisk in the firing lines the wires leading to them are correspondingly busy. It is of course highly important that tactical messages and operation orders should be expeditiously dealt with. The messages are hurried through by the "check," *i.e.*, the collector, conveyed at once to the delivery point and thence delivered within a minute or two to the Commander-in-Chief's Office. There are no slack periods, for as soon as the "business" houses are closed in the Field, the offices at the various bases commence work. Then lengthy indent messages on ordnance and other supplies begin to come in and Wheatstone working is resorted to. Pressure continues up to 5 a.m., when there is a slight lull for a short time. Then first one and then another circuit "wakes up," and that is the sign that the activities for the day "farther up" have commenced. Outside in the street all through the night one hears the rumble of mechanical transports and horse-drawn supply wagons, while the impatient throb of motor cars and motor cycles indicate the speed with which things have to be done in modern wars as compared with old. The grey dawn finds troops and transports still passing through, the former suspending for a time their familiar "Tipperary," no doubt out of consideration for the sleeping inhabitants and not because they are in any way "down-hearted." Later on in the day one meets a column of ambulance cars laden with some of the wounded from the Front. Occasionally there is the silent procession with a motionless body covered with a Union Jack on a gun-carriage. "God's acre" for soldiers who have died for their country is a triangular piece of land in the fork of two main roads, and there the flags of England, France, and Belgium, hoisted over the little mounds, bear eloquent witness to the "path of glory."

Fancy moving T.S. or any other large office within 24 hours' notice and without severing a communication! Yet this is what happened to the Central Telegraph Office of the British Army. It was decided that the college where we were located was inconvenient, and orders were received to move "farther up the street." The work of organising the move was carried out by Lt.-Col. Godfrey Faussett, and early one morning a certain number went ahead to "carry on" and the remainder followed. It was quite difficult to realise that one had not been in the new quarters all the time instead of five minutes. Moreover, the new office was complete



No. 3 RELIEF: SIGNAL SERVICE, GENERAL HEADQUARTERS, FRANCE.

with new incandescent gas-fittings in place of less modern illumination supplemented by candles. The new leads were run along the window-sills of houses &c. in quads. In the new premises we have one room for circuits to the Front, another for those to the rear, and a third for Wheatstone working. The counter and delivery also has a room for this work. The bustling in and out of orderlies with messages, and other noises incidental to a telegraph office staffed by men with very thick boots, do not disturb the slumbers of the despatch riders on the floor of one side of the delivery room. Well-earned rest is theirs, and while awaiting their turn they roll themselves up in a blanket and sleep.

Night has its excitements as well as day. An operator announces that he is losing "X——" and quite steadily is ticked out, "I say—we are being shelled and are——" The rest of the sentence is easily guessed, and that is the signal to rush any urgent work through to "X——" on another wire before they are lost completely. Soon, however, communication to that point stops altogether, but not for very long as a rule, for a telegraphist must send something telegraphic if it is only on a spoon at dinner. Presently we are called very stedfastly and the distant station must have got in from a pole outside the place receiving so much attention from the enemies' guns. Sometimes the engineering parties get too far ahead with their work and then communication ceases very abruptly! The Germans seem to have a rooted objection to anything which we have come to regard as necessary to civilised life. The bursting of shells in the vicinity of telegraph wires seems to have quite an adverse effect upon good construction and maintenance.

GUERNSEY STATES TELEPHONES.

THE statement of working of the Guernsey Telephone Department shows an increase of 92 subscribers' and other lines during 1913. At the end of last year the total number of lines was 2,141, of which 33 were public telephones. The mileage of metallic circuit wire was 1,446 overhead and 824 underground, without including 1,746 miles of leading in wire, &c. The total number of calls during 1913 was 1,366,433, an increase of 67,281 on last year.

A LETTER FROM THE FRONT.

THE following is an excerpt from a letter to his wife from Sapper W. P. Walker, Royal Engineers Special Reserve, Sorting Clerk and Telegraphist, Manchester, which we are permitted to publish :—

The next "landmark" I come to is our advance, and this, I may say at the outset, brought us to the Aisne. We arrived within half a mile of the river when a long halt was called, and we began to see the wounded (mostly French) coming by. Then the word was passed along the line: "German prisoners coming—don't pass remarks," to be followed by 55 prisoners, who looked pretty much as our own troops, though these first were good specimens. Well, we crossed the river, but had to make a detour on the far side along the canal, as a bridge was blown up. The R.E.'s here did some splendid sapping work under heavy fire. We stayed the night at Bourg, and next morning we progressed about one and a half miles to meet with our first Company casualties. I was dumped at the side of the road, working to the advanced brigades for about two hours, when one of the "Jack Johnsons" pitched right amongst Headquarters at the rear, killing our quartermaster and a sapper. Next day I had the worst experience in my life. I was ordered to proceed alone to the First Guards Brigade, which meant trudging with all my kit about one mile through the heavily shelled village of Vendresse. What a journey it was! The Germans didn't half know how to play on that road, all "Jack Johnsons" and heavy shrapnel. As I walked along I was met by a lot of wounded whom I asked, "How is it you're running away," and they said they had orders, as the shells were bursting on their house. Halfway down the slope was a haystack which I ran for. I had not been waiting more than a minute when a shell caught two chaps right in front of me, running up the road. Poor beggars, one was killed outright, and the other was on his elbows trying to tell me something, but I could not wait, so gathering my things I ran again to a hedge lower down, and from there made the buildings all right; then from the village up to the caves, and I got through safely, to drag out an existence of cave life for five days, then run the gauntlet again to go in to Headquarters. Here I must pause to pay a tribute to the gallant O.C. I won't name him except to call him "M." Businesslike and methodical, he handled the officers in his command with such masterly ability that only such treatment could produce the results it did. You will understand that at that time we had only a thin line, and the attacks on it both from the heavy shrapnel and "Jack Johnsons" were absolutely murderous, and indeed I well remember one occasion in particular when it proved more than human nature could stand, and even the brave and heroic guards were compelled to give way. But the General, by skilful handling, was the means of their re-occupying their positions—and that, in such a kindly manner. It was a standing joke amongst the officers to call our cave

the "Funk hole," but the name was wide of the mark as applied to these men, who so nobly led attacks and counter attacks against such an implacable foe. You would be amazed could you pay a visit to this particular district. Why, I have seen the time when we have paid money to visit such caves as the "Blue John Mine"! but here there is a regular network of caves—Chivy, Paisy, Vendresse, &c.—which we visit mid shot and shell, all affording shelter and immunity for English, Zouaves, and Algerian troops (the latter looking very picturesque at Paisy). What an experience to look back on, to those who eventually pull through!

(We hope to publish next month other interesting letters from the Front which have been received too late for insertion in this issue.—ED., *T. & T.J.*)

LOWER TELEPHONE RATES FOR NEW YORK CITY.*

BY E. H. OUTERBRIDGE (*Chairman of the Committee on Public Utilities of the Merchants' Association of New York*).

IN 1905 complaints were made to the Merchants' Association by numbers of its members alleging that telephone charges were excessive. The association thereupon appointed a special committee to investigate the subject.

This committee gathered a large amount of data including the service rates for telephones in the principal cities of the United States. A great diversity was found to exist in these rates, as well as in the principles upon which they were based. The committee reached the conclusion that a comparison of rates without knowledge of the costs of operation and of the particular circumstances relating to the various localities would afford no sound basis for testing the equity of the rates in this city. The committee therefore entered upon negotiations directly with the telephone company, with the result that the company consented to give the committee's accountants access to its books and records for the purpose of learning the relation of the company's net earnings to the costs of operation and to the value of its property. The committee further stated that in its opinion the net earnings of the company (including dividends, provision for depreciation, and reserve for contingencies) should be limited to 10 per cent. upon the value of the property, and the company accepted this as a basis for a revision of its rates.

The committee's accountants made an examination of the company's books covering their operations during a period of sixteen years and found that the net earnings during that time had averaged between 11 and 12 per cent., but that during the year previous to that in which the examination was made the net earnings had been approximately 15 per cent. The company thereupon, acting in concert with the association's committee, prepared a new schedule of rates, adjusted, as near as practicable, to reduce their earnings to the stipulated 10 per cent. The aggregate amount of the reductions for the year 1906 was about 1,525,000 dols.

Although all the members of the committee were very large users of the telephone company's service at the lowest rate then prevailing, it was the opinion of the committee that the reductions then made should mainly apply for the benefit of small users, and the maximum rate was therefore reduced from 10 cents per message to 8 cents per message in the case of measured service, with a corresponding reduction in those local areas where flat rate service prevailed. It was the view of the committee that as low a rate as possible should be made for small users in order to stimulate the use of the telephones by the class who would otherwise be debarred by its cost. Beginning with the maximum stated the successive rates at the higher part of the scale were likewise graduated downward, but no reduction was made in the message rate charged the larger users, although a concession in the annual charges for extra equipment was allowed.

The rates as revised in 1906 were received with very general public approbation, as was also the method of reaching an agreement by negotiation rather than by hostile legal proceedings.

In 1907 the Public Service Commission's law was passed, whereby railroads, gas and electric companies were subjected to public regulation, but telephone companies were not included. Public sentiment in favour of subjecting telephone companies to regulation by the Public Service Commission rapidly developed, and also manifested itself by the introduction in the legislature of successive bills for arbitrarily fixing the rates which the New York Telephone Company might charge. The maximum rate usually specified in these bills was 5 cents per message. Although these measures received considerable support none of them became law, but they had the effect of crystallising the demand for public regulation of the telephone company's charges, and in 1910 the Public Service Commission's Act was amended to include the regulation of telephone companies.

For a year or two after the telephone company was subjected to the Public Service Commission's Act no proceedings of importance were brought against it, although public dissatisfaction with its system of toll charges was steadily growing. Owing to the large area covered by the City of New York and the adjacent districts, as well as to the topography and distribution of the population, the zone system had been put in operation by the company. Under this system subscribers were entitled to the use of telephone service at the regular message rate only within the zone within which they were respectively located, and an additional toll charge was exacted for communication with other zones.

The demand for a 5 cent maximum rate of service, co-extensive with the city, became frequent. The matter was first brought to the Public Service Commission in the form of a complaint against the toll charges for communication between Manhattan and Brooklyn. The zone system and the exaction of an excess charge for a communication between the different zones were sustained by the Public Service Commission as reasonable, but certain of the zones were enlarged and the amount of the charge between Manhattan and Brooklyn materially reduced.

Meanwhile bills regularly appeared in the legislature seeking to fix the maximum charge of 5 cents per message, abolishing the zone system, and making the service for a single charge co-extensive with the city. Such a bill in 1913 passed both houses of the legislature, but owing to a defect in its form was withdrawn when before the governor.

Immediately thereafter two proceedings against the telephone company were brought before the Public Service Commission, the first seriously to attack the company's schedule of rates. One of these bills proposed to reduce the maximum charge per message from 8 cents to 5 cents and to abolish the zone system. The other proposed to reduce greatly the annual charge for extension telephones. A great deal of publicity was given to these proceedings and numerous small civic associations were induced to give their approval to the movement.

The Merchants' Association was requested, among others, also to lend its support. A careful study of the scope of the pending proceedings was thereupon made, and it was found that, although sweeping reductions were demanded, the scope of the proceeding was in reality so limited as to deal very inadequately and unjustly with the situation. The reduction proposed would have affected only the small users of the telephone service who would have received a very large concession in rates, while large users would have received no benefit whatever. The latter class of users pay a message rate of 3 cents in addition to which they pay rental charges for extra equipment. Taking into consideration these rental charges, it was found that a subscriber having a 3 cent rate and using 4,800 messages would in reality pay 5¼ cents per message, while a subscriber using but 600 calls per year would pay but 5 cents. As a result of the charge proposed by the complaint, therefore, the large user would actually pay at a higher rate than the small user.

The association's committee further found that there were substantial differences in the conditions, and presumably in the cost of supplying service to the various classes of users, and that these differences in conditions and costs warranted a graduated scale of rates determined with relation to the varying costs.

The committee was further convinced that no readjustment of any part of the company's scale of charges could be intelligently made until the company's property had been appraised, the extent of that property applied to the service of various classes of users determined, and the cost of supplying each class of service fully developed. Instead, therefore, of supporting the pending pro-

* Reprinted from the *Annals of the American Academy of Political and Social Science.*

ceedings to which it found such serious objections, its committee took the matter up directly with the New York Telephone Company, with the purpose of establishing a basis for a more comprehensive proceeding, which should cause a complete revision of the company's scale of charges based upon the cost of supplying each class of service.

The committee deemed that the first step in such a proceeding would be a valuation of the company's property, both with reference to its aggregate and to the portions used by different classes of users. It was found that the Public Service Commission was without funds to undertake so large and extensive a task, and application was therefore made to the Interstate Commerce Commission, which body was about to begin, under an Act of Congress, an appraisal of the property of all public carriers. It was found, however, that the Interstate Commerce Commission could not at the time definitely state when it could undertake the proposed appraisal. The Public Service Commission of this State, moreover, was unwilling to assent to the proposal that the appraisal should be made by the Interstate Commerce Commission, and it was also unwilling to suspend the pending proceedings unless such an appraisal were provided for. In view of the fact that the legislature had made no appropriation for such expenses, and further, that hostile bills reducing the rate to 5 cents would certainly be pressed in the legislature, this association suggested to the New York Telephone Company that it voluntarily consent to an appraisal by the Public Service Commission, that it pay the expense thereof, and that, pending a general revision of its rates, it should make an allowance of 10 per cent. upon certain of its existing charges.

These suggestions were favourably received by the telephone company, were presented by them to the Public Service Commission and accepted by the latter. This result was brought about by the fixed determination of the association to see that any review and alteration of rates were based upon a proper scientific determination, and that all users might share, in proper proportion to the cost of their respective services, in any reduction of rates.

The effect of the association's attitude, therefore, was to supersede the pending proceedings to which the association objected, and to substitute therefor a broad and comprehensive proceeding which should determine rates upon a scientific basis with due regard to the rights of all classes of users, and with justice to the company itself.

The basis contended for by the association having been accepted by the Public Service Commission and the New York Telephone Company, the actual work of revision yet remains to be done. This will be undertaken by a staff of engineers and examiners selected by, and solely under the control of, the Public Service Commission, all of the expenses being paid by the telephone company.

An appraisal of the company's property will be made, the value of the property applying to the use of any particular class of patrons will be determined, and operating and overhead charges will likewise be ascertained and distributed *pro rata* to each class of users. By this procedure the costs of each class of service will be fully developed and rates can be made, on the basis of such costs, that will be fairly proportioned thereto.

Hitherto such a distribution of costs and charges has been impracticable, and it has necessarily followed that the Commission has been unable to exercise its rate-making power with a knowledge of the facts essential to just determination. A revision of rates on the basis proposed will undoubtedly result in a scale of charges which will be entirely equitable and satisfactory to the public.

DEATH OF MR. CRABB.

WE deeply regret to record that Mr. E. Crabb, C.B., late Second Secretary of the Post Office, died on Dec. 15. It is but a few months since Mr. Crabb retired, and it is said that like the late Sir Robert Hunter he should have enjoyed his well-earned retirement for so short a period.

PRESS-THE-BUTTON TELEGRAPHY.

BY DONALD MURRAY, M.A.

(*Continued from page* 57.)

III.

In the first article of this series I brought the history of the Murray automatic printing telegraph up to December 1902, when it was started on traffic between London and Edinburgh. The German Post Office decided to get a set of the apparatus in the same year. I also exhibited it in Paris in 1902, but the French Administration preferred the Baudot. It was a disappointment to me at the time, but I know now that the French officials were right. In 1903 the German Post Office ordered two complete installations of the Murray automatic system, and in succeeding years Germany installed the Murray automatic between Berlin and Hamburg, between Berlin and Frankfurt, and between Hamburg and Frankfurt, the last circuit being established at the end of 1909. Russia ordered an installation in 1905, and I went to Russia and assisted in establishing it between Petrograd and Moscow. It was afterwards put on the longer circuit from Petrograd to Kazan, and subsequently extended from Petrograd to Omsk in Siberia, working duplex over 2,200 miles of iron wire with three repeating stations. This was the first time that the Murray automatic was applied to a circuit for which it was really well suited—a very long aerial line. The reasons for this suitability I shall explain later on, and I shall only mention now that this Murray automatic circuit was established in April 1908 and it has been working ever since. In 1911 I received a letter from the Russian Telegraph Administration stating that the circuit was working duplex in an entirely satisfactory manner, the speed in each direction with the Murray automatic being 56 to 60 words a minute. This circuit was previously worked with the Wheatstone and the speed did not attain more than 30 words a minute, rarely 35, and under the very best conditions, and then only for very short periods of time, 40 words a minute. This means that the Murray automatic system nearly doubled the carrying capacity of this long line compared with Wheatstone. By agreement between the Russian and German Administrations the Murray automatic was also established between Berlin and Petrograd, a distance of about 1,000 miles. Russia is getting two more Murray automatic installations manufactured in Petrograd, probably for long Siberian lines. At the end of 1905 the Indian Administration ordered an installation of the Murray automatic system for Calcutta-Bombay, a distance of about 1,200 miles of copper wire, and it was running well on that circuit in June 1907. In 1909 I got news that the Calcutta-Bombay Murray automatic installation had been closed down, as the Baudot had proved superior to it under Indian conditions. There was not sufficient traffic to keep the Murray automatic fully employed, and a Baudot double, working simplex, carried all the traffic with less delay and at less expense. Austria dabbled with the Murray automatic system in a rather *dilettante* way. They started in 1907 with a small experimental set, and gradually increased this to a full installation working between Vienna and Prague. It worked well for a time, but as repairs began to be necessary the results grew poorer and the Murray automatic in Austria gradually faded away, and it was dismantled in 1912. In 1907 Sweden got an installation of the Murray automatic for Stockholm-Gothenberg, and it worked well; but the distance was short, about 300 miles, and the traffic small, owing to the extremely widespread use of the telephone. In 1911 I was informed that there was only work enough for the Murray automatic for four months in the year, from August to November, one Morse quadruplex being sufficient for the rest of the year. Sweden is the only country where I have found telephone competition affecting the telegraph so seriously as this; but there does not seem to be doubt that in other countries also much more telegraphic work will be done by telephone than at present, and the Morse key will be driven out of its usual haunts by the telephone and by various kinds of printing telegraphs. Norway got an installation of the Murray automatic for Kristiania-Bergen in 1908. In this case

there was plenty of traffic and the system has done well. I had an official letter from Norway last September stating that about 2,540 telegrams a day are forwarded on the Kristiania-Bergen circuit by the Murray automatic system.

In Great Britain the career of the Murray automatic was decidedly peripatetic. It gave fairly good service between London and Edinburgh for several years, the best record being 1,727 messages exchanged in seven and a half hours on one wire, or an average of 230 per hour. This was regarded as quite good, but it is miserably poor compared with what the Baudot and the Murray multiplex can do on a similar line (about 500 miles). The apparatus was improved and shifted from London-Edinburgh to London-Dublin in October 1906. It gave good service here also, and during a two-weeks' trial it averaged 35.7 messages per operator per hour as against 27.2 for the Wheatstone on the same circuit and under the same conditions. The Baudot quadruple simplex, between London and Paris, reduced to the same basis averaged 45.3 messages per operator per hour.

The London-Berlin circuits have always been a source of worry to the Administrations concerned, and experimental tests were made from time to time with the Murray automatic between London and Berlin. In March 1908, for instance, a speed of 84 words a minute each way between London and Berlin was obtained with the Murray automatic. The best result was 113 words a minute. Finally at the beginning of 1909 the Murray automatic was switched round from London-Dublin to one of the London-Berlin circuits for a practical working trial. The results were far from good, chiefly on account of the serious inductive trouble in the four-wire cables across the North Sea. There were also extraordinary delays in Berlin. It often took more than 20 minutes to get an RQ from Berlin. Also if the circuit had been worked by Germans at both ends of the line or by Englishmen at both ends of the line better results would have been secured. Finally, a Baudot double duplex was tried, and as long as only one wire in the cable was worked with the Baudot the results were good, but with an increasing number of wires in the cable working Baudot the results have correspondingly fallen off from 50 or 60 messages per channel per hour to the wretched figure of 18. By the time the trial of the Murray automatic between London and Berlin had closed, the apparatus was more or less out of date, and a new installation was ordered by the British Post Office, including specially constructed high-speed typewriters for the printers. This was originally intended for London-Dublin, but the peripatetic fate of the Murray automatic in Great Britain led to its installation between London and Leeds in 1912. One of the chief troubles with the Murray automatic system had been the weakness of the typewriter employed. It was a good machine for hand use, but when driven by power at a high speed it proved very frail. I then decided to make a special high-speed typewriter of my own. It was very strongly constructed and it did beautiful work at 200 words (1,200 letters) per minute, and I supplied a printer fitted with this high-speed typewriter to Germany. It was found, however, that the machine was not durable at this extreme rate (20 letters per second), and the printers for the Leeds installation were reduced in speed to 160 words (960 letters) per minute. Even this speed of sixteen letters per second was found, in spite of very careful construction, to be more than iron and steel could stand, and the unfortunate machines were frequently in the hospital. Proposals were made by Post Office officials to reduce the speed to a point at which printers would prove durable, probably about 120 words a minute. By this time, however, I had become convinced that for British distances the multiplex had overwhelming advantages over the automatic plan, and I recommended the conversion of the apparatus to multiplex. The installation was stopped in June 1913, ten years after the Murray automatic was started on the London-Edinburgh circuit, and in due course Leeds, like every other important centre in Great Britain, will be equipped with the multiplex. The best record of the Murray automatic Leeds-London circuit was 1,006 messages sent from Leeds to London in seven and a half hours on one wire. From London to Leeds the record was poor, as the Leeds printers were giving trouble. Assuming that 1,000 messages had been sent each way in the seven and a half hours, this would only have been 266 per hour. An eight channel multiplex such as that now working between New York and Boston will easily handle double this number of messages per hour on one wire. It may be mentioned that the best record with the Murray automatic in Germany was during the great storms in November 1909 when the Berlin-Hamburg Murray automatic circuit handled 5,700 messages in one day. I do not know how many hours were covered by this record.

In order to complete the history of the Murray automatic I may add that it was tried on the *Glasgow Herald* private wire from London to Glasgow in 1909. Excellent results were obtained, and a speed of no less than 184 words (1,104 letters) per minute from London to Glasgow was reached on the line. It was found possible to perforate the tape at the rate of 224 words (1,344 letters) per minute, or no less than 122 holes *per second* punched in Wheatstone tape successively by one punch. The speed of 184 words a minute, however, was the practical limit. Several columns of news were sent through at that rate and successfully printed in page form, but the *Glasgow Herald* wanted at least 240 words a minute and as they were not at that time prepared to lease two wires from the Government, nothing further was done in the matter.

This history of the Murray automatic illustrates very well the importance of fundamentals. As far back as 1903 I had begun to realise that there were fundamental disadvantages in automatic systems for countries like Great Britain, where the distances are short and the traffic heavy. I had spent twelve years and some thousands of pounds in developing the Murray automatic and it had met with very considerable success; but the fundamental disadvantages were there hammering away with their hard logic, and I was gradually and most reluctantly forced to admit that for all ordinary telegraph traffic the multiplex was superior to any possible automatic system. With the multiplex there was less delay on traffic and much greater saving of labour, and on lines of moderate length the traffic-carrying capacity was much higher. The one advantage of the automatic was in line-saving on very long lines.

Apart from the general advantages and disadvantages of multiplex systems, the history of the Murray automatic shows pretty conclusively that automatic systems cannot be worked satisfactorily at high speeds. The limit appears to be about 150 words a minute (900 letters). No typebar typewriter can be constructed at any reasonable cost to maintain even 150 words a minute for any length of time without requiring a good deal of mechanical attention. My high-speed typewriter worked nicely at 200 words (1,200 letters) a minute as long as it was watched all the time by a skilled mechanic; but even 160 words a minute proved too much for it under practical conditions. Creed also had to make a special typewriter for himself, a typebar machine, and according to published statements of the Creed company, the maximum speed is only 775 letters or 130 words a minute. It is true that with the Murray and the Creed automatic systems, as the signals are received first in the form of perforated tape at a high speed, the work of printing can be divided up amongst several printers. This, however, is not practical owing to the extra labour and delay. The multiplex under regular commercial conditions gives 180 words a minute printed direct, with no intervening perforated tape. The Murray automatic cannot approach that, and I do not know any automatic that can, except the unpractical Siemens' photoprinter. A continuously rotating type-wheel appears to offer better prospects of high speed than a typebar machine. In the case of a continuously rotating type-wheel there is far less strain on the mechanism. On the other hand immensely greater precision is required in the timing of the operations, so that it appears to be six of one and half a dozen of the other. For instance, in the Siemens' automatic system for a speed of 1,000 letters (166 words) a minute, the inventors of the system say that the letters on the type-wheel have to travel at the rate of $6\frac{1}{2}$ feet per second, and that consequently to secure clean printing the printing hammer must not remain in contact with the type for more than one ten-thousandth of a second. It is known of course that the contact of a hammer on an anvil is extremely brief, but the figures I have just quoted

speak for themselves in regard to the precision in timing operations required for high-speed type-wheel printing. The Siemens' photo-printer reached 300 words a minute quite satisfactorily, but the extreme precision required for timing operations was against it, to say nothing of the practical disadvantages connected with the use of photographic paper. It is obvious from these facts and figures that the printing speed of automatics is limited to an average of about 150 words a minute, and that even that speed involves strain or high precision. The obvious remedy is to divide up the work of printing amongst several direct printers as multiplex systems do. On the other hand on very long lines where the speed is of necessity low—60 to 100 words a minute—automatic systems are at no disadvantage so far as printing is concerned. Such speeds are well within their range.

The first warning I received on the subject of automatic *versus* multiplex was the rejection of the Murray automatic by the French Telegraph authorities in 1902. Practical experience in London also began to disclose the disadvantages of automatic systems for countries like Great Britain. The abandonment of the Murray automatic in favour of the Baudot by India in 1909 only confirmed what I had already begun to realise. The Austrian experience also was not reassuring. The long years of hesitation on the part of the British Post Office were likewise due to the same disappointment with automatic results that I had myself experienced. In Russia, too, the indications were plain to read. The Murray automatic was shifted successively from the comparatively short Moscow circuit of 500 miles to Kazan and finally to the Petrograd-Omsk circuit of 2,200 miles ; and during the same years the Baudot multiplex was extended in all directions until there are now about 80 sets of the Baudot in use in Russia. They are having two more installations of the Murray automatic made in Petrograd, but they are for long distance work. In the struggle for existence in Russia between the Wheatstone, the Murray automatic, and the Baudot multiplex, it is the Baudot that has come out victorious for all ordinary distances. My one remaining hope for the Murray automatic in England was that my high-speed typewriter would prove durable at 200 words per minute or even at 160. That would have greatly strengthened the position of the automatic, but experience on the Leeds circuit convinced me that a high-speed automatic though possible is not practical.

(*To be continued.*)

THE POSTMASTER-GENERAL'S REPORT, 1913-14.

THIS annual publication, which makes its appearance this year in foolscap form for the first time, contains some interesting statistics of the development of the Telegraph and Telephone Services. The extension of high speed telegraphy and of the underground cable systems is briefly reviewed, and detailed figures of telegraph and telephone traffic are, as usual, given. The estimated number of the trunk and local telephone calls originated during the year was 872,220,000. As each telephone call consists of at least a message and reply, this is equivalent to 1,744,440,000 messages If the number of telegrams passing over the P.O. wires, 87,089,000, be added, it will be seen that nearly 1,831,529,000 communications were effected between members of the public by means of the P.O. electrical wires, or more than one-half of the total number of letters delivered, viz., 3,477,800,000. During the year 108 new telegraph offices were opened, 184 telephone exchanges, and 1,905 call offices, over two-thirds of which were provided with full trunk line facilities. The extension of the telephone system we have dealt with in detail elsewhere, bringing the figures to the end of the current year. Automatic exchanges are being constructed at Newport (Mon.), Darlington, and Hereford—the two latter are in fact now working—and the construction of several others is about to be commenced. We hope to deal with this subject, however, more fully in our next issue.

THE GEOGRAPHICAL DISTRIBUTION OF THE TELEPHONE IN GREAT BRITAIN.—THE RESULTS OF THE LAST THREE YEARS.

BY W. H. GUNSTON.

THE progress of the geographical distribution of the telephone and the process by which it gradually reached towns and cities of varying importance in this country, will bear a somewhat close comparison with the process of development of that older means of communication, the railway. London, Lancashire, and the industrial districts of the North were in both cases first provided for, then the larger Southern seaports and seaside resorts took their turn. In the case of the railway, the North preceded the South, but otherwise there is a marked similarity in the lines of progress ; for, whilst we find that places of first importance are first served, places of second, third, and fourth importance are in both cases served in a fortuitous kind of order which is easily explicable. That is to say that unless a place is of sufficient economic importance to be served for its own sake, it will, in the early stages of development be entirely dependent on its proximity to a first rate place for its chances of obtaining service. For example, railways were opened from London to Birmingham, and London to Bristol. Rugby and Swindon, therefore, which lie on those routes obtained railway facilities long before Warwick and Salisbury, and villages such as Tring, Bletchley, Didcot, and many others were served before considerable country towns which lie off those routes. It was a smaller matter to throw off a short branch line to Aylesbury from the London and Birmingham, which thus enjoyed the benefits of the new mode of communication before there was any probability of its extension to much larger places such as Peterborough and Lincoln. In a similar manner the telephone systems in London, Lancashire, the West Riding, Glasgow, and elsewhere soon embraced all the important places and even rural villages within a wide radius of the great commercial centres, but the large country towns had long to wait for their telephone service, whilst the small towns in the non-industrial parts of the country are still engaging the attention of the Department, although the field becomes less fruitful with each succeeding year, as village after village is reached by the telephone. It is with the considerable progress which has been made during the last two or three years in covering rural England—and in a less degree Scotland and Ireland—that this article proposes to deal.

Telephone development therefore may be said to proceed in a series of widening circles which increase until they meet, and the whole country is covered by the areas which they include. Thus it was a more difficult achievement to open an exchange at Bedford, Cromer, Ilfracombe, Taunton, or Falmouth in the early 'nineties than to do so at Deeping St. Nicholas, Kingston Bagpuze, or Eaton Socon in 1913. In the former cases expensive trunk lines of 20, 30, or 40 miles had to be erected before any but a purely local service could be given, whilst in the latter cases a comparatively short junction line or an adapted telegraph circuit to the nearest large village placed the new exchange in communication with the trunk system of the whole country. On the other hand, as the service is gradually extended to the larger country villages the places which remain to be supplied tend to become small indeed. The task of the Post Office in meeting local demands is often arduous, and the conception of the local powers of what constitutes a reasonable amount of support for the maintenance of lines and other plant and for the provision of continuous service is vague in the extreme. Here, as elsewhere in the field of telephone criticism, false comparisons come largely into play, and applicants for telephone facilities often cannot see why if one village of 1,000 inhabitants has an exchange another of the same population cannot also have one, regardless of its geographical position, distance from an existing telephonic centre, and even of the fact that a smaller amount of financial support is forthcoming in their own case. However, the new exchange officers at Headquarters sift all such claims very thoroughly and, at the same time, sympathetically, as is evidenced

COUNTY.	EXCHANGES OPENED IN		
	1912.	1913.	1914.
England.			
Berks.	— —	Kingston Bagpuze, Boxford, Chieveley, Lambourn.	Woolhampton, Winkfield Row, Yattendon, Twyford Littlewick Green.
Beds.	Gt. Barford	Eaton Socon, Harrold	Kempston, Eaton Bray, Woburn.
Bucks.	— —	Colnbrook	Hambleden, Penn.
Cambs.	Gamlingay, Willingham, Haddenham	Harston, Prickwillow	Waterbeach, Caxton Benwick.
Cheshire ...	Chelford, Threapwood ...	Audlem	Tarvin, Kelsall, Poynton, Aldford.
Cornwall ...	Bude, Marazion	St. Germans	Mullion, St. Keverne.
Cumberland ...	— —	— — —	Aspatria.
Derby	Pleasley, Clay Cross ...	Chellaston, Pinxton, Chinley, S. Normanton	Sudbury, Ambergate Tibshelf, Cowers Lane (Derby), Shirebrook, Hathersage, Grindleford, Great Longstone, Ashover, Clown.
Devon	Plymstock	Holsworthy, Ashburton	Woolacombe, Princetown.
Dorset	— —	— — —	Beaminster.
Durham ...	— —	Fence Houses, Tantobie, Langley Park (Durham).	Burnopfield, Chopwell.
Essex	Bradwell - on - Sea, West Mersea.	Takeley, Newport	Laindon, Stanford-le-Hope, Nazeing, Ongar, Coxtie Green, Orsett, Potter Street (Harlow), Writtle, Thorpe Bay.
Gloucester ...	St. Briavels	Didmarton, Weston Birt, Coln St. Aldwyns	Uley, Bisley, North Cerney, Wickwar, Bromesberrow, Bibury, Poulton.
Hants.	*Beaulieu, Hamble*... ...	*North Farnborough, Bordon, Sutton Scotney*, Fawley, Hursley, Yateley.	*Holdenhurst, Overton, Preston Candover*, Ower, Eversley, Kingsclere, Droxford, Owslebury, Sparsholt, Durley, Yarmouth, I.W.
Hereford ...	Brimley, Eastnor	Bromyard	Leintwardine, Holme Lacey.
Herts.	Watton, Stanstead Abbotts	Bovingdon, Chipperfield, Garston, Little Wymondley.	Essendon, Hunton Bridge.
Hunts.	— —	Buckden	Warboys, Kimbolton.
Kent	Green Street (Sittingbourne)	Hoo, Eastchurch, Ide Hill.	Otham, Cobham, Hunton, Lenham, Kingsdown, Biddenden, Plaxtol.
Lancashire ...	Knowsley	Pemberton	Silverdale, Cotton Tree (Colne), Golborne, Whitworth, Milnrow.
Leicester ...	— —	Great Glen, Knipton	Market Bosworth, Markfield, Bottesford.
Lincolnshire ...	Keadby, Scampton ...	Branston, Scawby, Market Rasen, Caistor, Kirmington, Deeping St. Nicholas, Burgh, Kirton.	Metheringham, Owston Ferry, Elsham, Epworth, Haxey Crowle, Barnetby.
Middlesex ..	— —	— — —	Harefield.
Monmouth ..	— —	Bedwas	Llanvihangel- Gobion.
Norfolk	Holme (Hunstanton) ...	Horning	Heacham, Martham, St. Faiths, Ormesby, Potter Heigham, Acle, East Rudham, Wells, Great Ryburgh, Narborough, Upwell.
Northants ...	Hardingstone	Castor	East Haddon, West Haddon, Moulton, Cranford, Chapel Brampton, Dingley, Yardley Gobion.
Northumberland	Simonburn	Warkworth, Whalton, Hepscott	Bamburgh, Belford, Seahouses, Chathill, Rothbury, Belsay, Hartburn.
Notts.	Collingham	Misterton, Winthorpe	Ranskill, Woodborough, Stanton Hill, North Carlton, Lowdham.
Oxfordshire ...	— —	Nettlebed, Rotherfield Greys, Charlbury ...	Watlington, Checkendon, Boars Hill.
Rutland ...	Whissendine	— — —	— — —
Salop	Burwarton	Dawley	Bedstone, Bucknall, Adderley.
Somerset ...	Chewton Mendip, Coker ...	Cheddar, Axbridge, Wedmore, Nunney, Meare, Castle Carey.	Somerton, Martock, Langport, Milborne Port, Bruton, Whitchurch (Bristol).
Staffs.	*Streetley, Armitage, Kingswinford*, Brownhills ...	Kinver, Gnosall	Pelsall, Pattingham, Hales, Longsdon.
Suffolk	— —	Grundisburgh, Boxted, Blundestone ...	Holbrook, Kessingland, Pakefield.
Surrey	Knaphill	Chobham, Elstead, Frensham, Long Cross ...	Headley, Shalford, East Clandon, Ash Vale, Worplesdon, Dunfold.
Sussex	Chelwood Gate, Northiam, Goring, Rushington, Glynde, Lancing, Hampden Park.	Lavant, Findon, Singleton, Cooden Bay ...	West Ashling, Bosham, Rudgwick, Durrington, Framfield, Alfriston, Storrington, Warbleton.
Warwick ...	Mere Green, Barford, Studley, Tanworth in Arden, Polesworth.	Marton, Longford, Snitterfield, Pailton . .	Ettington, Walsgrave-on-Sowe.
Westmoreland	— —	Kirkby Stephen, Brough, Milnthorpe ...	Kirkby Thore.
Wilts.	Ramsbury	Hilmarton, Horningham, Sutton Verney, Kington Langley.	Mere, Tisbury, Amesbury, Downton, Bodenham, Shrewton, Cholderton, Seend, Maiden Bradley, Lacock, Seagry.
Worcester ...	Newnham Bridge, Eardiston, Tenbury, Wolverley	— — —	Suckley, Hartlebury.
Yorkshire ...	Cotherstone, Pickering, Stokesley, Hemsworth...	North Cave, Snaith, Hawes, Leyburn, Wensley, Brotton, Middleham, Bainbridge, Causeway Foot, Stamford Bridge, Helmsley, Helperby, Pateley Bridge, Thornton-le-Dale, Kirby Moorside.	Bentham, Leven, Askern, Adwick-le-Street, Barnby Dun, Tickhill, Kiveton, Maltby, Delph, Drighlington, Kettlewell, South Milford, Snainton, Coxwold, North Stainley, Hovingham.
Wales.			
Anglesey ...	— —	Llangefni	Llanfairpwll.
Carnarvon ...	— —	Chwilog	Penygroes, Talysarn.
Cardigan ...	— —	— — —	Borth.
Carmarthen ...	St. Clears, Whitland ...	— — —	— — —
Denbigh ...	Chirk	Llanddulas Quarries	Glan Conway, Old Colwyn.
Flint	— —	Rhudlan, Northop	Caergwle.
Glamorgan ...	Newton Llantwit	— — —	— — —
Merioneth ...	— —	— — —	Penryndeudraeth, Fairbourne.
Radnor	Knighton	— — —	— — —

COUNTY.	EXCHANGES OPENED IN		
	1912.	1913.	1914.
Scotland.			
Aberdeen ...	Kincardine O'Neill ...	— — —	Drumoak.
Argyll	Tighnabruaich	Campbelltown, Kilmun	Inverary, Ardrishaig, Tarbet, Lochgilphead.
Ayr	— —	Symington	Galston, Straiton.
Berwick ...	— —	Lauder	Chirnside, Athelstaneford, Leitholm.
Bute	— —	Millport.	— — —
Edinburgh ...	— —	— — —	Ratho, Balerno, Davidson's Mains.
Elgin	— —	— — —	Grantown-on-Spey, Burghead, Hopeman, Ballindalloch
Fife	— —	New Mills.	— — —
Forfar	Lintrathen	— — —	Friockheim, Bridge of Dun.
Haddington ...	— —	Gifford	Preston.
Kincardine ...	— —	Bervie.	— — —
Kirkcudbright ...	— —	— — —	New Galloway, Crocketford, Dalry.
Lanark	— —	— — —	Caldercruix, Stonehouse.
Peebles	— —	Kirkton Manor.	— — —
Perth	— —	Blackford, Dunning	Killiecrankie, Blair Athol, Kinrossie.
Renfrew ...	— —	Inchinnan.	— — —
Roxburgh ...	Nisbet	— — —	— — —
Ross	— —	— — —	Conon Bridge.
Stirling	— —	Drymen, Balfron, Killearn.	— — —
Wigtown ...	Newton Stewart	— — —	Portpatrick, Lochans.
Ireland.			
Antrim	Ahogillh.	— — —	Whitehead.
Carlow	— —	Carlow.	— — —
Cavan	— —	Cavan.	— — —
Cork	— —	— — —	Lombardstown.
Down	— —	Donaghadee, Dromore	Dundrum.
Dublin	Skerries, Clondalkin ...	Donabate	Portmarnock.
Fermanagh ...	— —	Killadees, Tempo	Springfield.
Galway	— —	— — —	Ballinasloe.
Kildare	— —	Athy.	— — —
Louth	— —	— — —	Ravensdale.
Meath	— —	— — —	Kells, Dunboyne.
Monaghan ...	Clones	— — —	Carrickmacross.
Queens Co. ...	Stradbally	— — —	— — —
Tipperary ...	— —	Thurles, Nenagh.	— — —
Waterford ...	— —	Dungarvan, Kilmacthomas.	— — —
Wexford ...	— —	— — —	Castlebridge.
Wicklow... ...	— —	— — —	Glendalough.

by the figures which follow. Nothing is left undone there or in the district concerned to convert a "proposed" exchange into an exchange in being, and no case is turned down until its possibilities have been considered in all their bearings.

Since the acquisition of the National Telephone Company's system by the State, great activity has been displayed in extending the network of rural exchanges. No county in England or Wales is now without the telephone service; in Scotland only Sutherland and the Orkney Islands are untouched (there is an exchange at Lerwick in Scotland); in Ireland only Mayo, Leitrim, Longford, and Roscommon as yet possess no exchange, although exchanges will shortly be opened in the two latter counties.

In 1912, when the work of amalgamating the late Company's system with that of the Post Office, the closing of duplicate exchanges and the transfer of others to Post Office premises, naturally occupied much of the attention of the staff, there was not a great accretion to the number of exchanges. In fact there was an actual reduction due to the weeding-out process referred to, but as in no case the closing of an exchange meant depriving the locality in which it was situated of the telephone service, this process implied no slackening in the expansion of the system. On the contrary the service was carried to 73 new places in that year. In 1913 the number of new exchanges opened increased to 140, and in the present year up to the time of writing (Dec. 15) 240 exchanges have already been opened; altogether 453 in the three years. This, however, by no means represents the whole of the work achieved in extending the service to rural districts. The figures I have given must be multiplied fourfold to show the number of villages and localities which now enjoy telephone service for the first time. In 1912 rural call offices were opened in 115 places, in 1913 in 408, and in 1914 in nearly 800; and it should be explained that these figures only include those call offices which imply the extension of the system to a new locality. Work of this type is obviously of considerably greater importance than the opening of call offices at post offices in places where the telephone service already exists: it involves the provision of a junction circuit or the adaptation of an existing telegraph circuit, often of many miles' length; and, as in the majority of cases full trunk facilities are provided, it affords telephonic communication to the inhabitants of the village almost as effectively as an exchange. It will therefore be seen that, after making allowance for those cases where a call office already existed before the exchange was opened, some 1,700 new localities have been provided with telephone service during the past three years.

The following tables dealing as they do with the progress of the last three years show, as might be expected, the greatest development in districts of the least economic importance. In Middlesex, for instance, only one new exchange has been opened, if we except three which have been opened in the heart of London. In Yorkshire there are numerous additions, but they are almost entirely in the rural part of the North and East Ridings, and in Northumberland the development is not in the Tyne District. Lancashire has only 7 new exchanges, Durham 5, and Lanark 2—both well removed from the neighbourhood of Glasgow.

As is fitting, Yorkshire comes first in point of numbers with 35. Then come Hants and Sussex with 19 each, Lincoln with 17, Wilts and Derbyshire with 16 each, Somerset with 14, Norfolk with 13, Essex with 12, Northumberland, Gloucester, Surrey, Warwick, and Kent with 11 each, Staffordshire with 10, and Berkshire, Herts, and Northants with 9. The sparsely populated county of Argyll is first in Scotland with 7, while in Ireland, Dublin is first with 4. Taken in telephone districts, 24 exchanges have been opened by the Chester district, 23 by the Reading and Nottingham districts, 22 by the Norwich district, 19 by Lincoln, South-West Scotland, and Bristol.

The
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Editing and Organising Committee - - { MR. JOHN LEE. MR. J. W. WISSENDEN.

Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

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

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INTELLIGENT INTEREST.

A VALUED contributor, in submitting an article for consideration, expresses his fears that if his contribution appears in these pages, his chances of promotion are ruined. He imagines himself to be a heretic. He is confident, of course, that his heterodoxy will be the orthodoxy of the next telegraph and telephone generation, but he is haunted by the memory of the fires of Smithfield. There is, he thinks, an "official" opinion and that opinion will be enforced upon everyone. So our friend prepares himself for the stake. We admire his courage, but we hasten to reassure him. First and foremost we venture to hope that no reader of this JOURNAL and no contributor to its columns will regard them as bearing upon individual promotion. These pages have one concern only, and that is to be an open court for the discussion of such problems as cannot more suitably be discussed elsewhere. We cannot conceive that Stiles or Nokes will find "official" favour on account of anything which is contributed to these columns. The general dissemination of knowledge and the encouragement of intelligent interest are altogether apart from questions of individual merit. "Official" opinions are always in the making and they cannot but gain in ripeness and worth from the thought and experience of the Service as a whole. In this conclave there is no heresy. We have room for all opinions save those of the somewhat irritating crank who differs for the sake of differing and whose influence is never constructive. Our friend may be reassured. His article shall appear, un-edited and with no addition beyond the occasional comma which must be added in the change from handwriting to cold print. Though his conclusions are startling they are based upon a careful collocation of fact and they are ably and courteously argued. There is no other criterion.

It is a suitable occasion to discuss a wider question. An interesting pamphlet published recently expounds the advantages of co-partnership. Towards the end of the 32 pages the writer states "one more advantage" in a way which seems rather like a *jeu d'esprit d'escalier*. It is clearly an afterthought, hatched on the staircase on the way home. "And then," he says, "it is all for good that workers should have a vital interest in administration. It is of mental value; it is of moral value." The after-dinner speaker hit on his most valuable thought just as he was sitting down, an experience which is not singular. The history of industrial enterprise is just catching up with the history of Parliamentary Government. A century ago it was amazing to the world at large that humble workers should be interested in government. Were there not the governing classes ready to hand? Of what value was the artizan's opinion on taxation? From that day to this there have appeared dozens of giant books which discuss the principles of taxation, and the widest differences of opinion still exist. But no one can deny that there has been a spread of general enlightenment on the subject and the artizan to-day is much more interested in the principles of taxation and has much clearer ideas of the fundamental doctrines than his predecessor before the time of the Chartist movement. It might have been better for industry in the process of its development if an intelligent interest in administrative methods had been fostered. To say this does not mean that the control of industry by means of a popular vote is a practicable scheme, for the Parliamentary system retains both the "representative" characteristic and the "controlling" characteristic even with the most daring use of the referendum. There are other means whereby the intelligent interest of the main body can be encouraged. "You would not let the crew control the ship, surely," says someone. Certainly not, but it is just as well that the crew should know whither the ship is bound and where the shoals and sunken reefs are. It is just as well that the galley-boy should peep over the rails at times and preen his eyes for the gleam of the light-ship. To be a good galley-boy he must be much more than a galley-boy.

This nautical parallel will indicate what we mean by "intelligent interest." A wrathful reader, writing on a postcard, and forgetting to add his name, tells us that he has no interest in "supreme financial questions" or in historical documents. He would much prefer that we should give him articles to help him to pass the examinations for special increments and for promotion. Here we have the issue clearly defined. We venture to remind him that he has a very real interest in "supreme financial questions." To the touchstone of a comparative balance sheet we must apply our service, year by year, or we shall fail to know where we stand. The afterthought of our pamphleteer comes again to mind. It is all for good that each of us should be able to see the valuation of his work in the form of the administrative record, and that—by Sir C. A. King's aid—we should be able to understand that record. It is all for good that we should be able to comprehend how we have developed that particular type of co-partnership which our Service really is, and what relation it bears to the evolving schemes of industrial control which we see developing around us. This is "intelligent interest" in its widest phase. At the moment it seems to be more valuable, more desirable to encourage, than the narrower "intelligent interest" which will only assist individual officers in their efforts to qualify, praiseworthy though those efforts are

THE RURAL EXTENSION OF THE TELEPHONE.

THE figures which we publish in another column are evidence of a somewhat remarkable development of the rural telephone system of these islands within the last three years, and would form an excellent text, were any needed, for a discourse on the benefits of State control. At least they bring out in a striking manner one aspect of those benefits. Notwithstanding that the year 1912 was not a year of normal progress in view of the absorption of much of the energy of the Department in the process of assimilating the National Telephone Company's system, we find that in the last three years upwards of 450 exchanges have been opened chiefly in small villages in the most rural parts of the kingdom. The very names of these places have an archaeological, we might almost say an Arcadian, ring. Preston Candover, Chewton Mendip, Kingston Bagpuze, Walsgrave-on-Sowe, Little Wymondley, Nazeing, Owslebury, Yardley Gobion, to select a few at random, will, we feel sure, be found in no railway time-table. It would indeed form a pastime for the curious to ascertain in how many of these places the telephone has preceded the railway—certainly in nearly half of them. A few such as Kimbolton, Market Bosworth, Kirkby Stephen, Ashburton, Milborne Port, Wells, Amesbury, Bervie, Carlow, Cavan, and Dungarvan, have a certain geographical or historical importance, but the majority of the villages can only be found on a large scale map.

But this list of 450 places in which exchanges have been established by no means exhausts the number of localities to which the telephone has been extended during these three years. Rural call offices have been opened, in numbers considerably exceeding twelve hundred, at places too small to support an exchange. These offices in many cases afford the inhabitants facilities to speak by means of the trunk wire system over the whole county, and in all cases limited trunk facilities at least are given. These results are, we think, an excellent example of the activity of a Government Service in what a commercial company would consider as unprofitable territory. Most of these extensions are in fact of a nature which a private company could not be expected to undertake; they afford a bare return on capital and in many cases show little promise of development in the future. Other extensions were only rendered possible by co-operation with the Telegraph branch and by utilisation or adaptation of their existing plant. The service was nevertheless a public need: villages formerly cut off from the world, in many instances possessing not even a telegraph office, and in most cases no railway station, are now furnished for use in cases of urgency with the most rapid means of communication extant. It is no discredit to any private concern that they should not be able to adventure on a work so valuable to the economic development of the country. It is nevertheless a very practical demonstration of the value of combining the Telegraph and Telephone systems under public administration.

REFERRED TO A COMMITTEE.

A CONTRIBUTOR to this number takes strong exception to certain recommendations of a Departmental Committee. We do not propose to take up the cudgels in defence of that committee. Its members are well able to look after themselves, as, with three Contract Managers and a statistician among them, they certainly will not be found wanting in facts or argument.

But of Departmental Committees in the abstract. What are their functions and their limitations? In these times when—to use the official phrases—team work among telephonists and telegraphists, co-operation between District Managers, Postmasters, and Sectional Engineers, and conferences between Surveyors, Superintending Engineers and Architects are the order of the day, "team work" at headquarters is imperative if the whole machinery is not to suffer from want of a proper co-ordination of the various interests How is such co-ordination to be effected? We live in an age of specialisation and, despite the efforts of societies and journals, the majority can only hope to *know* their own duties—more or less perfectly according to individual temperament—and a reasonable fringe of other duties directly concerned with them. The higher the rank the wider must be the scope of work, and necessarily the less detailed the knowledge of any particular branch of it The brain must perforce discard the less important details if it is to maintain a thorough grip of the main principles. A chief faced with a problem involving a detailed consideration of facts and theories has therefore no alternative in strenuous times but to apply the principle of "team work" and refer the question to a departmental committee.

Such committees generally consist of representatives of the different departments concerned, who work with a single object—the good of the Service. Its members acquire from one another a balanced knowledge of their subject; they surrender prejudices, they reconcile the apparently irreconcilable, and ultimately they arrive at a compromise which is at least safe and workable and generally sound and businesslike. Committee work is generally additional to officers' ordinary work; and, if it were not for the deeper and wider insight which is obtained on committee into Post Office work, the work would be burdensome. By far the larger portion of the work falls on the secretary. It is his duty to collect and collate evidence and to write reports of the meetings, and if anything goes wrong he is frequently regarded as the scapegoat. But yet so strange is human nature that secretaryships of committees are thankfully accepted. Verbatim reports of the meetings are expensive and are little or no use to the secretary. They are indeed a snare and a delusion, and happy is the secretary who early realises that fact. Verbatim reports may show how opinions given on the spur of the moment have to be revised, and that So and So uses long sentences without verbs and incoherent in cold script, or they may reproduce with faithful accuracy the broken or interrupted sentences or the not-too-obvious bull; but they rarely bring out the gradual focussing on a centralised opinion of the general discussion. In fact, the decision of a committee is often not expressed in words until the secretary writes down his impression.

Committees have their limitations. Like all corporations they have no body to be kicked nor soul to be condemned; and, consequently, the sense of personal responsibility amongst its members must to some extent be restricted. But as the essence of their work is compromise, the member who bows to the opinion of

the majority, perhaps against his own convictions, can hardly be as enthusiastic for the final opinion as if he had had a complete victory. Of course he could make a minority report; but such reports are rare, because they imply an acknowledgment of failure, the prime object of a committee being to find a *modus vivendi* on a difficult subject. Another difficulty is that a member representing one department may not have the whole-hearted support of that department, which is apt to ignore the many aspects of the case presented to the committee and to conclude that its "end has not been kept up." Despite these and other limitations it must, however, be confessed that, so long as we cannot raise a race of supermen, committees of an advisory character must be regarded as an integral part of the administrative machinery of the Post Office. At any rate they have the advantage of keeping in the foreground the efficiency of the Service as a whole, and it is not the least advantage of committee work that the members learn, possibly out of their disappointments, that the surrender of sectional interests can be a sacrifice with a rich recompense. These remarks do not, of course, apply in their entirety to the more important committees, such as the Telephone Arbitration Committee and the Telephone Finance (Rates of Subscription) Committee, which were composed of the heads of the various departments concerned and whose work bore fruit of national importance.

HIC ET UBIQUE.

ALTHOUGH this issue goes to press earlier in the month than usual, and will be delivered by the printers before Christmas time, it is improbable that it will be in the hands of the majority of our readers before the holidays. We nevertheless take the opportunity of wishing them all the compliments of the season. At this time when a dark shadow overhangs so many homes, the old wish for a Merry Christmas cannot appropriately be given; nevertheless we can hope that all who are able to do so will enjoy a well deserved holiday, and we can on the occasion, with a special significance, wish our readers a happy New Year. May it, ere it expires, see the foundations laid of a glorious and lasting Peace.

WE had hoped to print, either abridged or *in extenso*, the paper read by Mr. Morgan on the subject of the "Stores Department" before the London Telephone and Telegraph Society. Pressure, not only of ordinary and committee work but also of special work in connexion with the war, however, has precluded Mr. Morgan from furnishing us with a draft of his paper before we went to press, and we therefore have to defer publishing a report until next month.

THE members of the Traffic staff who are serving at the Front with the Royal Engineers Signals, had the honour of being presented to the King, on His Majesty's recent visit to the Front. We are able this month to give our readers an account of the signalling arrangements in force, which will be of especial interest to the Telegraph branch of the Services.

WE learn from the daily press that although Turkish controllers have now been installed in all foreign banks and in the offices of the Administration of the Public Debt in Constantinople, they have not yet seized the telephones, as they would be unable to operate them without foreign assistance. Telephone men and women will sympathise with Mr. Douglas Watson, Miss Minter, and other members of the late National Telephone Staff in their dilemma. They are apparently not allowed to leave, and while they are carrying out their duty to their subscribers they must also at times perform the uncongenial task of assisting the unspeakable Turk to speak.

IN a recent issue of *Telephony* a lineman in Minnesota is represented as unburdening himself as follows:—

> "If y' can't fix my box so's 't will work y' c'n take it out. What's t' matter with it anyhow?"
>
> Did you ever hear "them very words"? How did you handle the situation? Did you say: "All right, we will take it out if you ain't satisfied, and it will be a long day before you get it back again." Or did you explain, in simple language, that, owing to the multitude of infinitesimal irregularities which could co-operate to nullify the energies of any electrical apparatus by de-energising its component parts and to dissimulate its impulses without any adequate outward symptoms to aid in making a diagnosis, you would have to suspend judgment until making a close exa ination? Then while you were doing this, did you ask the lady if she made the quilt herself which took the first premium in the women's department at the county fair or whether it was done at a "bee"?
>
> Of course you knew it was not at a "bee," but that will give her time to start a little line of talk which will not have to do, even remotely, with the telephone business.
>
> A soft answer turneth away wrath and a timely interrogation often shunts a roast.

When you have mastered the language you learn that the ways of Minnesota are even as the ways of Manchester, Monmouth, and Moreton-in-the-Marsh.

CABLE ROOM MEMS.

IT is gratifying to observe the steady increase in the sale of THE TELEGRAPH AND TELEPHONE JOURNAL in this department, the subscribers of which have been pleased to note that strict order of seniority has been observed in fashioning the title as against the contrary policy in naming the society itself. The excellence of the production has been its sole advertisement, and the JOURNAL has apparently supplied a long-felt want—pardon the hackneyed expression. The increase is the more surprising that the staff itself is scattered over the British Isles, London, and the War zone, so that quite a number of the most likely patrons are out of reach.

It is hoped that Cable Room subscribers will not only assist by purchasing copies but by supplying interesting telegraph notes for these pages. The telegraphs are not dead or even moribund, as the war has proved, and Anglo-Continental cable telegraphy has played and has yet to play a very important part in the present international struggle. The note of despair, which, prior to the war, had not infrequently been struck by the *Doleful Dicks* of the Service as they regarded the strides made by both the Telephone and Wireless Services, has received a salutary check these last few months as the limits of the two latter became recognised, the lack of security afforded by both being quickly evident at the beginning of hostilities. On the contrary, especial security has been afforded on the Anglo-Continental-Telegraph circuits by the use of synchronic types of telegraphic appa atus, which have at times given invaluable aid, notably during the last days of Antwerp.

Other safeguards of secrecy have also been possible, and have been brought into use in the Cable Telegraph Service, none of which safeguards are available, at least in the present stage of scientific development and so far as telephones and wireless are concerned.

The staff of Belgian telegraphists temporarily assisting in the work of the Cable Room continues to increase in numbers, and adds to the curious medley of the present situation; thus, while Belgian telegraphists are assisting in the C.T.O. London, British telegraphists are working at the foreign end of certain Anglo-Continental lines, a British civil engineer has assisted in erecting French land lines, and a Belgian engineer is temporarily attached to the Engineer-in-Chief's staff. In addition we have the priceless aid which the British military telegraphs are giving across the Channel, so that the various telegraph experiences and impressions of the civil and military authorities of the three nationalities immediately concerned

should alone form a most interesting and instructive, not to say, unique symposium, at the end of the campaign.

The extension of the additional facilities for Baudot working to France offered by the *double duplex* installations, with the switching arrangement for working four traffic channels on *one* wire (*i.e.*, *double duplex*) or four traffic channels on *two* wires (*twin double*) has proved exceptionally useful these last war months. By this means a more economical and at the same time a more efficient utilisation of the longer Anglo-French cable wires has been rendered possible, and the stability of the communications considerably enhanced. This increased stability is pre-eminently noticeable with the *twin double* system, but, given satisfactory wire conditions, the *double duplex* should give an increased line output of 100 per cent. Such satisfactory conditions are, however, rarely attainable on the Anglo-French circuits in *peace* times, owing to the variability of the wires beyond the French cable heads, and have never once been reached since the outbreak of war. It is simply stating a fact that not on one single occasion, so far, has Baudot duplex been attempted by the French authorities during the present war period.

This can easily be understood when the demands made upon the French land lines by the military exigencies in France are considered, but without making invidious comparisons it is, in a sense, a matter of national gratification that the efficiency of the British wires right down to the submarine cable heads has, up to date, been well maintained throughout. That this has been so, despite the adverse atmospheric conditions as regards the overhead lines, and despite occasional " accidents " as regards the underground wires, is altogether satisfactory. How much has at times depended upon these slender threads it may probably never be politic to reveal. Private demands have necessarily bowed to national naval and military needs, and must continue so to bow " for the period of the war only," but should so regrettable though so remote a contingency occur as the landing of a hostile force in these islands, the crucial test of *lines of communication* would doubtless have arrived, as well as the only possible conditions of real comparison between British and French home telegraph engineering during hostilities.

Other special facilities and attentions given by the Engineering branch to certain matters in connexion with Anglo-Continental telegraphy, have undeniably proved several points at various times humbly urged by the Commercial branch as a minimum standard of *peace* efficiency. This is not the time to discuss admittedly debateable matter, but one may be forgiven for quoting the suggested motto of a November editorial and ask : " Is there any way of " retaining these as a permanent standard ? Could we not in " some senses take as our motto—*a la paix comme a la guerre* ? "

It was a suggested motto for the Telephone branch more especially, but it is hoped that secretarial sanction may be obtained for its use in the Telegraphs !

One word should by this time appear as to the strain upon the Cable Room *apparatus* since August last. Some of the installations have worked ceaselessly day and night, seven days per week, except for a few minutes, grudgingly snatched for the removal of accumulated " matter out of place," and have thus been most severely tested. The electrical and mechanical efficiency of these sets has therefore been very severely tried, but apart from the difficulties necessarily accompanying certain types of complicated apparatus and a " black patch " of apparently defective parts, the installations have borne the strain wonderfully well.

Before the matter is forgotten it may not be amiss to direct attention to the type of Baudot moderator used by the Belgian Administration which, from the description received, would appear to offer certain advantages over the present type fully worthy of consideration. The presence of Belgian officials in our midst should facilitate enquiry into what, on the surface at least, would appear to be an advance on the existing type and system of " local synchronism " in use here.

A correspondent in the daily papers has suggested that Civil servants employed at the War Office, the Admiralty, the Board of Trade, the Home Office, and " other departments " which bear the strain of extra work caused by the war, should be rewarded by a war badge at the end of hostilities.

Leaving this matter to be settled by members of the British public less interested than even the most unbiased Civil servant could possibly hope to be, one could not help but feeling just one twinge of regret that the much tried organisation of the Post Office should have been bundled among the miscellaneous collection of the " other departments." It is, however, a fair type of the public appreciation of one of the most useful and necessary public services. The fact that telegraphic communication between these isles and the Continent, for example, necessarily entails as careful attention and vigilance as any of the more prominent militant services, and has a very direct bearing on the course of the war, appears to have passed the comprehension of the kindly soul who made the suggestion. One wonders how far the decorations would be distributed, and can imagine the glad surprise of the manly breasts—and womanly also, it is presumed—of, let us say, the officers responsible for assessing and debiting the incomes of their fellow-citizens on account of the increased war tax, when decorated with a tiny medallion inscribed with the words " For Valour " !

J. J. T.

REVIEWS.

American Telegraph Practice. By Donald McNicol, A.M., A.I.E.E. McGraw-Hill Book Company, New York. 507 pp., 17s. net.—The author's object has been to give a detailed exposition of the various systems of telegraphy in use in America at the present time, together with a complete description of modern methods of operation and an extensive compilation of the formulae used in practical telegraphy ; and a perusal of the book shows how well he has succeeded. The American practice is of course very different from that in this country, and much of the book devoted to apparatus and systems of working will not directly appeal to students in this country. At the same time the book contains a vast amount of information which will be useful wherever there is a system of telegraphy. There is a great deal to be said in favour of one book covering the whole ground instead of several books dealing with various stages of the subject, but the beginner will not feel quite at home in passing from elementary facts to Helmholtz equation, time-constants, dynamos, &c., all of which might have been placed at the end of the book for more advanced students.

The book opens with a clear explanation of the terms used and a short chapter on primary cells, followed by a chapter on dynamos, motors, &c., which the beginner should have no difficulty in mastering. The exposition of circuits and conductors, although somewhat advanced in places, is one of the best we have seen. Thus far the subject is common to all countries, but, closed circuit working being the system still preferred in America, we are introduced to new instruments and connexions. In electrical measuring instruments we are on familiar ground again, the Murray, Varley, and other tests being clearly described. The first part of the book closes with a very good chapter on the speed of signalling. The American Morse alphabet (26 letters) has a total of 77 elements, while the Continental alphabet (26 letters) has 82 elements, but the spaced letters and long signals in the former render it more uncertain, and opinion in America is veering round to the slower but more certain Continental Morse alphabet. The effect of inductance and capacity is dealt with, and calculations on the K.R. law are given. The effect of " cross-fire " disturbances is explained and a table supplied showing the maximum permissible lengths of line for various gauges of line. The chapter contains a great deal of most useful information.

Telegraphs not being a government monopoly in America, inventors have had a better chance of having their inventions tried and adopted by some one or more of the companies. In this country there is only one simplex repeater, but the book describes quite a number of repeaters in use in the States, and the method of adjustment is made clear. The lines being very long are mostly worked by dynamos, and necessitates the introduction of a new instrument called a pole-changer in double-current duplex working to prevent short-circuiting of the dynamos. Duplex is dealt with at some length. The presence of neighbouring conductors carrying

high potentials created a demand for the development of a high efficiency duplex, and one ingenious method of overcoming this trouble is described. The lines being worked with such high power, 300 and even 380 volts, sparking is produced and various devices to overcome it are set forth and illustrated.

Several quadruplex systems are described at some length, and quite a number of devices, called "bug-traps," to overcome the B side "kick" are illustrated. The balancing of duplex and quadruplex circuits is considered of sufficient importance to warrant a separate chapter of twelve pages, and there is no more informative chapter in the book. Operators here have for the most part to find out for themselves how to balance, and students will welcome the assistance given in the chapter. Annunciators in quadruplex working sound strange to our ears, but they are used for several purposes in America. It is the usual practice there to concentrate all duplex and quadruplex equipment in a room at a greater or less distance from the operating tables, and signalling by means of annunciators to the quadruplex attendant is provided. Another ingenious device is described to enable wire chiefs to communicate with distant offices by wire instead of service messages. The practice is to quad a duplex circuit, the polar side being assigned to carry the regular traffic while the neutral side is used for speaking purposes, annunciators being used for calling the distant wire chief. The chapter contains a description of selectors which are used on long omnibus circuits to gain the attention of any particular station where the operator may not always be at hand.

In a country where the wires are long it is desirable to make the best use of those erected, and superimposed or "phantoplex" working is resorted to. A circuit can be superimposed on a simplex, duplex, or quadruplex circuit without interference between the two methods of signalling, and diagrams of the arrangements and apparatus are given. The Wheatstone system has for many years been in use in the States and in Canada, and there is a good description of the apparatus in Chapter XX. One circuit is over 3,000 miles in length, and yet has only three repeaters in circuit. Accuracy and not speed is the object of writing it by Wheatstone. In the Postal automatic system the Wheatstone receiver is replaced by a reperforator which is now becoming a familiar instrument in this country, and is briefly described in the book.

Transposition of lines on poles and screening of relays from induction are described and illustrated, as is also simultaneous telegraphy and telephony over the same wires. The specifications for wires and cables in the final chapters will be of use to engineers and students. A copious index is provided. The diagrams, of which there are 418, are excellent throughout, the type is clear and errors are *nil*. Some of the expressions used will be new to our readers, such as "ground," "pole-changer," "bug-trap," &c., but the context makes their meaning clear. The book, which is tastefully bound, should be a welcome addition to the literature of the subject, and is one which we can cordially recommend.—S. W.

Practical Uses of the Wave Meter in Wireless Telegraphy. By Lieutenant J. O. Mauborgne, United States Army. McGraw-Hill Book Company. 67 pp., price 4s. 2d. net.—In most of the text books which are published on wireless telegraphy, the subjects of wave length, decrement, coupling, &c., are dealt with by means of elaborate mathematical investigations, but the student, even if he is able to follow these investigations, is generally left somewhat in the dark as to the manner in which practical application is made of the results so obtained

The author of the book under review, which was originally written for students at the American Army Signal School, has endeavoured to remedy this state of affairs. The various formulae which apply to the different measurements are assumed without mathematical proof, and only the application of these formulae is considered. The book is thus of use, not only to the student with a good knowledge of the theory of the subject, but also to the practical wireless engineer, even if the mathematical attainments of the latter do not extend beyond the ability to solve a simple equation.

After an introductory chapter dealing with the general arrangement of wave metres, the special types of these instruments in use by the United States Army are described. Then follow chapters on the measurement of wave lengths, the tuning of the transmitting apparatus, the measurement of damping and logarithmic decrement, the measurement of the wave length of received signals, and the calibration of an adjustable receiving set for various wave lengths. The final chapter deals with the measurement of capacities and inductances at wireless frequencies.

The book is written in a very lucid manner, and we are pleased to note a complete absence of the American technical slang which mars so much of the literature dealing with applied science which is produced on the western side of the Atlantic. It is well printed and bound, the diagrams are very clear, and we can confidently recommend it to all who are concerned in any way with the adjustment of wireless stations. F. A.

The Principles of Electrical Measurement. By Professor Arthur W. Smith. McGraw Hill Book Co., New York.—For the majority of us, the idea of electrical measurements is comprised in one word—*Kempe*. During a long period of years Mr. Kempe's *Handbook of Electrical Testing* has been our guide, and, in some cases perhaps, the mere possession of the book appeared to the owner as an additional qualification for promotion.

The advent of a new work on similar lines cannot therefore fail to be of interest. *The Principles of Electrical Measurement* by Professor Smith, of the University of Michigan, is not unworthy of being compared with the book we have just mentioned. Professor Smith has written his book for the instruction of those who are beginning their course in electrical engineering, and a survey of the chapters fills us with a certain amount of envy of the professor's pupils.

The author has, in addition to his knowledge of the subject, one special qualification. He has been teaching the subject for ten years and has not forgotten the lessons learnt. The result is reflected in the general arrangement of the various sections, a result that can truthfully be described as admirable. Starting with a series of simple experiments, involving the use of the ammeter and voltmeter, the student follows a definite programme gradually increasing in difficulty, and when the whole of the experiments have been worked, the student will not only have obtained dexterity in manipulation of apparatus but will have increased considerably his knowledge of the fundamental scientific principles and the effects of the operation of such principles under given combinations of conditions.

In a preliminary note the author states that his aim has been to lead the student to learn the facts from his own observations. It is desirable, however, that the student should have a firm grasp of the fundamental principles, otherwise his conclusions will in all probability be false. In our opinion the author would have done better had he assumed a knowledge of elementary principles on the part of his readers, as his necessarily brief *resumé* of such matters appears apt to confuse rather than aid the backward student. This is the more to be regretted as in those cases, notably in his explanation of the magnetic circuit and the definition of the *Maxwell*, the lucidity of the explanation leaves nothing to be desired.

The electrical measurements dealt with cover a wide field. The Wheatstone bridge, Tangent and Ballistic galvanometers, Kelvin balance, coulometer, and electro-dynamometers represent some of the types of apparatus required for the experiments. The measurements of resistance, capacity, and inductance are dealt with in a systematic and thorough manner, and the magnetic tests of iron and the measurement of self and mutual inductance, coupled with the accompanying explanations, should go far towards clearing away the mist in which the average student dealing with these matters is usually groping.

Though an American book, yet it is singularly free from Americanisms. The use of the word "tips" for the peaks of the curve is somewhat startling at first, but one word—"setup"—for the student's apparatus duly connected for the experiment, has been commandeered for our own vocabulary. We have wanted this word often.

With memories of underground laboratories often inadequately lighted and ventilated, we offer our sincere congratulations on the admirable manner in which the book has been printed and the excellent diagrams which illustrate the text; the book will be legible notwithstanding that neighbouring students are experimenting with the lighting mains! Students who are taking practical classes in telegraphy, telephony, or magnetism and electricity should add this book to their collection.

W. J. W.

THE PROBLEM OF NIGHT SERVICE IN LOCAL EXCHANGES.

BY N. L. SMITH (*Traffic Superintendent, Telephones, Glasgow*).

THE question of the nature of the service which should be provided during the evening and night hours is one which may be open to various answers. There is one answer, however, which it is thought will meet with general approval—viz., that the quality of the service at all portions of the day and night should equal, *as nearly as the circumstances permit*, that of the busy hour service. It may be argued that it is not reasonable to expect in the late evening, say, between 8 p.m. and 11 p.m., a service equal to the day service, but after all it is not infrequently found that the proportion of calls of a very urgent character in the late evening is greater than in the middle of the day.

Moreover, a telephone stands for rapidity and must maintain its reputation or it is apt to be considered a nuisance. The question then is "How is the service, particularly of the evening hours, to be kept approximate to the day service without unduly increasing the operating cost?" The difficulty of making such an arrangement will readily be seen if an example is taken showing the application of the different conditions. This could perhaps be most effectively shown by means of a small table and by taking some actual figures which give an indication of the relationship between the calling rate per position, positions taken over, and percentage loss of efficiency per head of the staff employed.

	10-11 a.m. Busy hour.	8-9 p.m.	9-10 p.m.	10-11 p.m.
Number of original calls per position valued calls ...	210	7.5	2.5	1.5
Positions taken over	—	7	14	16
Percentage loss of efficiency per head of the Staff employed	—	75 %	88 %	90 %

For the discussion of the table, and in order to avoid invidious comparisons, equality of operating ability is assumed over all hours, and readings from the standard tables are applied. It will be seen, therefore, that in the very nature of things a loss of 75 per cent. of efficiency is sustained on every "A" operator employed on night busy hour service as compared with the day busy hour. This percentage will vary a little, up or down, in accordance with the ratio existing between the day busy hour and the night busy hour, but, generally speaking, the percentage quoted here will, it is thought, be found to be a reasonable average. In other words, then, every originated call operated in the night busy hour essentially costs approximately 75 per cent. more than a similar call operated in the day busy hour.

Let us now turn to the "B" operating. "B" operating, as recognised in the day busy hour, disappears, and all incoming call wires and lines take on a common method of ringing for attention, unless in very exceptional cases.

There are no tables known to the writer which show what this means in percentage loss of efficiency, but it is recognised that if five offices are taken over and worked together on one call wire, the loss is 48 per cent. It will be quite safe, therefore, to assume that the loss of efficiency, if ringing on the call wire is adopted, would be not less than 70 per cent., as an average, under ordinary night busy hour conditions

The problem then is "By what system can the day busy hour conditions be restored to the night busy hour?"

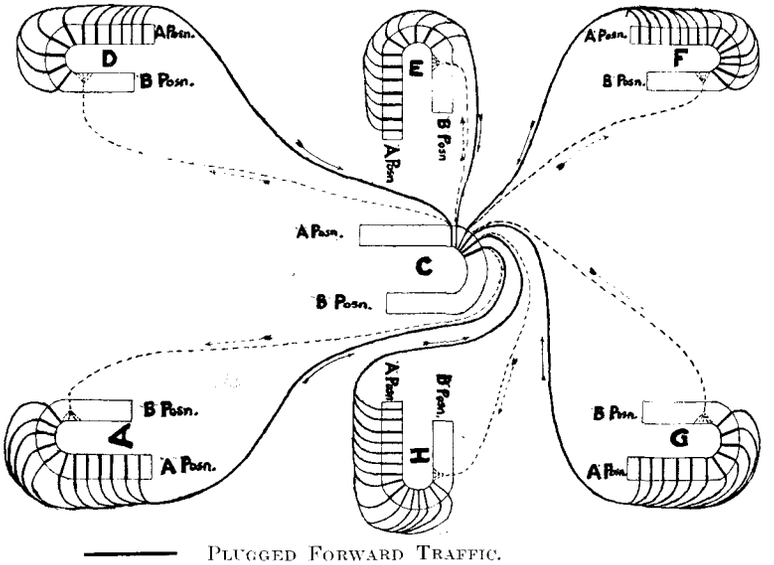
The late National Telephone Company went some little way to get over the loss of efficiency by endeavouring to collect 60 per cent. of the originated night calls upon one-sixth of the total "A" positions. This was well in its way, in so far as it went, and may be considered a reasonable attempt to deal with the fringe of the problem. It had the effect of reducing some part of the loss of efficiency on the "A" positions, but farther than that it does not go. All the attendant evils of the night work brought about largely by slowness of work between exchanges and by failures of promptness to clear, go almost untouched.

Even in the reduction of the loss of efficiency per head of the staff on "A" positions, it does not go nearly far enough, as will be shown in a table of comparison later.

What, then, is the scheme for which it is claimed that it would restore to the night busy hour the conditions of speed and accuracy which pertain to the day busy hour? In a word the arrangement is one which provides for the throwing forward of all originated calls in any local area to be operated at one point at which a staff, fully covering the necessary group of positions, is provided. Simultaneously, and as a sequel, it provides for the cessation of all "B" working except on one incoming position in each exchange of the area, and that one position is worked on the full call wire system, where such a condition prevails in the day busy hour.

If this is accomplished, then the conditions of the day busy hour have been attained, inasmuch as the "A" operators performing the operating, deal with the work at adjacent positions, and have, therefore, no loss of efficiency through positions taken over, while calls may be got through with the same promptness and expedition because of the full call wire facilities afforded for demands.

The accomplishment of such an arrangement is rendered a comparatively simple and inexpensive matter by the fact that such a large proportion of the junctions between exchanges is idle during the evening and night hours.



Now to examine the proposal in more detail, the accompanying outline diagram may be useful. "C" is the point at which concentration is made and at which all calls are operated and supervised. The arrows indicate the direction of inward and outward calls at "C." No originated calls are operated at "D," "E," "F," "G," "H," or "K" on the "A" positions. What happens is that when a call is received on the home section of any of these exchanges a plugging forward peg is used. This is placed in the jack corresponding to the calling lamp. This peg is connected by means of a junction line to the concentration point at "C" and terminates there in a lamp and jack. The call is therefore transferred forward to the concentration positions at "C," and is there operated. One operator will suffice under these conditions to cover

a reasonably large number of positions, as his only actions are to place the plugging forward peg in the jack when a call is received, and to withdraw the peg when the clear, which is an audible signal, is received. At "C" all outward connexions are obtained by means of call wire junctions worked to the "B" side of "D," "E," "F," "G," "H," and "K" exchanges. As all originated calls from every exchange are plugged forward in this manner, all incoming work except that received from "C" ceases, and therefore all "B" positions at all exchanges are closed except the one incoming from "C."

It might be to some advantage now to set out a theoretical area with a small number of exchanges, allot traffic to each of them, and set up in a table the effect of :—

1. The ordinary method of handling the calls
2. Handling calls with 60 per cent of "A" traffic concentrated on one-sixth of the positions.
3. The concentrated method of handling the same traffic.

Exchange	No of 'A' Positions	No of Originated Calls	Positions Staffed	Positions taken over by each operator	Percentage loss of efficiency	Plugged forward operators	Total 'A' Staff	No of 'B' Positions	Incoming Calls	Probable No of B positions per operator	'B' Staff	Total Staff
C 1	70	500	10	7	75%	–	10	30	320	10	3	13
· 2	"	"	8	Av 10	Av 85%	–	8	·	"	"	3	11
· 3	"	"	3	–	–	2	5	"	"	–	–	5
D 1	25	410	5	5	70%	–	5	24	300	8	3	8
· 2	·	·	5	Av 4½	56%	–	5	·			3	8
· 3	·	·	–	–	–	2	2	"	·	1	1	3
E 1	30	300	5	6	70%	–	5	11	220	5·5	2	7
· 2	·	·	4	Av 5	Av. 62%	–	4	"			2	6
· 3	"	"	–	–	–	1	1	"	·	1	1	2
F 1	20	200	3	6⅔	75%	–	3	10	200	5	2	5
· 2	·	·	3	6⅔	"	–	3	·	"	"	2	5
· 3	"	"	–	–	–	1	1	·	"	1	1	2
G 1	90	90	2	10	85%	–	2	8	60	8	1	3
· 2	·	·	2	·	"	–	2	"	"		1	3
· 3	"	"	–	–	–	1	1	·	"	1	1	2
H 1	12	120	2	6	75%	–	2	7	80	7	1	3
· 2	·	·	·	·	·	–	2	"	"	·	1	3
· 3	"	"	–	–	–	1	1	"	"	1	1	1
K 1	6	140	2	3	45%	–	2	3	90	3	1	3
· 2	·	·	2	Av 3	45%	–	2	·	·	·	1	3
· 3	·	"	–	–	–	½	½		·	½	½	1

1	Total Staff employed – Ordinary Operating	42
2	· · · 60% of A Calls concentrated on 1/6th of A Positions	39
3	· · · Concentrated Method	16
	To this last figure has to be added operators required to operate 1260 plugged forward calls at concentrated positions. 1260 = 6 operators at 6 positions full – loaded.	6
		22

Let us assume that the traffic during the night busy hour at the exchanges shown in the diagram is as follows :—

	Originated.	Incoming.
C	500	320
D	410	300
E	300	220
F	200	200
G	90	60
H	120	80
K	140	90

Note.—These figures represent *in each case* the actual staff which would be employed under the various systems of working, assuming that every person employed were capable of effecting 220 valued calls in a busy hour under day busy hour conditions. They are calculated from the standard curves of efficiency.

These figures are mostly drawn from actual cases.

Under the concentrated method of operating there would of course be as much perhaps as 20 per cent. of calls which originate in the exchanges "D" to "K" which will be plugged forward to "C" and will have to be completed back to the originating exchange through the "B" position at the originating exchange. This feature is, however, to a large extent counterbalanced by an approximately equal percentage of calls which would have been junction calls at the originating exchanges for "C" which, when plugged forward to "C," become local calls on that exchange.

These figures demonstrate the economy to be effected on the assumption that the value of calls is equal ; but it will, of course, be recognised that under the much improved conditions of operating with the concentrated method the value of calls would be much reduced. This would, of course, be a further economy in staff, but a detailed description of this further advantage would involve too great a prolongation of this article. It will, however, be recognised that in the matter of "facility for working," "supervision of calls," and for the "general supervision of staff," the concentrated method of working has enormous advantages.

The description of such a system can, in such an article as this, be given in the merest outline. The circuit conditions which enable metering to be done from "C" to the subscribers' meter at each exchange have been designed and, by bringing in the battery at the originating exchange, have been made suitable and effective. These details, however, would require a special article to themselves. Sufficient has, it is thought, been written to show that up to the present no really satisfactory study has yet been devoted to the "night" question, which although of lesser importance than day work in point of volume, is none the less a sadly inefficient and expensive item to the Telephone Administration.

SOME MINOR TROUBLES.

ON page iii of the first number of THE TELEGRAPH AND TELEPHONE JOURNAL there appears an advertisement for technical books. One of these books is entitled *Telephone Troubles, and How to Find Them. On both C.B. and Magneto Systems.*

When one hears of "telephone troubles, and how to find them," one is inclined to pause and consider whether there is a man or woman engaged in the telephone business of this country, or of any country, who really requires to spend money to know how to *find* telephone troubles. Personally, I should regard as a far far better thing a booklet, or even a simple essay, which would tell me how to *lose* telephone troubles. I daresay such a publication would come very near to being the publication of the year from a selling point of view.

Yes, we have all our telephone troubles, and it is safe to assume that we shall continue to have them, more or less, week in week out. So we must make up our minds to tackle them as cheerfully as possible when they do come along.

In the course of our daily occupation many of us come in contact a good deal with the telephone subscriber. Speaking generally, I believe subscribers recognise that the Telephone Administration of the country is in earnest, and that it is giving the public a service of ever-improving quality. But, of course, there are individual cases to be met with all over the country in which the subscribers concerned have a very poor opinion of the Post Office management of the telephone business, and do not hesitate to give expression to their opinion in the newspapers and elsewhere. These people in the main are quite good-hearted chaps who bear no animus, but who have got the idea that the Department is not treating them fairly in some way or another, or is not doing what it ought to do, or *vice versa*.

Now, we are all servants of the public, and these lines must not be regarded as in any sense an intended "hit-back" at our masters. It is merely desired to bring under notice, very briefly, one or two things for which the Telephone Administration is often held blameworthy, and to endeavour to show in a fair light the other side of the picture.

In the first place there is the question of the quality of the service given to the public. As an old servant of The National Telephone Company (of happy memory) I can well recall many cases in the latter years of the Company's lifetime when some very strong things were said by some people about the Service generally, and how ardently these people expressed themselves as longing for the transfer of the business to the State. Nowadays

we not infrequently hear from many of the same people of the splendid service which was invariably given by the late Company, and how badly the Post Office is handling matters. There is still with us, for instance, the subscriber who, when he fails to get an immediate response to his call for the exchange, concludes that the operator is "too busy reading a novel to attend," and embodies his conclusion in a letter of complaint either to the local responsible official of the Department, or to the Press. Well, it is fair to say that most of the telephone operators *do* read novels, but if any subscriber honestly believes that anything of the kind is done by an operator during a period of duty at the switchboard, a visit to the telephone exchange is the best thing in the world to clear *that* particular poison out of the air. It is to be regretted that only a comparatively small number of telephone subscribers have seen the inside of an exchange, or have anything but an extremely hazy idea of what goes on there. The Department welcomes visitors to its exchanges, and telephone officers generally regard it as a privilege to show an enquiring or a complaining subscriber round and to explain to him the *modus operandi*. Such visits are entirely good for everybody concerned, and there ought to be far more of them.

Then there is the never-ending difficulty of "engaged" numbers. It is often concluded by a subscriber, quite incorrectly of course, that an operator reports a number "engaged" to save herself trouble. Here again is where it is desirable to administer a knowledge of the facts. Many subscribers do not provide themselves with telephone facilities nearly sufficient for their requirements. Their lines are greatly overloaded, with the result that calls for them are frequently ineffective. If all such subscribers were educated up to the point where they could see it to be to their advantage to have as many lines from their offices to the exchange as the volume of their traffic calls for, the service would benefit tremendously. The "engaged" trouble would be a very small thing in comparison with what it is, and nobody would be more pleased than the telephone operator if only a small proportion of calls could not be effected right away. Her work would be very considerably simplified.

It cannot be too widely or frequently advertised that the quality of the service is constantly under supervision all over the country. It should be known that operators are not set down at telephone switchboards and left to do as they think fit. There are supervisors and service inspectors both inside and outside the exchanges who are ever vigilant, and the activity on the part of experts to devise the means of effecting improvements in apparatus or methods is never-ceasing. That, notwithstanding all this, faults arise at times is a regrettable fact, but only a very unreasonable subscriber could expect what no Telephone Administration will ever be able to give—a service wherein no fault can arise. The machinery for clearing faults when they do arrive is well organised and works smoothly, and I believe this is generally recognised by subscribers.

Then there is the subscriber who believes that a deep scheme is in operation by the Department to charge him for more calls than are actually originated at his telephone. I recall one particular and very vivid instance when a subscriber, and a small user at that, called upon me and proceeded to prove, during a period of nearly half an hour, how iniquitously he was being dealt with in this respect. He had an easy utterance that required no assistance from my adjacent water-bottle. We parted excellent friends with the understanding that he should keep a record of calls for a week, and compare it with the Department's record. When the comparison day arrived we found that *his* record was one or two in excess of the Department's, and although he did not say it, his manner conveyed that he doubted my integrity. Well, we decided to try another week, and this time the Department's record exceeded his by one or two. I had every reason to believe that his record was an accurate one. He had only a small office and no office staff, and he was the sole originator of calls from his telephone. His record gave, for each day, the various times at which he had rung up his several correspondents, with their telephone numbers, and in two cases I observed he had entered the words "No answer" against calls. These he did not count in his record. On enquiry I ascertained that, although he obtained no answer on these two occasions from his correspondents, he had failed to acquaint his exchange operator of the fact, and so, as I explained, she would make out effective tickets for these calls in the absence of advice from him that they had been ineffective. He left me with an expression of conviction that the Department's records were to be relied upon, and he has not since questioned them.

There is a condition in each subscriber's agreement that he is obliged to accept the Department's records of calls as accurate. Notwithstanding that condition, the Department does not take up the stupid attitude of infallibility in the matter of call recording or anything else. If a subscriber feels that he is being overdebited with calls, the Department is ever ready to listen to his complaint and to give way if it is proved to be in the wrong. Telephone operators, like telephone subscribers, are only human, and make mistakes at times, but it must surely be admitted in fairness that, as the accurate recording of calls is part of the special training of an operator, she is much less liable to err in this matter than the average subscriber, whose record (when he keeps one) is often of a spasmodic character. Especially in an office with one or more clerks are the subscriber's records likely to be less reliable, because if a clerk calls up someone on private business he is not always likely to record the call, and so the poor operator is often blamed for over-recording.

Again, there is the man from the "back blocks" who is anxious to have telephone service there, and who expresses pained surprise because the Department does not proceed to instal an exchange upon his assurance that "he knows at least a dozen people who will become subscribers willingly." It is wonderful how frequently "the dozen" is reduced to a miserable two, or maybe three, as the result of a canvass. In such cases the Department is often regarded as wanting in enterprise, the idea of the disappointed ones evidently being that, once an exchange were established, it would soon grow and become a success. But then it *might* not—in many cases certainly *would* not—and the Department would be failing in its duty to the public if it did not see that its exchanges were at least self-supporting to begin with.

Then again, many of us have met the man who, after condemning the "exorbitant charges" for telephone service in this country, wants to know how it is they can do things telephonic so much cheaper in Sweden. I have heard the price for exchange telephone service in Sweden stated by a caller at a figure so low as to compel me to tears and the use of my handkerchief. There is no doubt that telephone service is cheaper in Sweden than in the British Isles, but the Swedish service has its drawbacks. For example, in Stockholm, the capital of the country, which contains about one-third of the telephones in Sweden, there are opposition systems (that of the State and that of a company), and as there is no intercommunication between these systems, all subscribers who wish to be able to communicate with the whole Stockholm telephone system have to pay two subscriptions. Sweden *versus* the British Isles in the matter of cost of telephone service, however, is not a fair comparison. Labour generally in the former country costs much less than it does in this, and that of course is *the* important factor. If we turn to the United States of America, we find there conditions which more nearly approximate to those existing at home, and we also find there telephone rates in operation which the British public would regard as ruinous. And the reason is principally that labour costs more there than here.

These are but a very few of the minor troubles with which we have to deal from time to time, so far as our intercourse with subscribers is concerned. There are, and always will be, unreasonable people in this world, but we need to remember that when we are up against one of these people, he on his part considers that it is *we* who are unreasonable. It is absurd for one to lose one's temper in such circumstances. We should meet them all with that courtesy, and deal with them with the care, which our position as servants of the public requires of us, and endeavour at all times to demonstrate to conviction the fact that the Department is carrying out its obligations to the full, and with absolute fairness to everybody concerned.

M.

ANCIENT SIGNALLING.

SIGNS for conveying a message without an intermediary between places far apart are probably as old as communication by gesture, which doubtless was used by primitive man. How old their reduction to a code may be we do not know. A sort of semaphore signalling seems to have been known to the Romans. The Greeks used beacon fires. Polybius in the tenth book of his histories relates how in B.C. 208 Philip V. of Macedon, when his forces were operating at once at Peparethos (in the Sporades Islands), at Phokis and in Euboea, gave orders that reports should be made to him by means of fire-signals to Mount Tisaeus in Thessaly, a position conveniently situated for commanding a view of those places. In the clear Greek air the flare of torches might be seen for perhaps twenty miles.

Polybius, who had fought in the wars with Rome, considers the method of signalling by fire to be of the greatest use in war. It has never, he says, been clearly expounded, and he accordingly gives an account of it, which, slightly abridged from Shuckburgh's translation, is as follows :—

Formerly the art consisted of employing certain pre-arranged signals. For instance, it was possible by means of the signals agreed upon to send the information that a fleet had arrived at Oreus or Peparethos or Chalkis ; but it was impossible to express that "certain citizens had gone over to the enemy," or "they were betraying the town," or that "a massacre had taken place," or any of those things which often occur but which cannot all be anticipated.

Aeneas, the writer on tactics, wished to correct this defect, and did in fact make some improvement ; but his invention fell short of what was wanted. "Let those," he says, "who wish to communicate a matter of pressing importance to each other by fire-signals prepare two earthenware vessels exactly equal both in diameter and depth ; let the depth be three cubits, the diameter one. Prepare cork floats of a little less diameter than that of the vessels ; in the middle of each fix a rod divided into equal portions of three fingers' breadth, and let each of these portions be marked with a clearly distinguishable line, and in each let there be written one of the most obvious and universal of those events which occur in war ; for instance, in the first 'cavalry have entered the country,' in the second 'hoplites,' in the third 'light-armed,' in the next 'infantry and cavalry,' in another 'ships,' in another 'corn,' and so on. Then carefully pierce both vessels in such a way that the taps shall be exactly equal and carry off the same amount of water. After testing them and ensuring that the rate of discharge of water is the same for both, the vessels should be taken respectively to the two stations from which the watch for fire-signals is to be kept. As soon as any of the events inscribed on the rods takes place, raise a lighted torch and wait till the signal is answered by a torch from the other station. Both parties are then to set the taps running at once. When the cork and rod at the signalling station has sunk low enough to bring the division containing the words which give the required message level with the brim of the vessel, a torch must be raised again. The receiving station must then at once stop the tap and observe the words on the division of the rod which is level with the brim of their vessel. This will be the same as that at the signalling station if everything has been done with equal speed at both stations."

Now this method is still wanting in definiteness ; for you cannot foresee or write on the rod every possible event that may happen ; and so, when anything unexpected in the chapter of accidents does occur, it is plainly impossible to communicate it by this method. Besides, even such statements as are written on the rods are quite indefinite ; for the number of cavalry or infantry that have come, or the particular point in the territory which they have entered, the number of ships, or the quantity of corn, cannot be expressed. And this is important.

But the last method, which was hit upon by Kleoxenos and Demoklitos, and further elaborated by myself, is definite and capable of indicating clearly whatever is wanted at the moment. In working, however, it requires attention and the closest observation. It is as follows :—Divide the alphabet into five groups of five letters each (of course the last group [of Greek letters] will be one letter short, but this will not interfere with the working of the system). The parties about to signal to each other must prepare five tablets each, on which the several groups of letters must be written. They must then agree that the party signalling shall first raise two torches, and wait until the other raises two also. The object of this is to show that they are attending. These torches having been lowered, the signaller raises first torches on the left to indicate which of the tablets he means ; for instance, one if he means the first, two if he means the second, and so on. He next raises torches on the right showing similarly by their number which of the letters in the tablet he wishes to indicate to the recipient.

At the respective points of observation each party must have an observing instrument (*dioptra*) with two funnels, to enable him to distinguish through one the right, through the other the left position of the corresponding signaller. Near this instrument the tablets must be fixed, and both points, to the right and to the left, must be defended by a fence 10 feet long and about the height of a man, in order to make it clear on which side the torches are raised, and to hide them entirely when they are lowered. These preparations being duly completed, when a man wishes, for instance, to send the message "some of our soldiers to the number of a hundred have deserted to the enemy," the first thing to do is to select words that may give the same information with the fewest letters, for instance, "Kretans a hundred have deserted," for thus the number of letters is less by more than half and the same information will be given. This sentence will be transmitted thus : the first letter is K, this comes [in Greek] in the second group of letters and therefore on the second tablet ; the signaller, therefore, must raise two torches on the left to show the recipient that he must look at the second tablet ; then he will raise five on the right, because K is the fifth letter in the group, and the recipient will thereupon write down K. Then the signaller must raise four torches on the left, for R is in the fourth group, and two on the right, because it is the second in that group, and the recipient will write down R ; and so on.

Now everything that happens can be definitely communicated by means of this invention ; but the number of torches is large, because each letter has to be indicated by two series of them ; still, if proper preparations are made, the thing can be adequately carried out. But whichever method is employed, those who use it must practise beforehand, in order that when the actual occasion for putting it in use arises they may be able to give each other the information without any hitch.

P. Z. R.

POST OFFICE LIBRARY AND LITERARY ASSOCIATION.

SIR A. F. KING, K.C.B., who has been Chairman of the Post Office Library and Literary Association since 1906, retired last month and has been succeeded by Mr. G. E. P. Murray.

The latest act of the committee under Sir A. F. King's chairmanship has been to make each subscription cover two volumes instead of one, and at the same time reduce the yearly subscriptions by sixpence each.

Under the new arrangement, which will come into effect at the New Year, it will be possible to obtain a daily exchange of two volumes, one from the Permanent Library and one from a Circulating Library, Smith's, Mudie's, or the Times' Book Club for 7*s*., 10*s*. 6*d*., or 11*s*. 6*d*. per annum respectively. These subscriptions cover also the use of the Reading Room.

The subscription for the use of the Permanent Library and Reading Room has been reduced from 3*s*. to 2*s*. 6*d*. a year.

Further particulars may be obtained from the Sub-Librarian at the Library, from the Hon. Sec., Mr. G. S. Edwards, Secretary's Office, or from any member of the committee.

THE SIGNAL SERVICE.

AN officer writes home :—

I am very much surprised to see in the English Press so little mention made of the Field Telegraphs, or Signal Service, as it is now known. In time of war the signal companies of the Royal Engineers are one of the most important and necessary arms of the service. They are the nerves of the Army.

Most of the important towns in the North of rance and also London and Paris are in direct touch with General Headquarters. These are called the main lines of communication, and over their wires day and night pass a continuous flood of traffic for the hospital bases, ordnance, remount, and store depots. From General Headquarters radiate wires to the various army corps headquarters, and again each army has its communications to the divisions, which, further, have wires right up to the brigades. It will thus be seen that in the space of a few minutes the War Office is fully and clearly informed of what is going on in the firing line. In fact, were the lines joined straight through it would be possible to hear the roar of artillery and the bursting of shrapnel in St. Martin's-le-Grand.

As the tide of battle turns this way and the other and headquarters are constantly moving, some means have to be provided to keep in constant touch with General Headquarters during the movement. This emergency is met by cable detachments. Each detachment consists of two cable wagons, which usually work in conjunction with one another, one section laying the line whilst the other remains behind to reel up when the line is finished with. A division is ordered to move quickly to a more tactical position. The end of the cable is connected with the permanent line, which communicates to Army Headquarters, and the cable detachment moves off at the trot ; across country, along roads, through villages, and past columns of troops, the white and blue badge of the Signal Service clears the way. Behind the wagon rides a horseman, who deftly lays the cable in the ditches and hedges out of danger from heavy transport and the feet of tramping infantry with the aid of a crookstick. Other horsemen are in the rear tying back and making the line safe. On the box of the wagon sits a telegraphist who is constantly in touch with headquarters as the cable runs swiftly out. An orderly dashes up with an important message ; the wagon is stopped, the message dispatched and on they go again.

At Le Cateau the situation was so desperate that signal companies were sent to the trenches to assist the infantry in repelling a heavy attack. For this piece of work we were highly complimented by General Smith-Dorrien, who at the same time expressed his great satisfaction at the way in which his communications had been established throughout the campaign.

Telegraphists are often left on duty in the trenches and lonely farm houses, chateaux, &c., close to the firing line, and I leave it to your imagination to picture how difficult it is to concentrate one's mind on the signalling and reception of important messages while the air is filled with the deafening roar of artillery and the screaming and bursting of shells. An experience of this kind happened to me a short time ago in a lonely chateau on the Ypres-Menin road. The chateau was the centre of a perfect hell of German shrapnel for nearly a week, until it became almost untenable, and was abandoned by the Headquarters Staff. The General gave instructions that a telegraphist was to remain behind to transmit important dispatches from the brigades, and I was left in charge of the instruments in this shell-swept chateau for a day and a night. On the second day the Germans broke through our trenches, and the wires were cut up by shell fire. I was given orders to evacuate the building and smash up my instruments. These I saved by burying in a shell-proof trench, and then had to escape between our own fire and that of the enemy's across a field under a terrible tornado of shrapnel. On the early morning of the same day one of our cable detachments was cut up and another captured by the Germans only to be retaken by our sappers and drivers after a desperate and glorious fight.

In the region of the Aisne, where the hilly and wooded nature of the country admitted of much cover, spies often took advantage of this to tap our wires. The lines are constantly patrolled by mounted linemen, whose duty is attended with much risk. On one occasion a lineman, in passing along his patrol, noticed that there was a quantity of slack cable lying on the side of the road. Dismounting to coil it up out of the reach of traffic he found to his surprise that a piece of spare wire had been tied into the main line, and upon investigating discovered that it led to the top of a haystack, the wire being cunningly hidden in the straw. Going further down the line he tapped it and reported the matter to headquarters, then, mounting guard over the haystack, he awaited the arrival of an armed escort, who discovered the spy, together with several days' supply of food hidden in the depth of the hay.

Telegraphists of experience can often detect if anyone is tampering with the line. An operator on duty at Bavai, near Mons, was listening attentively to the buzz of the various stations in circuit on an important line when his attention was arrested by a very faint drone, which he knew immediately was caused by induction from another cable. He amused himself by writing down on a scrap of paper the signals as they faintly echoed in his receiver. Some French telegraphist, he thought, sending a cipher message. An officer looked over his shoulder, "Hello," he said, "so you understand German." When the excitement had subsided after the telegraphist's explanation, a scouting party was dispatched from ends of the wire, and succeeded in making a very neat capture. Wireless telegraphy, of course, plays an important part in this war, most of the larger aeroplanes being equipped with apparatus, by which means they swiftly communicate important observations to headquarters. The Germans also make elaborate use of this system.—(*The Times.*)

LONDON TELEPHONE SERVICE NOTES.

SINCE last month's notes ere written, the Telephone Societies have each met once more. On Nov. 23, Sir Charles King, the *Comptroller and Accountant-General*, read before the Telephone and elegraph Society a paper which was published at length in the last issue of this JOURNAL. The subject, as all must realise, is one which can only be properly treated by a master hand or by "a gripper," to use the picturesque phraseology of the Chairman. The discussion which followed was confined to a select few, or it might have been possible to elicit from Sir Charles his views on the respective average longevity of the Telephone, Telegraph, and Postal staffs, as evidenced by the Departments' pension liability in respect of each. One of the audience was heard to remark at the close of the evening that she could now appreciate the truth of those lines :—

"Kings are like stars, they rise, they set. They have
The worship of the world, but no repose."

The Telephone and Telegraph Society of London have, it is understood, decided to grant free membership this session to all those officers who were on the roll last year but are now serving with the forces of the Crown. It is further intended to forward, free of cost, to each such member a copy of this JOURNAL month by month. The course is one which will certainly be approved by the general body of members.

The Telephonists' Society continues to grow apace. Subscribing members already number more than 850 and the end is not yet. On Dec. 8 two papers were read. The first by Miss V. Rix, of the London Wall School, was entitled "The Training of Learners—Notes from Several Diaries." It described many of the difficulties which have to be overcome before the learner is fit to take her place in the "firing line." By way of illustration the reader cited a number of "howlers" perpetrated by learners. For example, one girl's definition of an "order wire" was "a wire on which the exchanges are ordered in and out of ondon." The paper was most effectively read, but the ensuing discussion was somewhat less well sustained han is usual at these meetings—possibly the audience, recollecting their own entry into the Service, felt they were on dangerous ground. The second, an address on "Ideals," was read by Mr. P. W. H. Maycock, and proved as distinctive as is usual with the products of his pen. Mr. Maycock accorded to "imagination" the premier place amongst the ideals to be sought in connexion with telephone work, and it was evident from his treatment of the subject that, like those other poets from whom he quoted, he is "of imagination all compact." A number of those present contributed to the discussion, and the company learned amongst other things of the manner in which an ideal chief may assist one to "walk amidst the stars." One of the participants in the discussion fell so far from the ideal as to parody one of Kipling's poems, which had figured i n Mr. Maycock's address. The revised version described the state of affairs when the "very last call is connected and the cords are twisted and torn." The engineers might say the last condition is not essentially one of the future.

No limits can be placed on "imagination" when once it is set free, and this is in some measure proved by the fact that at the last meeting of the Croydon Telephonists' Society a paper on this same subje t was read by Miss Pyne, of Purley Exchange. It is to be hoped that one at least of these papers will find a place in a later iss e of this JOURNAL. A second paper, which was a prize contribution, was read at this meeting of the Croydon Society Miss Hillier, a telephonist of the Purley Exchange, had secured the award offered to officers of that grade with less than two years' service, and in her paper she discoursed of the claim that "A woman's voice is her charm."

The next meeting of the London Telephonists' Society will be devoted to the reading and discussion of certain of the "competition" papers. The gathering should prove unusually interesting as the telephonists will be themselves responsible for the good things provided. They have shown their keenness at the earlier meetings, and it has been remarkable how many have joined in the discussions, and how exceedingly clearly and concisely all such have given expression to their different views. January is a busy month, but it will be a great pity if the attendance at these meetings, which has been so unusally good this session, should be allowed to fall off.

The telephonists of London are, as every one who has een privileged to work amongst them knows, generous to a fault, and since the launching of the original appeal for the Post Office Relief Fund it has received hearty support at all the exchanges. Not only are the subscriptions being increased all round, but entertainments have been organised and are being organised with a view to swelling the fund.

On Nov. 26 two concerts were held with this excellent object. One, at Laurence Hall, Southfield, was organised amongst the staff of the Western Exchange and resulted in a net profit of £5 10*s*. The leading spirits were Miss Hill and Miss Slevin, who worked indefatigably, and the hall was filled to overflowing. A most pleasing programme, which it is not possible to quote at length, was opened by Mr. Parkes and Miss F. James who, on violin and piano respectively, gave in succession the National Anthems of Britain and her Allies. The other artistes, all of whom acquitted themselves to their own credit and to the delight of the audience, were the Misses Alma Burrell, Armstrong, Winifred Kempe, M. Godding, C. Worth, D. Bott, G. Davis, H. Billing, R. Hicks, M. Herring, little Daisy Lemon, and Messrs. Osborne and Wright. Programmes were sold by Miss K. Dudley and Miss D. Hedgcock, whilst tiny Doris Clarkson and the little Miss Sheppard disposed of chocolates to the audience. Mr. Winney, who was present in uniform, undertook the duties of stage manager, and fulfilled those duties in a manner at once resourceful and witty. The programme concluded with a hearty rendering of "Rule Britannia," all the artistes being grouped round Miss Rosa Hicks who represented the Mistress of the Waves.

The second concert held that evening was one arranged by the members of the "Victoria" Exchange staff. This took place at the Fulham Town Hall (*small hall*), and proved a success in every way. The national airs again found *premier place on the programme, being played by Miss Evelyne Beaumont.* The whole programme was thoroughly enjoyed by the audience, and it is not possible to single out for special praise any one of the contributors. The artistes included, in addition to Miss Beaumont, Miss White who opened the second half with a pianoforte solo. Mr. Arthur Clark, the very spirit of *amiability*, added the duties of stage manager to the responsibilities of bass soloist. Mr. *Thomas Beck, now Exchange Manager of Museum*, contributed baritone songs, as did Mr. Stanley Edenborough. Mr. *Alfred Barclay gave* several character sketches in costume, whilst humorous items were provided by Mr. H. B. Vicerage and Mr. D. Ballard. Other lady artistes were Miss Myfanwy Williams (soprano) and the Misses Aimee Lismore and Minna *Noruschkat (contralto)* whose singing was extremely sweet. Several of the Victoria staff *undertook the sale of programmes* and chocolates, and they made a charming picture as they flitted to and fro amongst the audience. As a result of the concert a contribution of £17 has been forwarded to the treasurer of the fund, and the committee responsible (the Misses Garrod, Burdett, Beswick, B. Lear, and E. Williams) may congratulate themselves *on the signal* success of their efforts.

The evening of *Dec. 4 found yet another* concert in progress for the same excellent object. On this occasion the audience were *gathered at the* Sunday School Union in the Old Bailey. The responsibility for the arrangements had been undertaken by Miss Gladys Crompton, on the staff of Miss Heap, whose personal help was accorded as freely on this occasion as it is on all *others which aim* at the relief of distress. The concert proved not only a musical treat *but also a business success*, for its organisers were enabled, after paying all expenses, to send a sum of £20 *to the fund—making a total* of no less than £42 10*s.* in all from the three concerts referred to in a matter of eight days. It looks as if in this respect also it might be written *London leads.*

We *hear* there are several other undertakings of this kind in hand. We wish them equal success, *for the Post Office Relief Fund* cannot have too much money if the losses amongst the staff continue *at the present rate.* Considerably more than 200 widows are now on the register of the fund.

The "Central" Exchange have for some years past run what is known as a "Christmas Charities Fund," and the following is the balance sheet as *at Dec. 5, 1914*:—

	£	*s.*	*d.*		£	*s.*	*d.*
Balance brought forward from last session ...	20	17	3	Dolls' heads and dolls ...		3	8
Collected by Mr. Webb	3	14	4	Children's tea	10	0	0
				Children's toys (per Miss Dee)	1	10	1½
				Anaesthetics for Soldiers' Fund (per Mrs. Reddell)	5	0	0
				Children's tea (per Miss Dee)	5	0	0
				1 doz. hot water bottles (3rd London General Hospital)		18	0
				Five leg cradles (ditto)	1	2	0
				Fruit, *cigarettes*, chocolates, &c. (ditto) ...		17	9½
	£24	11	7		£24	11	7

The letters of thanks from or on behalf of the various parties benefited make pleasant reading, but space will not admit of their reproduction here.

There is no doubt that many of the other exchanges have somewhat similar funds, *and it might be possible to publish* a copy of the balance sheets in this column if the necessary particulars are *furnished.*

It has been the practice for some years past to send to various quarters a card of Christmas greeting from the office of the Controller, London Telephone Service, but this year a sum representing the cost has been sent *instead to the Post Office Relief Fund.* The wishes of peace and good will are of course *no less earnest because on this* occasion they have not received outward and visible expression. The *London Telephone Service* takes this opportunity of wishing all who may read these lines—A happy New Year. If 1915 enters in gloom may it end in a blaze of glory for Britain and Britain's Empire.

WHEN?

(*With apologies to* Mr. RUDYARD KIPLING.)

WHEN the very last call is connected, and the cords are all twisted and dead:
The very last headset broken, and the last "number please" has been said.
We shall rest, and faith—we shall need it; lie down to dream and sigh,
While the T.18's are preparing—to be answered by and by.

And those that are good shall be happy, they shall sit in an Avenue chair.
They shall use what expressions they fancy, without ever turning a hair.
They shall find real Saints to answer—Basil and Bernard and Paul,
And one or two *more Exchange Managers*—strange that they got there at all!

And only the Master shall praise us, and only the Master shall blame.
We never have worked for money; all we have got has been fame,
And each for the joy of the working, and each in her separate star,
Will gladly tell the subscribers what *their characters* usually are.

PERSONALIA.

NEWS OF THE TRAFFIC STAFF.

LONDON TELEPHONE SERVICE.

Promotions—

Miss EDITH A. M. HUTCHINS has been promoted to be Assistant Supervisor, Class II, at the East Exchange.

Miss CATHERINE E. PEACOCK to be Assistant Supervisor, Class II, Ealing Exchange.

Miss LILIAN MILDRED JUDGE to be Assistant Supervisor, Class II, Hampstead Exchange.

Miss DAISY F. TAYLOR to be Assistant Supervisor, Class II, Putney Exchange.

Miss WINIFRED AGNES BARBER to be Assistant Supervisor, Class II, Harrow Exchange.

Miss FANNY M. PERKINS to be Assistant Supervisor, Class II, at Woolwich.

Transfers—

Mr. FRANK GROVE, Exchange Manager, has been transferred from Avenue Exchange to Holborn Exchange. He was presented with a drawing-room clock and a set of silver backed brushes, as a mark of esteem, by the Avenue staff.

Miss ALICE BARRATT, has been transformed from the Hop Exchange to Gerrard Exchange.

Miss DORA MARTIN transferred from Central Exchange to New Cross Exchange.

Resignations—

Miss MAY MARY CHANNING has resigned in view of her approaching marriage, and has been presented by her colleagues with a clock, butter dish, a pair of trays, and an art pot. Miss Channing was formerly of Gerrard Exchange.

Miss ELSIE MAY SAUNDERS, Telephonist, Wimbledon Exchange, has resigned in view of her approaching marriage, and was presented by her colleagues with a tea service.

Miss ROSETTA L. MAIN has received the following wedding presents from the operating staff: half a dozen knives and forks, a silver butter knife, jam spoon and pepper dredge. Miss Main was connected with the London Wall Exchange.

Miss LUCY ASHLEY, Ealing Exchange, who is about to be married, has been presented by her colleagues with a glass fire screen

Miss OLIVE WINIFRED LEVEY of the Hampstead Exchange has resigned in view of her approaching marriage, and was presented with a dinner and tea service.

Miss GRACE DOROTHY BROWN, Hampstead Exchange, has resigned to be married. The staff presented her with a case of fish knives and forks.

Miss ISOBEL HAMPSON, Telephonist, Hampstead Exchange, has resigned in view of her approaching marriage, and has been presented with a case of meat carvers and fish knives and carvers, and a pair of silver gilt flower vases.

Miss LILY MAY WILLIAMS of the Avenue Exchange has been presented with a handsome set of cutlery as a wedding gift by her colleagues.

Miss EDITH M. FAWCETT, who is about to be married, was presented by her colleagues at Holborn with an electro tea-pot and an electro silver jam dish.

Miss E. L. ARNOLD, Hop Exchange, has resigned in view of her approaching marriage.

Miss EDITH GERTRUDE LETCHER of the Trunk Exchange, who has resigned in view of her approaching marriage, was presented with a cake stand, fruit bowl, tea knives, crumb scoop, two pairs of vases, sugar scuttle, and tea-spoons.

Obituary.

We regret to record that Mr. A. H. MASON, a night operator, of the Gerrard Exchange, has died abroad of gunshot wounds.

THE ISLE OF MAN TELEGRAPH AND TELEPHONE SOCIETY.

THE first meeting of the above society for the session 1914-15 was held at the Head Post Office, Douglas, on Nov. 5, H. F. Taylor, Esq., Postmaster, presiding. After the conclusion of the ordinary business, the first paper of the session was read by Mr. T. Longden, Inspector P.O. Enginering Dept., the subject being "Field Telegraphs." This proved to be a useful and instructive paper, and was very aptly illustrated by a number of experiments. It speaks well for the enthusiasm which exists amongst the members of this society that 86 per cent. attended this meeting, despite the very stormy weather which prevailed. Another feature is that 90 per cent. of the members have been undergoing for some weeks past military drill, and also are enthusiastic members of a local Rifle Club, so as to keep pace with the "national emergency." The second meeting was held on Dec. 3 at the Higher Grade School, Park Road, Douglas, when Mr. H. Cannell, B.Sc., gave a paper, the subject being "Condensers." The attendance was again excellent.

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WITH THE EXPEDITIONARY FORCE.

BY LIEUT. A. A. JAYNE, R.E.

No. III.

THE wires recently erected by the Royal Engineers in the neighbourhood of the firing line are excellent—the insulation loss at morning test being very small indeed. . . . Many readers will be familiar with the *pave* (cobble-stones) of the French and Belgian roads and the narrow strips of ordinary road on each side. . . . At one time one could drive many miles and pass nothing but mechanical transports, troops, infantry and cavalry, and ammunition columns. All kinds and conditions of animals, the colours of the Continental uniforms in sharp contrast to the khaki of ours, combine to make the procession more like a huge circus. There they were racing along; rakish-looking French wagons, motor omnibuses from London (advertising the "Criterion" and other theatres), and an extraordinary collection of vehicles from all parts.

In the middle of a French column could be seen Pickford's vans, Sunlight soap, Somebody's teas, Reckitts' blue, all out in holiday mood. It is quite a shock to see what one has always regarded as sober and law-abiding vans behaving in the most frivolous manner possible, as much as to say "this is our first trip to the Continent and we are going to enjoy ourselves." Many so far forget themselves as to slip off the *pave* and go along with their "hats" on the tilt, as if already the wine of the country had got into their heads. Others descend hills "broadside on" . . . all with as much sounding of horns, cracking of whips, and rattling of wheels as one would wish to hear. Then presently a huge lorry will throw discretion to the winds, lock its wheels with that of another, and the road will be stopped completely. The French soldiers get down and light cigarettes, the English will light fires on the roadside for tea or cooking, and all will make the best use of the respite offered.

English soldiers light fires under the slightest provocation, and they produce wood and fuel for the purpose in the most mysterious manner. They seem to have an organised plan of picking up every piece of wood to be found, concealing it on their persons and at the right moment light a fire with it. No matter whether it is a train stoppage or a waggon stoppage, a fire is lit and on goes the camp kettle. All this may be very interesting to those in the column, but if anyone wants to get on, a bye-road out of the blockage must be found.

When off the beaten tracks maps and sign posts must be very carefully studied or one would very soon be in what I heard an officer somewhat jocularly describe as "a position of extreme danger." The road up presents curious sights in many other ways, especially where it widens at a village or a little town. Here are the improvised smithies, forges, and the motor repairing shops, with here and there groups of A.S.C. men cutting up carcases of beef or mutton. . . .

On the other side an improvement is noticeable, and this gets better the farther one gets into Belgium. At the frontier one has to be careful over the pronunciation of names of places. If you ask the way of one peasant and give the place a French sound he is quite lost, until you have recourse to the Flemish which seems to approach, dare I say it? the German style. The process has to be reversed when a peasant of French origin is encountered.

At one Belgian town, yclept "———" which can be easily found on the map, I find that "bifsticks" and "mops" can be had at an hotel near the station. I am going to try "mops" when I have a holiday here after the war—the country is in too disturbed a state for experiments now. I preferred ration biscuits, cheese, and coffee, which can be obtained at a certain officers' mess held in a conservatory. A conservatory is an excellent place for cold collations on a warm day, but in cold weather not so agreeable, especially at night when it is used as a dormitory. Then officers have a fire in a large pail which is put outside at intervals when the air becomes too oppressive. On return journeys even one's temporary abode is "home," and the rattle over stones and the splash through mud is borne with a certain pleasure.

At frequent intervals one passes groups of Belgian refugees, generally women and children, with all that they can carry from their homes, trudging into France. Imagine the dusk of a December day, wind and rain blowing in great gusts across the flat country, with all the prospects of a raw and wet night, and these desolate people, footsore and weary, making for safety. There are no hedges to the roads and the wind has unfettered sway. One poor Belgian woman with her two little children was endeavouring to light a fire in one of the dykes by the roadside, for the purpose of getting something warm, the children with their scanty clothing trying to prevent the wind blowing the fire away. It was a picture of loneliness that I shall never forget.

No. IV.

THE area of the operations in Northern France having remained practically unchanged during the past three months the telegraph arrangements have to a great extent followed suit. It is therefore still necessary not to speak of places or give details regarding the movements of troops, and one has to fall back upon talking round the subject. We are "sitting" at present. The men in trenches wonder what the dickens the men behind are doing to pass the time along, and pitying their dangerous and uncomfortable positions; the men right behind cannot imagine why the deuce those fellows in front don't get a move on, and envy their regular cold water baths; and in between men on supply &c. columns, sit and think "what a wonderful thing steam is," vaguely searching the sky meanwhile in the hope that a Taube will hove in sight. Without question, the greatest war on record, has turned into aquatic sports on a large scale. No need to paint horses khaki colour, for they already look like the surrounding country and are in truth a part of it—horses and men get caked with mud.

The car I was in had broken down—I used to think this exceptionally bad luck, but I find that it is customary and indeed more or less looked forward to—and a motor cycle with side-car rescued me. Riding in a side-car is a very good turn in these parts. Every mechanical transport that passes sprays one very freely with mud, and as there are miles of them the condition one presents upon arrival at the rendezvous is most picturesque. It is also very comforting to be told about every two minutes "I say, excuse me, but do you know your face is covered with mud?" The only reply of course is, "Thanks very much. I didn't know." However, there is always welcome, lunch, and a dish of tea if you look in at a signal office, and one's sorrows are soon forgotten in the joy you give to others by your appearance. In the evening of this day the most expert car driver I have ever met, he is now a gunner officer, offered to drive me home. Out of the village we flew and down a six-mile road straight as a gun, our lights gleaming ahead and on either side the black flat countryside. Sometimes a side jolt of the car would disclose one of those narrow mounds by the roadside with a rough wooden cross at the head. "Halt! who goes there," and out of the dark comes a sentry with his shiny bayonet and swinging a hurricane lamp. "Friend, and here's my pass." "Pass, friend." On again for two miles and then a sentry's light from behind a cottage—"Halt!" There is no desire to run past in these times and we pull up with a jerk. No cursory examination is this. The pass is read very carefully and the lantern flashed in your face with a quick glance inside the car. "Pass, friend." On again until you come to a level crossing and you see a lamp swinging to and fro like a pendulum. No familiar "Halt!" but two pairs of keen questioning eyes. "Anglais, messieurs," but the reply is, "Laissez passer s'il vous plait." I don't like the look of the French bayonets nestling against the sentries' shoulders, and I am always thankful that I am not a German in disguise. They say little, do the French sentries, they simply hand over the pass and step back with a wave of the lantern.

One other to me rather notable breakdown was on the road to a place on the coast. As I started in the open car the morning seemed to be fairly warm, but in the open country I discovered quite a gale of wind blowing, and as the morning advanced the weather turned bitterly cold. The road quite suddenly takes a long steep decline, and upon negotiating the village nestling at the foot of the hill and the ascent on the other side the engine broke down—much to my relief, for I spent the time racing up and down the road to restore circulation. At our destination we found a good-sized hotel. Serviettes! above everything in the world. Fish! (Tommy never has fish after leaving the coast), and all the accompaniments of a fine luncheon. I am not an epicure, but after three months' exile *I did* appreciate the comfort of it all, it was astonishing. So was the bill, but it was worth it all. We started the return journey at 2 p.m., and with remarkable foresight I said to the driver, "if you *can* manage a breakdown halfway along I shall be grateful. Just outside the town, and ping, ping! on the face came the snow. Very soon we were covered and the snow lay hard on the roads and countryside. A breakdown came after very few miles, but of short duration, but long enough for me to warm my feet. Cars were passed on the roadside at frequent intervals broken down. "Can we help?" we shout. "No thanks," come the replies. At the foot of one hill there were two cars smashed up and a driver looking helplessly on. It appears from this driver's story that the car coming in the opposite direction was on the wrong side of the road and swerved to the right side just as he was endeavouring to avoid them. He shouted for them to reduce speed but without avail and the collision was then unavoidable. The occupants of the offending car were two civilians driven by a civilian. The usual amenities were exchanged and they waited for a friendly car to pick them up. A car came along with two English officers as passengers. They questioned the wrecked passengers and finally cross-examined them very closely with the result that they were taken on board the officers' car as suspected spies. Poetic justice, I thought this.

About halfway home our car broke down for good on the top of a bleak hill, dusk coming on rapidly. The engine would respond to none of the efforts of our half-frozen fingers, and at five o'clock we asked a passing car to send a lorry out for us. It was now pitch dark and one could see the country for miles covered with snow. The question I have asked myself hundreds of times came up, "Am I living in the twentieth century or have I gone back a hundred years?" The distant booming of the guns added to my sense of unreality. I said to the driver, "this appeals to me, the desolation; and surely Siberia cannot look worse than this." It did not however appeal to the driver who proceeded to enunciate attributes to the works of the car which I have never seen described in technical books. There was nothing to do but march up and down the road; the arrival of a long horse-drawn convoy in the dark road not tending to improve tempers, for as the wagons jolted by bales of compressed hay jumped off to the roadside. After much effort we got the convoy to stop, and all hands turned on to picking up 3-cwt. bales covered with snow and ice. Such groping and stumbling in the dark and as many strange idioms as one would wish to see and hear. The driver had reserve rations in the car which consisted of frozen bread and butter and cold unsweetened tea. With the aid of these and much tobacco we passed the next three weary hours until the rescue party came.

Speaking of breakdowns reminds me that a few hints as to what kit to bring here would be useful to many colleagues who will be coming out shortly.

First of all two good pairs of brown *grease* boots. If there is time coarse castor oil should be thoroughly rubbed in both outside and *inside* the boots. It is a good plan to pour some oil into the boots and let it soak in. Two weeks should be allowed for the boots to dry after which the only cleaning necessary is by a hard brush which will impart a dark mahogany polish and will give the wearer the appearance of having served His Majesty in the Army some years!

Two pairs of loofah socks for boots and four pairs of thick woollen socks.

Regulation puttees and gaiters, one tunic and one great overcoat. In spite of the fact that British "warms" are the fashion, I am of opinion that the old-fashioned great coat is better for our purpose. I have asked many officers out here and they confirm this view. When it is cold enough to wear a coat then the great-coat is good enough, and when very cold, riding in an open car, or sleeping out, it is indispensable When it is not too cold for a coat the Burberry meets all requirements. By the way, get the Burberry which fits loosely. One pair of good riding breeches is sufficient for many months. It is a matter of taste but I would not trouble about "slacks" nor about polished brown boots. Indeed, the latter are not required at all.

I thoroughly recommend a good cardigan jacket with sleeves, and until the really warm weather comes it should be constantly worn. It is an almost certain preventive against chills.

Get a waterproof cover extended over the collar to the cap, this will prevent rain pouring off the cap down the neck.

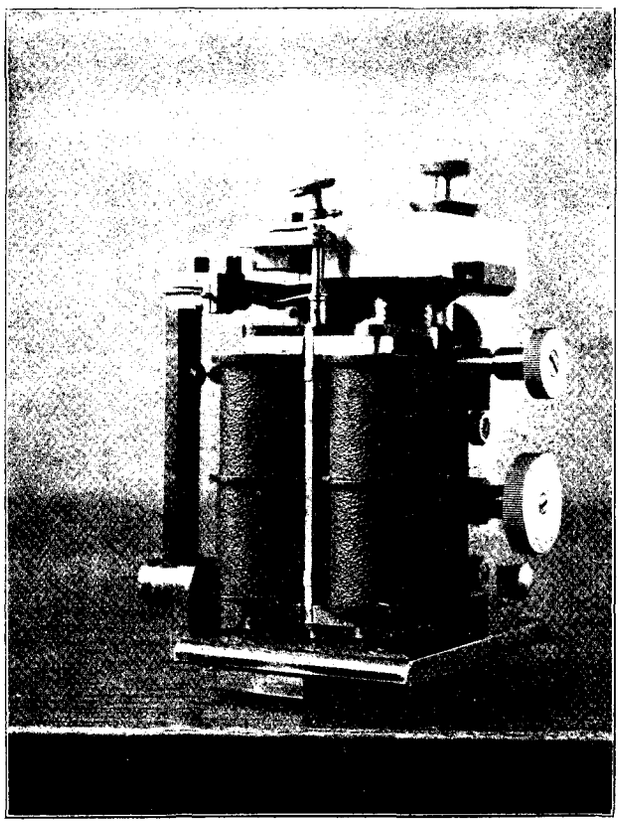
Give the Sam Brown belts and all his leathern children three or four coats of boiled linseed oil. This takes the "*nouveau riche*" appearance off. Woollen and kid gloves, a long woollen scarf, two changes of underclothing, complete the extras, except of course

two suits of very striking pyjamas. Bring a mess-tin equipment, simple shaving outfit, a folding bed (no mattress), and a good thick sleeping bag with pillow. Bath &c. are generally included in the bed equipment. Bring coal tar soap, matches, and . . . Keatings. The latter will be needed later. Finally, pack them *all* into a kit-bag or if a valise bed has been chosen roll them into one parcel and don't mention the weight of the package too often to Camp Commandants and other officers. Don't worry about polishing your buttons and belts on active service. And, oh yes! don't go too near anything that's likely to explode.

THE UNDULATOR.

By EDWARD BOYD (*Aberdeen*).

THE undulator is a receiving instrument used extensively by the Great Northern Company but only to a very limited extent by the Post Office, viz., on the circuits London—Nantes, Aberdeen—Lerwick, Aberdeen—Kirkwall, and Lerwick—Thorshavn—Seydisfjord (Faroe and Iceland), the latter being extended to Aberdeen by Lerwick when that office is closed. The distance from Aberdeen to Seydisfjord is nearly 900 miles, and for several years the circuit was worked direct, but to improve the signals a simple repeating arrangement was introduced at Thorshavn in the Faroe Islands.

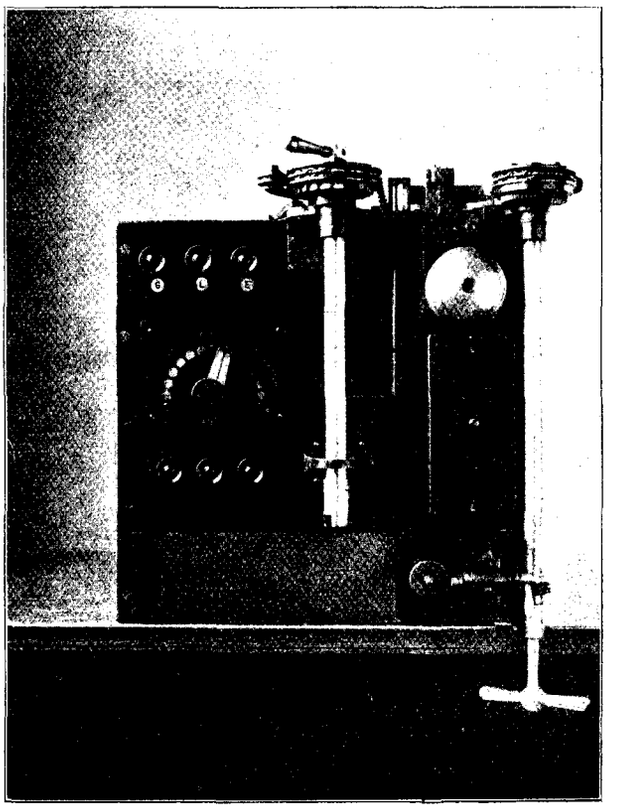


UNDULATOR HEAD WITH SIPHON FIXED.

and a Gulstad relay at Aberdeen. Experimental trials have also been made between London—Jersey, London—Cork, and Bristol—Cork, and although the results obtained were satisfactory when in the hands of experts, undulator working was abandoned for commercial reasons. The Aberdeen—Lerwick circuit prior to the introduction of the undulator was worked on the Bridge Duplex Wheatstone principle, at a speed of approximately 50 words per minute each way. This speed was insufficient to carry the heavy season traffic, which varies from 1,200 to 1,500 telegrams daily, without incurring considerable delay. To reduce the delay a repeater was installed at Wick by which the speed was increased to 100 words per minute each way, but this was a costly remedy, since it necessitated not only the loan and maintenance of expensive apparatus but the employment for several months of two skilled repeater clerks drawing subsistence allowances.

Undulator working was then tried with the result that the Wheatstone receiver was abandoned in its favour. The standard speed of the circuit is now 100 words per minute, but this alone does not represent the superiority of the system since the extreme sensitiveness of the instrument permits of the maintenance of duplex working on a line with a leakage so great that the ohmic resistance is reduced to less than half the normal value.

Further, on several occasions when the Lerwick direct cable was interrupted, communication was maintained by means of



MOTOR, SHOWING SHUNT.

Aberdeen—Kirkwall plus Kirkwall—Lerwick omnibus circuit, which until recently had five stations grouped on it. With Wheatstone working this would have proved insurmountable, and Kirkwall with its limited staff would have had to transmit the traffic.

To give some idea of the sensitiveness of the undulator the writer on one occasion had to substitute a faulty section (Perth—Aberdeen) of the Newcastle—Bergen line by another line nearly as low in insulation resistance.

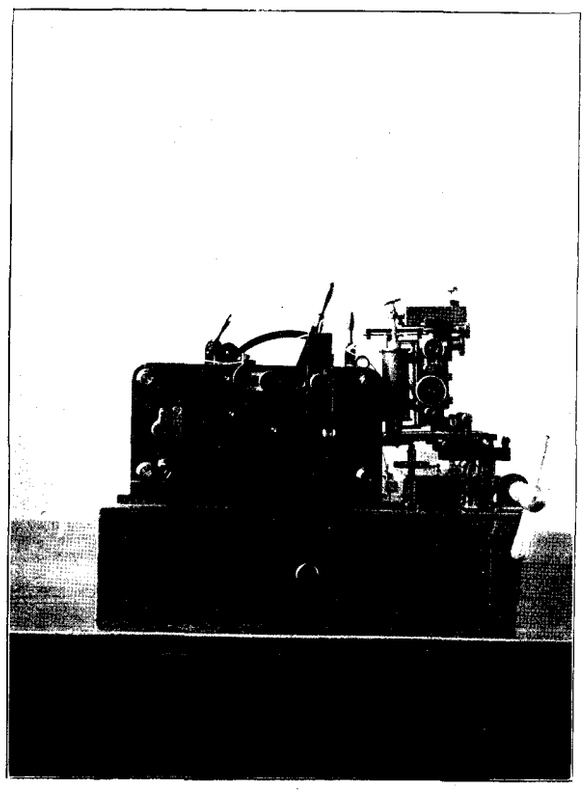
To prove the Aberdeen—Newcastle length it was connected to a Wheatstone receiver, but only fragments of signals were received. On the substitution of an undulator, signals were exchanged and the circuit was handed over to the company who reported it worked well at simplex. This sensitiveness, however, is also a defect since it renders the instrument particularly liable to inductive disturbances from other lines, but these, as a rule, can be eliminated either by inserting a shunt resistance, with which it is provided, or employing anti-inductance devices, (the latter are fitted on both Aberdeen—Lerwick and Aberdeen—Kirkwall circuits). Moreover, a higher engineering maintenance standard is required on the aerial sections. In support of the latter statement I would mention that when at Cork I found the aerial section between

Success to the Telegraph and Telephone Journal.

Success to the Telegraph and Telephone Journal.

Cork and Waterford so full of cross leakage and inductive disturbances that duplex undulator working on the Cork—Bristol circuit was impossible until the maintenance was improved, whereas Wheatstone working to London was unaffected.

The undulator when first introduced at Aberdeen some eight years ago was worked on the "systematic" principle, but when the traffic load was light it was found there was a waste of force. This was overcome by substituting for the galvanoscope, which was required for indicating calls, a Post Office standard relay specially wound and a sounder, in order that key or systematic working could be resorted to as necessity dictated.



MOTOR, TRAIN AND HEAD COMPLETE.

The undulator itself consists of four parts, the head, motor, train, and a galvanoscope. The essential parts of the head are two coils, which can be joined in series or parallel, the series resistance being 800 ohms, a thumbscrew for regulating the distance between them, an armature, made up of two bar magnets placed between the coils and mounted on a spindle, which also carries a saddle for fixing the syphon (silver or glass) and a horizontal arm having attached to it two tension springs for regulating purposes. The syphon is fixed at a suitable angle and has its upper end dipping into an inkwell, the lower end being in contact with the recording paper. By capillary action the ink flows through the syphon and normally a straight line is registered on the paper. The signalling currents in passing through the coils act inductively on the bar magnets, and an undulatory motion is given to the syphon which returns to the zero position with every reversal of the marking current. Provision is also made for raising and lowering the coils and also clearing the syphon from the slip when it is not in use. The motor and train are similar to those of the Wheatstone receiver excepting that the former carries a shunt from 0 to infinity, whereby the sensitiveness of the coils can be increased or decreased, while the train is so clamped to the motor base that it completes the connexions between the line, shunt, and undulator coils.

It is impossible in an article such as this to go into technical detail but some idea of the instrument may be gathered from the accompanying photographs, which illustrate the various parts, while the slip represents the character of the undulations with their variations in amplitude.

In conclusion it should be stated that the satisfactory results obtained at Aberdeen are, in a large measure, due to the determination of the staff to overcome difficulties by noting the effect of every fault as it appears and the means taken to remove it.

My thanks are due to Mr. W. Black of the Aberdeen staff for the photographs.

GLASGOW TELEPHONISTS' SOCIETY.

The first two ordinary meetings of the Telephonists' Society which took place during the first half of the session were held on Nov. 16 and Dec. 14 respectively. On the former occasion the subject for discussion was "What is a Good Service?" This subject was ably introduced by the Traffic Superintendent, Mr. N. L. Smith, who dealt with the following points:—(1) Who is the best judge of a good service? (2) Times of answer and clear. (3) Effectiveness of proper tone of voice. (4) Supervision of calls while in process of getting through. (5) Ineffective calls and methods of treatment. (6) The reasons for and utility of standard expressions. These heads were dealt with in an exhaustive and interesting manner which was greatly appreciated by the large attendance of members. Points of difficulty were afterwards introduced and discussed by members. Miss Benson, of the Central Exchange, raised some interesting cases which were analysed and explained by Mr. Smith. On the second occasion Mr. D. Howieson (Assistant Traffic Superintendent, Class I), dealt with the "Problem of the Subscriber." Under this title an excellent exposition was given of subscribers' difficulties with their apparatus, carelessness with manipulation and service and the effect of the subscribers' shortcomings on general good service. Incidental to the subject an interesting practical demonstration of the manipulation of different types of switchboards at present in use in the area was given by Mr. Howieson. The amount of interest displayed by the members in the apparatus at the close of the meeting was very gratifying and augured well for future better understandings between subscribers and staff.

POST OFFICE EXPERIMENTS WITH AUTOMATIC EQUIPMENT AT TELEPHONE EXCHANGES.

BY F. C. G. TWINN.

As a result of an investigation of the telephone system of the United States, made by certain officers of the Post Office in 1911, it was decided to fit one or two telephone exchanges in this country with automatic equipment, already widely employed in America, in order that the suitability of this type of equipment for the telephonic service of this country might be determined by practical experience. Arrangements were accordingly made with the Automatic Telephone Manufacturing Company to replace the manual equipment at Epsom and the official switchboard in the General Post Office in London by full automatic equipment of the Strowger type—which is most generally in use in America—and with the Canadian Machine Telephone Company of Toronto to equip an automatic exchange of the Lorimer type at Hereford.

It should perhaps be explained at this point that there are two main types of automatic telephone equipment, the full automatic and the semi-automatic.

A subscriber connected with an exchange equipped with full automatic equipment is able to call any other subscriber on the same exchange without the intervention of an operator, although for calls to other exchanges fitted with manually operated plant the services of an operator are necessary.

A subscriber served by a semi-automatic exchange is not able to set up his own local connexions, but, like a subscriber on a central battery manual exchange, has to gain the attention of an operator by raising the telephone receiver from the hook, and it is the operator's duty to actuate the automatic mechanism and furnish the calling subscriber with the connexion he desires. No semi-automatic exchange is at present working in this country, but arrangements are in contemplation to replace the existing magneto "Central" Exchange at Liverpool by a semi-automatic exchange to be erected in the "Bank" Exchange building. It seems unlikely that semi-automatic equipment can prove cheaper than manual plant, and in all probability it is chiefly valuable during a period of transition from manual to full automatic working. It has this advantage, that, in a mixed system of automatic and manual exchanges, the method of working is kept uniform so far as the subscriber is concerned. Moreover a semi-automatic exchange can readily be converted to a fully automatic exchange whenever necessary.

The automatic exchange at Hereford has only just been brought into use, but the exchanges at Epsom and the General Post Office have been in operation since 1912 and have afforded, on the whole, a very satisfactory service. These two exchanges were equipped with the object of ascertaining whether automatic equipment was capable of affording a satisfactory service in the climatic and traffic conditions existing in this country, and it was not expected these preliminary experiments would show the extent to which the replacement of manual by automatic equipment could be justified on financial grounds.

The capital cost and the cost of maintenance are appreciably higher in the case of automatic than in the case of manual equipment, and it is clear that the employment of such equipment in preference to manually operated plant can only be justified if it produces advantages and economies in other directions sufficient to outweigh the higher cost of providing and maintaining it.

Naturally the main economy to be expected from the use of automatic equipment is in operating staff and accommodation, and it follows that automatic equipment can most usefully be employed for exchanges where the amount of trunk, junction, and other traffic requiring the services of operators is relatively small.

These preliminary experiments may, however, be regarded as successful, inasmuch as they have conclusively shown that an automatic plant can be made to give a very satisfactory service in this country and have been considered fully to justify more extended experiments in connexion with exchanges of various sizes

The following table shows the exchanges at which fully automatic equipment is being installed, the capacity of the equipment to be filled in the first instance, the anticipated ultimate capacity of each exchange and the company by whom the equipment is being manufactured :—

Exchange.	Area.	Capacity.		Company by whom equipment is being manufactured.
		No. of lines for which the inital equipment is designed.	No. of lines which the equipment is designed to serve ultimately.	
Colnbrook	Windsor	—	50	Siemens.
Hurst	Reading	—	50	Siemens.
Kelvedon	Colchester	21	50	Siemens.
Ramsey	Ramsey	—	50	Siemens.
Chepstow	Chepstow	65	100	A.T.M.Co.
Dudley	Dudley	500	1,600	W.E.Co.
Accrington	Blackburn	700	1,500	A.T.M.Co.
Darlington*	Darlington	800	2,800	W.E.Co.
Stockport	Stockport	950	2,260	Siemens.
Paisley	Paisley	1,100	2,150	A.T.M.Co.
Grimsby	Grimsby	1,300	4,000	Siemens.
Newport	Newport	1,800	3,500	A.T.M.Co.
Blackburn	Blackburn	2,400	4,000	A.T.M.Co.
Portsmouth†	Portsmouth	5,000	7,000	A.T.M.Co.
Leeds	Leeds	6,600	10,000	A.T.M.Co.

* Now working.
† Including the system to be purchased from the Corporation.

In addition it is proposed to equip all the exchanges in the Sheffield area with full automatic equipment and, as previously mentioned, to replace the present Liverpool Central Exchange by a semi-automatic exchange to be accommodated in the "Bank" building.

As indicated above, the main question now to be determined is how far the replacement of manual by automatic equipment is capable of justification on financial grounds, and it is hoped these experiments will enable the Post Office finally to determine the conditions under which the automatic or semi-automatic exchange is preferable to the manual.

The exchanges selected as suitable for the comprehensive series of experiments now contemplated may be divided into five groups :—

(1) The village exchange (Kelvedon, Ramsey, Hurst, Colnbrook—not exceeding 50 lines).
(2) The small exchange (Chepstow).
(3) The exchange of medium size (*e.g.*, Accrington).
(4) The large exchange (*e.g.*, Portsmouth and Leeds).
(5) The exchange system (Sheffield).

The village exchange.—Considerable difficulty is constantly being experienced in providing a continuous service at small and comparatively isolated exchanges in rural districts at a cost at all commensurate with the revenue to be expected. In such cases as these it is clear that automatic equipment would be of great service always provided that it could be made simple in design and reliable in working, so as not to require the constant attention of skilled maintenance staff which in such districts would not be readily available. The main difficulty in extending the use of automatic equipment for these small exchanges has been the necessity of obtaining a supply of power for working the mechanism, and in

the localities now under consideration, where automatic exchanges might be expected to prove particularly valuable, a power supply is rarely available. At least five small automatic exchanges of under 100 lines are at present working in Germany, but these are situated only in places where there is an electric supply for charging the cells, although attempts are being made to arrange for their adaptation to places other than those provided with a power supply by charging the batteries at night over junction lines from the nearest centre. It is not expected that this method could be adopted in this country owing to the character of the junction lines used in connexion with these small exchanges.

Recently, however, Messrs. Siemens Brothers & Company, of Woolwich, have designed automatic equipment for small exchanges with not more than 50 subscribers' lines which can be worked from primary batteries, but for various reasons this equipment in it present state of development cannot, it is feared, be widely employed in this country.

In the first place it is essential that the line connecting the village exchange with the main exchange should be reserved for a single office, and also that a metallic circuit of good quality should be used. This largely restricts the utility of the automatic system in rural districts, where frequently the only economical means of providing an outlying place with telephonic communication is to group several exchanges on one line or to use a single wire which was originally provided for telegraph working. It is, of course, possible that automatic working might result in such enonomy as to make it worth while to incur the additional cost of special junction lines in order to admit of its introduction, and this aspect of the question will be borne in mind.

As regards communication over the junction lines to the main exchanges, there are difficulties due to the absence of operators to regulate the traffic.

Junction circuits connecting small exchanges are very frequently used for the telegraphic service also; at present the attendant at the small office can regulate the traffic as between telegram and junction calls, but on an automatic system a subscriber who "dials" a number which should connect him with the junction circuit while a telegram is being dictated will get the "busy signal," but the telegraphist will be unaware that the line is wanted. But these difficulties are probably not insurmountable, especially if junction lines are provided on a sufficiently generous scale, to leave a reasonable margin for growth in excess of the actual traffic requirements.

As regards the arrangements for making good defects in the apparatus, the staff on duty during business hours could no doubt attend to the alarm signals which would be actuated if anything went wrong and summon the Engineering staff to effect the repair. This would not be practicable out of business hours, but in any case repairs could not as a rule be effected at such times in the case of an ordinary manual board.

Again, this particular type of automatic apparatus is not capable of working calls from call offices fitted with coin-collecting boxes. It might be possible to make arrangements for dealing specially with calls from call boxes and with rural party line calls during business hours; but at night and on Sundays calls from coin-collecting boxes would have to be allowed free of charge.

Notwithstanding these limitations of the village automatic exchange as at present developed, there are no doubt man places in which it could usefully and economically be employed. It is possible even that it might prove suitable in cases where for special reasons it might be necessary to give attendance throughout the day—so that the benefit of the automatic equipment would only be obtained as a means of overcoming an otherwise insuperable difficulty in providing attendance at night and on Sundays. All this must be the subject of trial, and the experiments at Kelvedon, Ramsey, Hurst, and Colnbrook will be watched with particular interest.

The small exchange.—The use of automatic equipment for small exchanges with more than 50 direct lines is, as indicated above, precluded in the majority of cases by the absence of a power supply. Where no power supply is available there would be no alternative to installing an oil engine and generator with secondary cells. Moreover, in the case of such exchanges the day service is as a rule not unduly expensive and the main saving to be set off against the high cost of automatic plant of the ordinary type would be the cost of night attendance.

On the whole, therefore, it is clear that in its present stage of development automatic equipment cannot economically replace manual plant in the small exchanges if all the facilities which the latter can be made to afford are still to be offered, and so far as can be judged without practical experience its use is not likely to be justifiable except in cases of special difficulty, where it offers the only means of affording a continuous telephone service which for any reason it is difficult or undesirable to refuse.

It was thought necessary, however, fully to examine the suitability of automatic equipment for exchanges of all sizes, and the Automatic Telephone Manufacturing Company were accordingly asked to equip the Chepstow Exchange (Newport area). The automatic plant which they are installing there is of the same type as that being installed by the Automatic Telephone Manufacturing Company elsewhere, and is capable of affording all the facilities which manual equipment could afford.

Exchanges of medium size and large exchanges.—The exchanges selected for automatic working which may be grouped under this heading are Dudley, Accrington, Darlington, Stockport, Paisley, Grimsby, Newport, Portsmouth, and Leeds, and the new exchanges it will be noticed will accordingly vary in capacity from 500 to 6,800 lines. Complete records will be kept of every item of expenditure incurred in connexion with the establishment and maintenance of these automatic exchanges, and the records will be carefully analysed and compared with similar records which will be compiled at the same time for manual exchanges of similar character and capacity, and it is hoped that after careful study of the data which will thus be afforded, the conditions under which manual equipment can usefully and economically be superseded by automatic will definitely be determined.

The exchange system—Sheffield.—The economy in operating staff which is effected by the replacement of manual equipment by automatic equipment in a given exchange is increased if that exchange becomes one of a group of automatic exchanges, as junction calls between exchanges in the group can then be effected by the subscriber by means of the automatic exchange apparatus without the intervention of a junction operator. In the case of a group of exchanges the only calls for which the intervention of operators is needed—with the exception of coin-box calls which require special manual treatment—are calls to exchanges not included in the automatic group. It follows therefore that, from the point of view of economy, automatic equipment would be likely to compare most favourably with manual plant if fitted in exchanges forming an intercommunicating system. The fact is borne out by the study of the Sheffield area which has now been completed, for it is found on the figures of cost at present available that the adoption of automatic equipment for the Central, Owlerton, Sharrow, Attercliffe, Broomhill, and Beauchief Exchanges would result in an immediate saving of approximately £3,000 per annum.

The Department has not had sufficient experience of the working costs of automatic plant, and an exact financial forecast cannot be expected, but the figure given, £3,000, is believed to be a safe and conservative estimate.

The early introduction of automatic equipment into the Sheffield area must not, however, be expected as the work if commenced at once could not be completed in much under three years.

ERRATUM.

WE regret that by a printer's error, which will have been obvious to our readers, "it is said" appeared instead of "it is sad" in our obituary notice of Mr. Crabb in last issue.

PRESS-THE-BUTTON TELEGRAPHY.

BY DONALD MURRAY, M.A.

(*Continued from page 77.*)

IV.

THE London-Edinburgh Murray automatic circuit had not been long in operation before some of the drawbacks to automatic systems came into view. At the same time I had observed that the Baudot multiplex had also limitations, and at the beginning of September 1903 I started to work out a scheme that I had in mind for combining the advantages of the Murray automatic and the Baudot multiplex under the title of the "Autoplex." I prepared blue-prints of the essential features of the various machines required, wrote out an account of the advantages and disadvantages of automatic and multiplex systems, and described the proposed combination of the Murray automatic and the Baudot multiplex. I sent confidential copies of this paper of 1903 to the British, French, German and one or two other Administrations in September, October, and December 1903. That paper, which I have kept confidential up to the present date, contained the whole of the elements that go to make up the present Murray multiplex and its American off-shoot, the Western Union multiplex. In two respects only I went wrong. At that time I still thought there would be a large field for the automatic, and I proposed to retain the lengthways perforated tape of the Murray automatic system, so that the tape for the two systems would be interchangeable and many of the instruments would be the same. Now that I have realised that the field for the Murray automatic is restricted to a few very long lines I have adopted cross-perforated tape for the Murray multiplex, and, acting on my recommendation, the Western Union has done the same. The advantages are great, as I shall explain later on. The second point in regard to which I went wrong was in assuming that the speed on a typewriter keyboard would only average 30 words (180 letters) a minute. I know now that young girl typists of 20 to 25 years of age can work at 45 words (270 letters) a minute with ease all day long, and that many can work without difficulty at 50 words (300 letters) a minute. These figures are not based on mere fancy tests, but are the results of practical experience on ordinary commercial traffic continued not merely for hours but for many months. These high speeds on typewriter keyboards are of great practical importance.

With these two exceptions of the telegraphic tape and the telegraphic tempo of the future, I made a really surprising forecast of all the features of the modern multiplex in my paper of 1903. After describing the advantages and disadvantages of the automatic and the multiplex and the advantages of a combined system (a subject with which I propose to deal later on), I said :

1. "Obviously in a multiplex system printing direct at the receiving station, the transmitting operator must have complete control of all the actions of the printer. . . . Each message must be automatically written and tossed out of the printer complete like a ticket from a cash register." I outlined mechanism for doing that, and that is exactly what the Murray multiplex printer recently tested on the London-Manchester Murray multiplex circuit does to-day. The girl typist presses the buttons and the machinery does the rest. The title of these articles has been criticised as "rather imaginative," but "Press-the-Button Telegraphy" is a solid and successful fact at the present moment, not only with the Murray multiplex but also with several other page-printing systems. The Murray multiplex, however, is the only one using an entirely automatic cut message-form feed, and is therefore the only one of which it is strictly true that the whole of the telegraphic operations are performed by pressing buttons at the sending station.

2. I proposed that the new multiplex should retain the advantage of the Murray automatic in maintaining synchronism from the signals themselves. The Murray automatic was, I believe, the first high-speed printing telegraph to do that, and I have not discovered any anticipation of my proposals for applying the same principle to the multiplex. I went fully into this matter in my paper of 1903, the essential point being what I described as an "idle signal," or "temporary correction" to come in and maintain synchronism when no operator was transmitting. This idea of omitting the two special correcting contacts on the Baudot distributor and securing synchronism from the signals themselves, and in the absence of signals by means of what I described as "an idle signal," has since been carried out by the French Government on the Baudot across the Mediterranean between Marseilles and Algiers It has also since been applied in the Siemens & Halske automatic printing telegraph. The Western Union has hit upon the same plan and is applying it to the Western Union multiplex. Now that the Western Union and a German printing telegraph are using the idea, the British Post Office, I am told, is much impressed by it, though no one became enthusiastic about it when I submitted it to the Post Office eleven years ago. The gain of course is the use of five instead of five and a half units per letter ; but British distances are so short and the carrying capacity of the lines so much above any probable requirement, that it is really not of much importance in most cases in this country.

3. I also proposed to drive the distributors by the phonic wheel motor and vibrator, and I gave a diagram and description of the electrical method of maintaining synchronism between two phonic wheel-driven distributors that has been employed on the Murray multiplex between London and Manchester for the past three years. I repeatedly recommended the driving of Baudot distributors by the phonic wheel motor, but without effect. Now, however, that I have patented this combination of the Baudot mechanical method of correction, the phonic wheel motor and the vibrator, it seems to be coming into favour, and I have already received an order from the Indian Telegraph Administration for two phonic motors fitted to two Baudot distributors.

4. I explained that in addition to the five-key Baudot method of transmitting, there would be available a typewriter keyboard transmitter for direct transmission with "cadence" or timing mechanism and a letter-counter, or indirect transmission by a keyboard perforator, perforated tape, and a small transmitter under the immediate control of each operator. I added, in regard to indirect transmission : "This is the plan I prefer because it will combine the advantages of both automatic and multiplex methods of transmission. It will give the much desired 'free' typewriter keyboard. It will give instant correction of errors before transmission, so that there will be no sign of the correction in the printed message. It will do away with the necessity for an extra attendant to feed the automatic transmitter. As each tape will go direct from its keyboard to its transmitter, it will not be necessary to punch more than half a message . . . before transmission begins. . . . The transmitter will be a small and simple instrument operated by the distributor, without clockwork or motor. It will start or stop automatically accordingly as the tape is slack or tight. The operator will not have to pay any attention to the transmission. It will be completely automatic. He will have nothing to do but send his messages as fast as he likes on a free typewriter keyboard." I also pointed out that tape transmission had the advantage of supplying a "home record" of the messages transmitted. Further on I described and illustrated the automatic starting and stopping mechanism of the transmitter, and explained how it was arranged to start and stop between the transmission of letters so as to avoid mutilating signals and also to stop on the negative contact so as to avoid sending any positive or operative current to the line when the transmitter stopped. These are the essential conditions for automatic starting and stopping of a multiplex tape transmitter, and they have been carried out mechanically in the improved Murray multiplex tape transmitter. In the perfected Murray multiplex I have greatly improved the tape transmission by so designing the keyboard perforator and the tape transmitter that transmission can proceed up to within twelve letters or three seconds of the last letter perforated. With this new tape transmission at 45 words a minute, there is less delay in transmitting a message than with the Baudot direct five-key transmission at

the standard Baudot speed of 30 words a minute. In regard to the direct transmitting typewriter keyboard machine, one was made to my design by the British Post Office and tried in the gallery on the London-Birmingham circuit. It worked excellently so far as the mechanism was concerned, but the necessity for operating at a fixed speed made it much less efficient than a keyboard perforator and tape transmitter. Its use was therefore abandoned in favour of the keyboard perforator and tape transmitter, and it is now in the Post Office Museum.

5. For the reception and printing of the messages in page form direct from the line signals, I described a printer, the same in general principle as the Murray multiplex printers that have been in use on the London-Manchester circuit for the past three years. The weak point was the use of a small typewheel typewriter. I did not realise then that a typewriter well adapted for hand use might be very ill-suited for the severe work of machine telegraphy. So it proved unfortunately. That one mistake did the Murray multiplex more harm than anything else. About a year ago I substituted a type-bar typewriter and the machine so fitted gave excellent service during six months' trial at the General Post Office in London.

6. I entered at length into the automatic page-feed question, mentioning the various possibilities, including the use of a blank roll of paper, tearing off the messages and printing the heading in afterwards with a rubber stamp, and I gave preference to the cut message-form feed, which I have only recently succeeded in perfecting on lines similar to those I proposed in my 1903 paper. If I had only done that at first I would have avoided much trouble.

7. I proposed an arrangement by which two transmitters would transmit alternately to one printer. Mr. John Gell subsequently hit upon this idea independently of me and took out a patent on it as applied to Wheatstone transmitters. I pointed out that two transmitting operators and one printer attendant would in this way be able to do the work of two transmitting operators and two printer attendants. There would be a considerable saving of labour, but there would be a delay of one message in transmission. When the Murray multiplex was first tried from Birmingham to London two transmitters in Birmingham sent to one printer in London and the results were surprisingly good. I believe this arrangement will be found to be of considerable value in certain circumstances in future, but at present the powers-that-be seem to regard it as "rather imaginative," like the title of these articles.

8. I provided for automatic reperforation of messages at the receiving station simultaneously with the printing of the messages in page form direct from the line signals. I further made arrangements for giving the sending operator control of the receiving perforator so that only messages requiring retransmission would be reperforated. Nothing has been done in this direction in Europe, so far as I know, in connexion with multiplex systems, but I made one of these multiplex reperforators and sold it to the Western Union. They have altered the design to make it suitable for cross-perforated tape, and I understand that in due course it will be used freely in the United States. I am making six for the New Zealand Government to work in conjunction with the Murray multiplex apparatus being made for that Administration. Even if it is not found suitable for commercial messages in this country, it will certainly be found valuable for news work, for which the Murray multiplex apparatus is ideally suited.

9. The autoplex system was arranged for duplex working. The Rowland multiplex led the way in that respect, and the successful duplexing of the Baudot, first done by Mr. A. C. Booth, is shown by the satisfactory operation of the Baudot sextuple duplex between London and Birmingham, giving no less than twelve channels on one wire, and by the fact that the Western Union, after a year's experience on the New York-Boston circuit through all conditions of weather, has never yet been unable to operate full quadruple duplex. Mr. G. M. Yorke, Chief Superintendant of Plant for the Western Union, tells me that they have abandoned any idea of simplex working, and they propose to meet any bad line conditions by reducing the speed when necessary.

10. I pointed out that the new multiplex system would have a speed far beyond the automatic. I gave the limit of the Murray automatic as 150 words (900 letters) a minute each way with a possible 180 words (1,080 letters) a minute. That was in 1903. Curiously enough in the *Glasgow Herald* trial six years later I reached 184 words a minute, and that proved to be the limit. In the 1903 paper I pointed out that the performance of the Rowland multiplex and the Baudot proved that it was theoretically possible to attain a speed of no less than 450 words a minute in each direction on a line that would permit of such a speed. Already the London-Birmingham Baudot sextuple-duplex is working at a speed of 180 words a minute in each direction on regular commercial work, and the Western Union quadruple duplex between New York and Boston is working at 45 words a minute per channel or 180 words a minute in each direction as an ordinary commercial speed. That is substantially beyond what is possible under commercial conditions with any automatic system, and it is by no means the limit.

As I have already explained, I sent confidential copies of this paper of 1903 to various Administrations. I received a courteous acknowledgment from the French Government, and the Engineering officials of the British Post Office showed interest in the matter; but there it rested till 1906, when the British Post Office took up the proposal and a start was made under my supervision on the development of the Murray multiplex. In a year I had it running well in the laboratory, and arrangements were made to construct a few instruments for practical trial. There were many delays and it was not till February 1909 that the Murray multiplex was started with two transmitters in Birmingham and one printer in London. In a month or two it was giving very good results. In September 1909 the Post Office decided to have a complete double duplex installation made. The apparatus was not ready till the end of 1910 and preliminary testing and alterations were not completed till March 1911, when the work of installing the system between London and Manchester was begun. After further vicissitudes it was started on traffic and it has been running ever since. Considering that the apparatus was little more than an experimental set, the results have been good, and they would have been much better if the printers had been fitted with a stronger and more reliable typewriter. This part of the mechanism has been the despair of the mechanics, and how the Post Office has had sufficient patience to keep it going for three years I do not understand. The improvements in the Murray multiplex have rendered the London-Manchester installation quite out of date. In November 1911 the Western Union took an option on the Murray multiplex for the United States, and as the result of careful laboratory trials of the apparatus in New York the Western Union purchased the American rights and proceeded to develop it along lines that I recommended, including cross-perforated tape. Their transmitting apparatus though differing in appearance is in principle the same as mine, including my arrangement of the five-unit alphabet, the invisible correction of errors and my automatic start and stop for the transmitter. Their printer, however, is entirely different, being a typewheel machine something like a column printer in hotels and clubs, but on a larger scale.

While the Western Union was developing the multiplex along these lines, I was also improving it and communicating the improvements from time to time to the Western Union. I made a new cross-tape keyboard perforator and tape transmitter with the automatic start and stop, fitted the Murray multiplex printer with a typebar typewriter and designed the new automatic page feed from cut message-forms. These improvements have all been tested by the British Post Office on traffic and found satisfactory. The new page feed was only finished a month or two ago and the working trial of the new device by the Post Office has just recently been completed.

The Western Union has already made arrangements with the Western Electric Company for manufacture of the American edition of the multiplex in quantity, and it will be in use all over the United States in a year or two. The war has interfered with the progress of the Murray multiplex in Europe, but a number of Administrations are interested and are making enquiries, and orders have been received not only for complete installations but also for

instruments for working with the Baudot, for which purpose the Murray multiplex apparatus is specially well adapted.

That is the history of the Murray automatic and of the Murray multiplex printing telegraphs up to the present date, and the chief fundamental principle to be extracted from this narrative is that if you wait for a Government to do a thing you will wait a long time, but that if you have sufficient patience you will eventually get there.

I believe it is a common experience with inventors to be met with a smile of incredulity when they assert that their invention has been perfected, the general impression amongst laymen being that machines are capable of unlimited improvement. This is certainly a fallacy, and in the case of the Murray multiplex at any rate the improvements are completed in all essential respects and it is in final commercial form. The truth of that statement can be illustrated by a singular circumstance connected with the development of all printing telegraph systems that have achieved any measure of success. In practically every case they have gone through two distinct stages of development. The Buckingham was a practical working system, but it was not really commercial until it was completely recast and improved as the Buckingham-Barclay system. The Murray automatic also went through an imperfect half-baked stage and perfected final form. The Creed system at the time that it relied on the Murray-Creed printer was in a decidedly precarious condition, and it was not until it was recast and Mr. Creed made a printer of his own that real commercial success was reached. The two-stage development was very sharply marked in the case of the Siemens' automatic system. As the Siemens' photo-printer it made no headway, and it was not until it had been completely rebuilt that it reached commercial form. The Rowland multiplex was a practical working system, but its defects were many, and it has been completely and radically reconstructed by Dr. Louis M. Potts. Whether the Baudot went through these two stages I have no definite information, but judging by early accounts I suspect that there were two more or less distinct stages in this instance also. Certainly in the case of the Murray multiplex the two phases are very distinct. The first phase was that in which the system is working and has been working for the past three years between London and Manchester, and the system was in this first phase when I sold the American rights to the Western Union. The second phase, now completed, has involved complete recasting of the system on lines that practical working experience proved to be desirable. The principles remain the same as in the first phase and as described in the paper of 1903, but the appearance of the instruments is so different that there is hardly any outward resemblance between the two stages. The Morkrum printing telegraph also shows two phases. It started out and is still used as a direct transmitting and direct printing telegraph giving one transmission in each direction. It has since been developed into an automatic printing telegraph on lines remarkably similar in many respects to those of the Siemens' automatic system. The Wright system, another American printing telegraph of the Morkrum class, with direct transmission and direct printing giving one transmission in each direction, was a failure when tried by the Postal Telegraph Company. Mr. Wright was informed by the company that they would give his system another trial if he would modify it so as to use the Baudot alphabet and the alternating current for the signals. Mr. Wright, I understand, has done this in conjunction with the Union Switch and Signal Company, and my information is to the effect that the Wright system has now reached stable commercial form. Mr. H. H. Harrison's system may spring forth fully equipped like Minerva from the head of Jove. I hope it will, and if it does it will differ in that respect from any of its predecessors. In all the cases mentioned the second phase has been final. The development has been complete along the lines of each particular system. That is essentially true of the Murray multiplex to-day. It has reached good commercial form.

In the remaining articles I propose to give the reasons for the triumph of the multiplex over the automatic, and I shall conclude with a short description of the improved Murray multiplex.

(To be continued.)

TELEPHONE ACCOUNTS FOR 1913-14.

To Telephone men one of the most interesting parts of the Postmaster-General's annual report is the appendix containing the accounts. Telegraph men are in rather a different position, for who would take much interest in an account which shows his business to be conducted at a loss for the year of £1,231,000 ?

The first part which strikes a reader is that while the telephone revenue for 1913-14 exceeded the revenue for 1912-13 by £320,000, *i.e.*, by 5½ per cent., the balance of revenue over expenditure was only £272,643 or £30,700 less than in the previous year. This is a discouraging result for a service which means to pay its way and be no burden on the taxpayer, and it becomes necessary to analyse the principal items of expenditure.

The salaries and wages of the Administrative and Operating staff increased by £145,000 or 11 per cent. ; and while the wages of the Engineering staff have increased by £38,000 or 9 per cent., the cost of engineering supervision was up by £104,000 or nearly 25 per cent. The latter sum was no doubt swollen by the cost of designing and supervising the extensive capital works undertaken during the year, and much of it would go to the capital account in an ordinary business undertaking ; but these three increases taken together, when combined with a rise of £27,000 in the provision for pensions, had a disastrous effect on the telephone balance sheet.

From the accounts of the exchange system we get the following figures per subscriber's station :—

	1913-14.	1912-13.
Revenue—	£6 16 1	£6 15 8
Expenditure—		
Administrative and operating expenses	1 13 5	1 12 7
Maintenance of system	1 13 9	1 13 3
Provision for depreciation	1 12 6	1 12 7
Pension liability	8 6	8 8
Rental value of Department's premises	2 3	2 8
Expenses of Office of Works, Stationery Office, auditors, &c.	2 10	3 6
Interest	13 4	14 10
Total	£6 6 7	£6 8 1

The account for the trunk system gives the following results on the basis of the receipts and cost per call :—

	1913-14. Pence.	1912-13. Pence.
Receipts	6.3	6.3
Expenditure—		
Administration and operating	2.3	2.0
Maintenance of system	1.4	1.3
Depreciation	1.6	1.5
Pensions	.4	.3
Rent of Department's premises	.2	.1
Other Government Departments	.1	.1
Interest	1.2	1.1
Total	7.2	6.4

In view of these figures it is difficult to see how the trunk system is to be made self-supporting.

A reader of the accounts will probably be struck with the fact that the sum of £1,485,000 has been set aside for depreciation, a sum which appears very large in view of the fact that the amount expended during the year in renewals &c. was less than £600,000. The explanation is of course that the depreciation fund is being accumulated to cover not only current renewals, but also the renewal at the proper time of the whole of the existing plant, most of which (barring an invasion) will not fall to be renewed for a great many years to come. There is also a large sum representing the difference between the actual value of the National Telephone Company's plant and the amount paid for it, which, as not being represented by tangible assets, is to be written off out of the depreciation fund during the next few years.

"OUR WOUNDED SOLDIERS."

A SHORT article about our poor wounded soldiers—at least a very few out of the large number now flooding the hospitals all over England—whom we have had the privilege of visiting, may, it is suggested, be of interest to the readers of this JOURNAL.

It came about in this way. A relative wrote from Norwich asking the writer to go and see a poor fellow whose leg had been amputated below the knee. His home was in Norfolk and his relations were too poor to be able to visit him—although we heard later that the War Office had given his wife a free railway pass to enable her to do so. In company with a colleague from the City Exchange, the way to the 3rd General Hospital at Wandsworth was found, and we were directed to "J" Ward where 21 of our brave defenders were tucked up in beds, seemingly very cheerful, although may were terribly wounded.

We found our Rifleman Cox who was very pleased to have visitors, and endeavoured to repay us by recounting some of his experiences in the fighting line. He was a victim of shrapnel, and he spoke of the unspeakable agony of a 60-mile ride over the rough roads of France to the base hospital at Boulogne, where his leg was removed. Then came the splendid transport to the 3rd London General Hospital, and the care and kindness of everyone since he had been there. While visiting him from time to time we kept our eyes open for the lonely men who did not appear to have visitors, and so, on Rifleman Cox's departure, we continued our visits.

By the generosity of the City Exchange staff and a few friends we have been able twice a week to take or send little luxuries, such as cigarettes, fruit, chocolates, cakes, home-made sweets, writing pads, and the indispensable box of matches.

Victoria and London Wall Exchanges have kindly sent gifts of chocolates, and money for other goodies too. We wish all could see the pleasure which their gifts afford to these cheerful sufferers, who have nobly stood between us and the enemy. One day while chatting to the Sister, we found they were short of water bottles and cradles for the leg cases, and on mentioning this at the office the next day, Central Exchange grandly came to the rescue, and now both "J" and "K" Wards are supplied with these very necessary articles. A very nice gramophone has been presented quite recently by a lady, and our generous girls have again risen to the occasion by sending a number of records for use with the same.

There are many sad cases among the 1,000 patients who are being treated at this hospital. For instance—a reserve man of the Irish Guards was rendered unconscious for 48 hours by shrapnel which killed six of his *confrères* as they were walking along the road. His head was badly wounded, his left hand almost shattered, and he had also a bad thigh wound. When we first saw him it seemed impossible for him to pull through, but, with the wonderful care and skill lavished upon him, he is now able to get up daily, only one finger having been removed. A piece of shrapnel the size of a penny was extracted from his leg, under the operation for which he refused to have an anaesthetic. The hole by his temple is healing nicely, and he is now merry and bright and on the high road to recovery.

Again, a private in the Scots Greys whose regiment had charged five times throughout the battle of Mons, received at Armentieres six bullets in different parts of his body. The last of the bullets has now been extracted. It was resting on the spine, causing great pain and necessitated a "touch and go" operation.

Lately there have been a number of cases of frost-bitten feet, which cause the poor fellows much agony, and several have had toes removed.

Our contact with these men brings home most vividly one of the many terrible features of this war, and one feels that each and every one who has contributed to these acts of kindness has done something to alleviate the sufferings and cheer the painful days of a few of our soldiers.

We take this opportunity of thanking all those who have provided the necessities and luxuries which have been so much appreciated and give such great pleasure.

E. W. W., A. L., } City Exchange.

THE GERMAN RAID ON THE COAST.

HARTLEPOOL.

WE have received an interesting communication from Mr. J. W. Hargreaves, the Postmaster of Hartlepool, who witnessed the bombardment of the town by German battle cruisers from his front window on the morning of Dec. 16. They were then firing at the British Destroyer Flotilla. Suddenly, however, the leading ship fired on the town, a large shell hitting the bank of the promenade and throwing up earth and masonry sky-high. Mr. Hargreaves' six-year old son was out at the time and did not return until the bombardment ceased, having been knocked down by a spent piece of shell. Happily he was only badly bruised. On Mr. Hargreaves' arrival at the Post Office, he found the postmen had returned, their delivery uncompleted. One postman took shelter in Dr. Rawling's house, which was partly shattered by a shell. Another postman W. Asheroft, was unfortunately struck in the back by a piece of shell and killed instantaneously. Notwithstanding this, the postmen resumed their duty as under normal circumstances.

Then came a rush of work. Telegrams were handed in by the hundred. Telegraph and telephone wires were wrecked and most of the bicycles punctured by pieces of glass flying from the numerous broken windows. Willing motor cyclists, however, lent their side-cars to convey boy messengers to West Hartlepool whence the telegrams could be dispatched, and many gentlemen volunteered aid with motor cars. The Post Office was struck in the roof by a piece of shell which made a hole the size of a five-shilling piece. The fragment, weighing about eight ounces has been sent to headquarters.

The West Hartlepool Post Office (where the trunk exchange is situated) and the local exchange close by were both in the line of fire. When the Post Office was struck the telephonists were requested to take shelter in the cellars, but they remained on duty, as did those at the Local Exchange where the traffic, as may be expected, was extremely heavy. In addition to the two operators on duty, assistance was given by the resident caretaker and her two daughters, as well as by two inspectors; they, however, could not cope with the whole of the traffic, which is normally dealt with by three operators. Subscribers were enquiring as to the meaning of the firing, and as to the safety of their relatives and friends. An alarming incident happened to the local supervisor on her journey to the office. She had to take occasional shelter from the shells, and had the horror of seeing a young man killed outright by a fragment of a shell when only about five yards distant, while she escaped unhurt, but the terrible effects of the bombardment were brought home to the staff at West Hartlepool. A brother of one of the telephonists, who was a Territorial, was killed in action at Hartlepool, and a sister of another telephonist, when leaving her home for business, was struck in the face by a fragment of a shell, which disfigured her and destroyed the sight of one of her eyes.

SCARBOROUGH.

During the bombardment of Scarborough, Miss L. M. Procter (trunk telephonist) and Miss J. Busfield and Mr. J. Simpson (night telephonist) at the local exchange courageously stuck to their posts. Urgent military calls to Hornsea, York, &c., were effected before the wires were shot down and communication ceased.

The vibration caused by the bombardment shook down all the indicators on the switchboard. It seemed as if all the subscribers were calling at once.

All the staff who remained on duty during the bombardment of Scarborough, Whitby, and the Hartlepools have been specially commended.

REVIEWS.

The Practical Electrician's Pocket Book and Diary. Edited by H. T. Crewe. S. Rentell & Co. 1s. net.—This is the seventeenth annual issue of this well-known pocket handbook which preserves all the useful features of the foregoing issues whilst containing new sections dealing with sychronome clocks, half-watt lamps, C.T.S. wiring, Zed fuses, and other matters. Successive chapters deal succinctly with definitions, with boilers, steam engines, turbines, gas, oil and petrol engines as prime movers in electricity supply stations, with dynamos and motors, with electric tramway and railways, electric light, heating and cooking, with measuring instruments and testing sets, with switchboards and batteries, with electric bells and fans and vacuum cleaners. In fact within its compass of over 500 pages there are few, if any, branches of the application of electricity which are not covered. The various sections are illustrated by half-tones and diagrams, and accompanied by useful tables and data. Many of the chapters have been re-written, notably those on distribution, electricity in coal mines, and telephones. The little work concludes with sections on patents, treatment for electric shock, and with a list of London and Provincial electrical undertakings. Altogether it is a very valuable shillingsworth and we can confidently recommend it to our readers.

Questions and Solutions in Telegraphy and Telephony. By H. P. Few. S. Rentell & Co. 2s. 6d.—This is a new edition of a book which is a household word in the Telegraph and Telephone world. It gives us the questions set at the City and Guilds Institute examinations in Telegraphy and Telephony for the past ten years, and it adds the questions recently set at "departmental" examinations. Then it gives us model answers. Mr. Few has the gift of lucidity. His answers are model answers in the best sense of the word, for they help the reader not only to pass the examinations but to understand his subject. We shall be surprised if in its new form the book is not even more popular than the list of editions on the flyleaf indicates that it has been up to the present.

[*Note.*—It should be mentioned that the books, *American Telegraph Practice*, *Principles of Electrical Measurement*, and *Practical Uses of Meter in Wireless Telegraphy*, reviewed in our last issue, are published by The Hill Book Company, Bouverie Street, London.

"ST. MARTIN'S LE GRAND."

IT is not surprising that in these times the January number of this magazine should have a strong military flavour. There are articles on "A Visit to the Post Office Home Hospitals," "Mails for the Fleet," "Mails for the Expeditionary Force," "The Civil Service Rifles under Active Service Conditions," "On the Road to the Front," and the "Anglo-Foreign Telegraph Service and the War." The two last are by writers well-known to readers of the JOURNAL. The very titles suggest interesting reading, and the articles do not fail to fulfil expectations. Nearly all are illustrated by well-reproduced photographs, and, in addition, excellent portraits of Colonel Ogilvie and some of the Army Signals staff are, opportunely enough, inserted. *St. Martin's* maintains its reputation for travel sketches, Singapore being this time the subject, illustrated by some nice drawings. We notice that the editor in the course of a review refers to Nietzsche as *canaille*. Nietzsche and his works are, for quite conceivable reasons, shall we say unpopular, at the present moment, and they have produced a crop of *epigoni* whose writings out-herod Herod. But it is always hard to judge a man by the distorted teachings of his self-styled disciples, and we have our doubts upon the connexion between the excesses of German army and the quasi-philosophic prose-poetry of the anti-Prussian, anti-Lutheran writer. At least the use of the word *canaille* sends us in doubt to our French dictionary for new light. The supplement to the magazine, a charming water-colour by Mrs. Hobhouse, is quite a triumph of colour printing.

The Telegraph and Telephone Journal.

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Editing and Organising Committee - - { MR. JOHN LEE. MR. J. W. WISSENDEN.

Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

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

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THE COMMISSIONS.

IN most of our minds at this time of the year there is a vivid picture of some of the scenes depicted in that literature which we may call fundamental. Once more we have refreshed our visions of Cinderella or of Aladdin or of the dual Jack who slew mighty giants and grew mighty bean-stalks. Through all the accretions of musical extravagance, from the Marseillaise to Tipperary; through all the confusions of sex, the male widows and the female princes; through all the elusive mysteries of jugglers with pottery-ware, and through all the excitements of trapeze acts and trick cycling—yet are the precious scenes still the same. Cinderella is promoted from the kitchen to the great hall in the King's palace, and from the abuse of her ugly (and necessarily male) sisters to the embrace of her beautiful (and necessarily female) prince. Aladdin succeeds in complicating a very glowing East with a gorgeous Western wedding—almost a West End wedding. The two Jacks, whose souls are as one, leap up the social scale with similar success. The philosophical characteristic of these scenes is the abundant kindliness with which the success or good-luck of Jack and Aladdin and Cinderella is regarded by the less fortunate others. No one argues that there should be a bean, a lamp, or a glass slipper for every Jack, Aladdin, or Cinderella; no one even suggests that every Jack should have his giant to slay. The happy and garish throng in the brilliant scene at the close is content to share in the joy of hero and of heroine. The dainty feet and the other feet dance gladly to the reiterated reminiscent refrains. There were little human envies in the kitchen; there were jealousies in Widow Twankey's home; both Jacks, or the dual Jack, had to bear the shafts, in their youth, of miserable misunderstandings. But when the golden touch of romance asserts its power to upset normal arrangements, even grim giants and bold bad barons join in the acclaim and bestow their benedictions.

Our own Telegraph Service sounds, this month, its own unexpected romantic note. A number of our brethren find themselves gazetted as officers of His Majesty's Army. They hold His Majesty's commission, a proud honour indeed. A year ago we should have been surprised if any crystal-gazer had told us that such a development was within the bounds of possibility. But there it is, to-day, an accomplished fact. In the spirit of fundamental literature we join in their joy. They have reason for pride. To them will be entrusted the task of controlling telegraph traffic, the vital warp and woof of a historic national enterprise. In their hands is the honour of the Service. They come from all quarters, from the C.T.O., from provincial telegraph offices, from Edinburgh and Dublin which scorn the word "provincial," from provincial telephone traffic staffs, from the Engineer-in-Chief's office, from the London Postal Service, and from the Secretary's office. All of them were—in fact all of them are—skilled telegraphists. They break away from the daily round and common task of our calling to share the toil and hazards of another and more wonderful crusade. They are to be congratulated, and they will forgive those of us who remain behind if we fail to show the generous souls of grim giants and bad barons. We may be envious, but it is with a kindly and proud and affectionate envy. Our Jacks and Aladdins will visit us, clothed not in samite but in the more proud khaki. Cinderellas, maybe, will stroke fondly their shoulder-straps; as for the rest of us, clothed in the sorry motley of commonplace apparel, we shall know no fond strokings save those of the unpoetic clothes brush.

Still, we also serve. There be diversities of function, but there is the same spirit. The Telegraph Service fulfils its mission here at home, even though it undertakes another mission on other though friendly shores. To direct the military use of telegraphy is a high dignity; but it should not be overlooked that the superintendence and direction of the work at home are all the more difficult when the supervising and operating staffs are depleted. The possibility of our brethren obtaining their proud commissions has only come about through the elasticity of the remnant supervising force. So the analogy of the pantomime story does not altogether hold good. There is a slipper for each of the other Cinderellas, even if it be not of glass. The rival Aladdins may have a heart treasure, even if it be not either a lamp or a princess. Jack may discover vegetables other than the bean-stalk with magic of their own and grim difficulties quite as hard to surmount as giants are to overthrow. So that the spirit of mutual appreciation of function is the spirit to be encouraged. We shall all follow the adventures of our commissioned officers with affectionate pride, none the less because they recognise that those of us who stay at home are just as eager in readiness of service, just as adventurous in spirit, just as spontaneous in effort. Some of those who wished to go are held back by considerations of age, but it may be that there may be telegraph functions yet to be developed away from home where it will be less urgently necessary to impose an age-limit quite so rigorously. Some are held back by failure to pass the medical test; most of them much to their own surprise—tragedies of disappointment they are. But when the facts are looked fairly in the face the truest solace for disappointment is that as yet none of us know to what extent our Service will have to render its offering to national need. We can

say that already the Service has made a contribution far more in extent than anyone thought to be practicable and at a less cost in respect of depreciation of quality. Those who go forth to represent us do so all the more sincerely because we need at home exactly the same qualities. After all we are doing the same work, in much the same way—and with the same end

THE FUNCTIONS OF THE STORES DEPARTMENT.

IT is impossible to read the long and interesting sketch by Mr. Morgan of the history, development, and functions of the Post Office Stores Department, which we publish in this issue, without finding a somewhat unexpected fascination in that comprehensive subject. We say unexpected because the theme does not at first blush suggest the variety and importance which it really connotes. It is not alone that Telegraph and Telephone men will learn from it something of the vast, intricate, and efficient system by which engineering and office supplies of all descriptions are obtained, stored, and distributed, but they will also gather some idea of the successful efforts made to safeguard the national purse, to maintain the requisite level in the quality of stores, and to secure regularity in their distribution. The total figures quoted—whether of staff, quantities, or costs—are in themselves amazing, but what we think more amazing are some of the details, such, for instance, as the magnitude of the printing contract for the Telephone Directory, and the number of sizes of postmen's coats—1,800—which are kept in stock. We see our *confrères* in the Stores Department figuring incidentally as publishers of a book possessing the largest circulation of any annual, and as wholesale clothiers on the scale of our great universal providers.

Especially interesting is the passage in which Mr. Morgan says: "Several considerations have to be taken into account in determining the allotment of contracts, as for instance the desirability of spreading deliveries equally over a prolonged period, not only for the convenience of the Department in arranging for the regulation and storage of supplies but with a view to the equalisation of production, to insure as far as may be uniformity of employment for the wage earners concerned and especially for their employment during periods of the year—principally during the winter months—when the trade affected is ordinarily slack. Again, it may be desirable to keep open at one time more than one source of supply and not to overload one firm whilst another firm that has proved its value to the Department is starving."

This shows the Department quite unobtrusively in the ordinary exercise cf its functions doing a national service in furthering the interests of employing and employed classes alike. Again, it is impossible not to feel a legitimate pride in the effective and ready aid furnished by the Department to the War Office and Admiralty on the outbreak of war, not only in despatching postal and telegraph stores to the Front, but also in lending its organisation to the authorities for the distribution of recruiting and other leaflets and in placing at the disposal of the War Office a stock of material enabling them to clothe 100,000 men. In addition, the work of examining 20,000 garments a week and dispatching them direct to the military units was undertaken, and this by a staff depleted—as all other Department's staffs have been depleted—by the call to the colours.

A pathetic note is struck in the paragraphs dealing with prison-made articles. "The work of providing a sufficiency of suitable receptacles this year for the parcels and mails for our gallant soldiers in the Expeditionary Force," we read, "has led to the purchase of a large number of special bags, many thousands of which had to be produced at short notice. It is here that the value of organised prison labour is illustrated. But for the fact that the Home Office had an abundant reserve of prisoners to make these bags, their supply at the time they were required would have presented a very ugly problem, and there is surely pathos in the fact that the unfortunate fellows for whom this employment had to be found worked with undisguised enthusiasm when informed of the destined object of their labour."

The development of the Postal Stores from its basement in the old General Post Office to its present large and widely distributed buildings certainly forms an interesting record of departmental progress.

AUTOMATIC EXCHANGES.

THE article by Mr. Twinn dealing with the experiments in automatic exchange equipment made and about to be made by the Post Office, shows that considerable practical experience is needed before it can be decided under what conditions the replacement of manual by what are known as automatic exchanges is justified on financial grounds. Considerations of area, locality, and existing working conditions enter largely into the question, and obviously what is economical in a large town may be extravagant in a village. The installation of automatic exchanges on a large scale must therefore necessarily come about very gradually, and then only when experience has thoroughly demonstrated their superiority to best forms of manual service. We mention this because it is a point which touches the operating staff very nearly, and because in our experience the mere mention of the word "automatic" invariably moves the daily Press to prophecies of the immediate disappearance of the operator. The description of a new or quasi-novel automatic system is as surely followed by an outbreak of such headlines as: "The Doomed Operator," "Girl-less Telephones," "Good-bye to the Hello-Girl," and so forth, as was a bye-election by the legend "Greatly Reduced Majority," "Great Liberal Victory," or "Great Conservative Gain," as the case might be, in the party newspapers in the days when such things were. The normal expansion of the operating force is likely to continue for many years whatever experiments may be made with automatic equipment, and its adoption even on a large scale is not in the least likely to abolish the livelihood of a single living telephonist.

It may here be pointed out that the appropriation of the term "automatic" to telephone exchanges operated by a mechanical switching system instead of by hand tends to obscure the fact that telephonic communication is in its nature to a large extent automatic. In fact the development of the telephone has been in the direction of automatic working all through its progressive stages. The abolition by successive steps of transfer circuits between local exchange positions, of ringing by hand-generator to call the exchange and signal the close of a conversation, and of hand-restored indicators,

and the introduction of lamp signalling and keyless ringing are all stages in the development of the automatic principle. The subscriber calls the exchange by merely lifting the receiver from its hook, the "manual" process is confined to inserting plugs in jacks and depressing keys and buttons. In fact the development of the modern exchange service has been all in the direction of transferring work from the comparatively unskilled subscriber to the skilled operator. To say this is only to do justice to equipment which has been developed to a high pitch of efficiency, which has economised human labour, and has placed the operator in a position to control and to supervise the calls by mere observation. But quite naturally the telephone administrator looks hopefully for the equipment which will actually make the connexion without placing on the subscriber an undue burden. That such equipment is available, in several forms, Mr. Twinn proves clearly. There are outstanding problems, of course, and these have to be faced, but these problems will not be solved any more easily by forgetting the stages by which we have made our pilgrimage.

HIC ET UBIQUE.

"THE German Telephone Service" says the Berne correspondent of the *Morning Post*, "which is the cheapest in the world, admits a heavy falling off in the number of subscribers for 1915, many wealthy private people having ceased subscribing, particularly for trunk calls." This is interesting news, and we hope to publish next month some figures showing the effect of the war on the development of the British Telephone system. Greatly daring, the correspondent describes the German Service as the cheapest service in the world. Why this slight on Stockholm, the beloved of peregrinating town councillors, Members of Parliament, and amateur reformers of the Telephone Service generally.

AN officer in the Accountant-General's Department recently discovered three galvanised colanders in a package from the Post Office Stores Department, and was astonished to learn that they were intended to serve the purposes of three tin calendars. It was suggested that the Accountant-General required the first-named articles for "straining Treasury authorities," but the Accountant-General thinks that, if that is their object, they ought to have been sent to the Secretary.

AN American journal, *Commerce and Finance*, in referring to the American Postmaster-General's report on Government ownership, has the following paragraphs :—

> As to the telephone its use in local service is larger in the United States than in any other part of the world, being 130 *per capita* per annum, or more than twice that of Norway which, with 60 calls *per capita* per annum, ranks second.
>
> The rest of the report, so far as it refers to the telephone, is rather shocking. In efficiency the Bell Company is placed tenth. Norway is first; Russia, second; Belgium, third; the independent companies in the United States, fourth; Holland (municipal lines), fifth; Sweden, sixth; Denmark, seventh; Italy, eighth; and Holland (private lines), ninth.
>
> In interurban conversations per phone America is so far down the list as to be a trailer, but here the comparison means little owing to the density of population in the countries that lead the United States.

We have not before us the data on which this fearful and wonderful order of merit is based, but we cannot imagine them as other than arbitrary. What "efficiency" may connote and what criterion was adopted we will not try to conjecture; we can only observe that Belgium and Italy with their poor development come before the United States and Germany respectively, and marvel.

A CORRESPONDENT in the *Postal and Telegraph Record* accuses us of uttering "plausible platitudes" in our editorial on "Intelligent Interest." He says that the logical end of our arguments is that the industrial worker has a claim to a voice in administration. We find also, with some surprise, our independent lucubrations described as "the administrative mind." We confess we do not see any inconsistency between our claim that the JOURNAL is an open court for the discussion of problems and an organ for the general dissemination of knowledge and the encouragement of intelligent interest, and our argument that to be a good galley boy, one must be more than a good galley boy. The suggestion that he remains just a galley boy in his place—the galley—is surely Mr. Crawford's, and not ours. When he possesses the captain's wisdom we shall be only too pleased if he obtains his captaincy. If we have assisted him in that direction, not necessarily by text book knowledge, but by broadening his outlook, by stimulating his interest in our common work, and by enlisting his sympathy in the aims and policy of the department, we shall not have worked in vain.

SEVERAL articles and some interesting letters on the subject of "Standardisation of Contract Departments" are unavoidably held over until next month.

CABLE ROOM MEMS.

"THE youth of all things is beautiful," and thus without doubt it is that a new year, a young year, stands erect before us, a thing of high and glorious potentialities. That 1915 opens with immense possibilities of national, nay, world-wide moment is but to repeat the trite, and to apply this same view to international telegraphy is by no means an exaggeration. Indeed, it would not be unsafe to say that 1915 will become as historical a year as has been its predecessor, although not, we have full reason to hope, in the same direction.

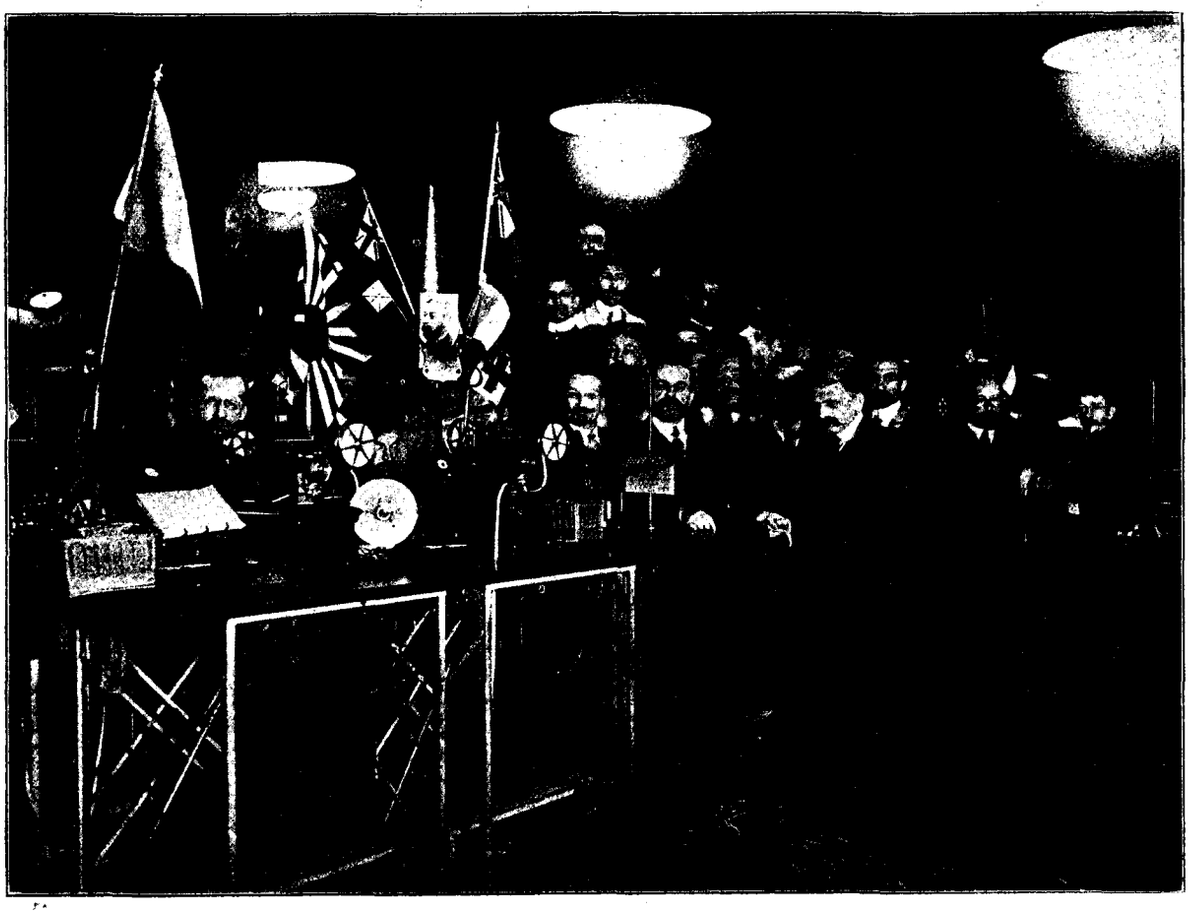
A.D. 1914 saw the destruction of line after line of telegraphic and telephonic communication between this country and the Continent until the Allies checked the onward rush within gunshot of Paris and forced the foe back towards the frontiers. Gradually followed the reconstruction—and more—even additions to the old electrical lines of communication, a process which without doubt will steadily continue, just as bridge and railway and road reconstruction and new construction have formed so silent yet so necessary a feature of the military operations out yonder.

A.D. 1915 still sees our Empire's capital severed from all telegraphic intercourse with Austria, Germany, Hungary, and Turkey, and with decidedly reduced facilities to Belgium and other countries farther afield. In contemplative mood one cannot but wonder what the tale of the year shall be, what its record of renewed communications. How much will be left of the old, how far will the new compensate for that which has been destroyed?

Although the Punchism remains true at the moment that, "*Longa est via ad Tipperariam*," it is equally true that when the goal is reached, new points of gravity will result from the present disturbance, new political centres, new commercial hubs, while if opportunity be afforded to certain newly budding nations, new industrial and even maritime cities may be evolved from the present European cataclysm. This much is seen from that telegraphic microcosm, itself but a tithe of that larger world the C.T.O. Visions of revised "Berne" lists, re-organised Continental "circulations," rates and routes are easily conjured up, and not without solid fact and reason behind them, for already the swing of events has made itself felt and revisions have been necessitated by changes in the available *reseau* of wires.

From the same corner of the cosmos, by those who have eyes, may also be seen THE DAY when the resurrection of silent wheels, the throw of needles and the merry movement of lever and shuttle shall become a reality. Just here in cold grey London, where now row upon row of slumbering apparatus pathetically appeal from beneath their ceremental dust-proof sheeting as from the coldness of a white sepulchré, here in our prosaic City that miracle will surely happen.

One day this revival of the now dead bones must become an accomplished fact, the re-opening of communications with our present enemy, an historic incident and condition which supervisors and staff alike will have to meet. Despite the presence of Belgian colleagues, and the cause of their presence in our midst a daily object lesson, it has to be realised that, at no very distant date, as history goes, we shall be once more in daily relationship with the Teuton and his country, across the North Sea wires.



THE PARIS CENTRAL TELEGRAPH OFFICE. DEC. 10, 1914.

Germany as a national entity in some form or other must survive, despite the tragedy of her own making, purged, let us hope, from her false philosophy, the root and cause of her unbridled ambition and ruthless militarism.

Having lived through Russian "Pendjeh incidents," French "Fashodas," and the trying telegraphic times of the Boer War, with the repeated calls upon the restraint of the British staff, one has little fear but that the same diplomatic correctness will be observed at the re-opening as at the tragic closing of Anglo-German circuits. An Administration which during one of the bitterest wars that has ever been waged is sufficiently open-minded to utilise an experimental telegraphic apparatus invented by the enemy, is not likely to blunder in this direction.

One wonders, however, whether Berlin is working the French Baudot with as little prejudice as London works the German Siemens and Halske! "It's a strange world, my masters," but it is well that we should look forward to that time when the cables shall again pulsate to and fro with market prices and bulletins. It is well, too, that we should educate ourselves to the necessity for self-restraint on the occasion when London, Emden, and Berlin are once more telegraphically re-united. The time may be long or it may be short. The occasion will have to be met when it does arise. As sober-minded officials with a full sense of public duty, let us be ready to meet the unique opportunity without expression of soreness for any losses we may have sustained individually, and with the traditional chivalry of our race.

It is understood that the special appeal made by the Local Committee of the Post Office Relief Fund has resulted in bringing up the subscription of the Cable Room to the neighbourhood of £200 per annum. This would appear to be a very creditable figure, especially when the depletion of the staff is taken into account, together with the fact that the seasonal lists have shown very little decrease. Incidentally, it may be mentioned, that the sum of £30 was also subscribed towards the Comforts for Troops at the Front, a very fair share was taken in the Belgian Refugee List, while even he "Blue Cross" was not forgotten.

The breakdown of wires at the stormy close of 1914 was perhaps a fitting rebuke to the congratulatory note of last month's "Mems" on the subject of British line stability, nevertheless, at the risk of giving further opportunity for pride to have a fall, truth demands the statement that the most important special circuits were kept going throughout the abnormal atmospheric conditions.

The usual shoal of New Year's cards from telegraph offices throughout the world to the Cable Room C.T.O., London, has been reduced to less than half a dozen this year, although one of the wags unearthed a 1914 greeting of *Fröhliche Neujahr* which caused a slight stir until the date was discovered.

Unadorned by flourish or gilding, the following simple greeting from M. Delmide, Directeur de Service des Télégraphes, Belges, at present in London, to the Controller, deserves to be recorded among the unique items of a period which itself will surely stand out clear and distinct in human history:—

> "Veuillez je vous prie agréer mes meilleures souhaits
> "de nouvel an et soyez assez obligeant pour en faire part à
> "vos collègues de la Cable Room.
>
> "Remerciments sincères à vous tous pour le bon
> "accueil fait aux télégraphistes belges."

It would be amusing, were the issues less momentous, to note the odd views taken with regard to certain telegrams during the war period. All telegrams are important, all are urgent, but the officer who could not see the supreme urgency of an aircraft telegram which simply stated "Weather calm," deserves to be placed in the telegraphic pillory! Truly has it been said, "some folks have not yet realised that we are at war."

The return of a number of Cable Room officers from certain Censoring centres need cause no qualm in the minds of these colleagues as to their supposed reduced usefulness, now that they feel themselves less in direct touch with military affairs. Certainly the Censor's loss will prove the Cable Room's gain, seeing the gaps made in the staff by a further departure of capable men as army or navy signallers, and the renewed demand for more and yet more

telegraphists. All the returned exiles express their appreciation of the cordial relations which have existed between the "dominant partner" and themselves as humble units.

The continued loss of so many highly trained telegraphists will doubtless offer opportunities to many hitherto untried men to show their willingness to fill gaps and to rise to the occasion. If less glorious than the Front it should prove no mean solace to those left behind at the inglorious Base that they too are helping in this great issue. In the performance of everyday drudgery, necessary for the welfare of the State, it still remains an heroic couplet to utter, if uttered from the heart:

> "Take and break us; we are yours
> England, my own!"

for there are men breaking themselves for England even at home.

A copy of the photograph of the flag-bedecked telegraph apparatus at the London end of one of the Paris wires which appeared in the November number of THE TELEGRAPH AND TELEPHONE JOURNAL found its way to the French capital, and the sequel appears to have been a similar decoration of the Paris end of the same wire. From the reproduction of a photograph of the latter, to which we are again indebted to Mr. Humm and his skill, it will be observed that our Parisian colleagues have gone one better and have added a photograph of King George V.

J. J. T.

THE POST OFFICE STORES DEPARTMENT.—ITS HISTORY, DEVELOPMENT, AND FUNCTIONS.*

BY GEORGE MORGAN, I.S.O. (*Controller, Post Office Stores Department*).

IT will be convenient if I take as the starting point of my paper the month of January 1870, this being the date of what is known as "The Transfer," *i.e.*, the transfer of the management of the Telegraphs of the United Kingdom from the Telegraph Companies to the Government.

Prior to the Transfer, the Post Office was concerned with such stores only as have since been known as Postal Stores in contradistinction to Telegraph Stores. The acquisition (by purchase or otherwise), the custody, and the distribution of Postal Stores were at that time, and for some time after dealt with in the Secretary's Office under a clerical officer who was known as the Storekeeper, the stock being warehoused in St. Martins-le-Grand in the basement of the General Post Office, East. There was no other Post Office building in St. Martin's-le-Grand at that time.

In 1880 the Postal Stores, with the staff concerned, were transferred to No. 11 Carter Lane, St. Paul's Churchyard, evacuated by the Savings Bank.

In 1883 the "Postal Stores Branch" was established as a separate entity, the Storekeeper's title being changed to that of Controller.

In 1886 the branch was dignified by the name of a Department.

In 1889 the Carter Lane premises were in turn vacated, the Postal Stores Department finding accommodation in one of the disused blocks—to wit the Chapel Block—of the Coldbath Fields Prison at Mount Pleasant, Clerkenwell. It may be noted in passing that the Ten Commandments came into their possession as one of the properties of this new theatre of operations—since pointed out as being, it is to be hoped, unnecessary.

In 1900, the Controller and his clerical force came, with a portion of the stores, into occupation of premises in Bedford Street, Strand, his principal depot remaining at Mount Pleasant, and his Department continued as a separate entity under the Post Office organisation until Jan. 1, 1902.

Now let me go back to the year 1870 and sketch with equal brevity the early history of what was known as the "Stores Department, Telegraphs."

The acquisition, custody, and distribution of Telegraph material as well as the management of the Telegraph Factories taken over from the Telegraph Companies were, at the time of the Transfer in 1870, in the hands of the Engineer-in-Chief, whose head offices were in Telegraph Street, the main Telegraph Depot and Factory being situated at Gloucester Road, Regents Park; and this arrangement continued until the year 1877, when out of the Engineer-in-Chief's office was formed a separate establishment called the "Stores Department, Telegraphs," under the first Controller of Stores, who up to that time had been Assistant Engineer-in-Chief, and to whom was entrusted the responsibility for the Factories and for all stores other than Postal Stores. This Department, like the Postal Stores Department, continued as a separate entity until Jan. 1, 1902. At the outset its offices were in the General Post Office, West, whither the Engineer-in-Chief's office had been moved in 1874, being the first to occupy those premises, but in 1878 were transferred to Telegraph Street, continuing there until 1895, when they were re-transferred to the General Post Office, West, and there they remained until November 1902.

On Jan. 1, 1902, under the Controller of Postal Stores, who became Controller of Stores, these separate Establishments—the Postal Stores Department and the Stores Department, Telegraphs, but minus the Factories—were amalgamated to form one Department, known as "the Stores Department," the Factories being made a separate Department under the first Controller of Factories.

The newly formed Stores Department and the newly formed Factories Department respectively co-existed for exactly ten years—until, in fact, Jan. 1, 1912—when the Factories ceased to exist as a separate establishment and were merged into the Stores Department; and it is with this Department of the Post Office organisation that we are concerned in the present paper. The date which witnessed the absorption of the Factories by the Stores Department—namely, Jan. 1, 1912—witnessed also the Telephone Transfer, the National Telephone Company's system becoming the property of the Government; and one result of this transfer was that the newly aggrandised Stores Department of the Post Office acquired on the same date control of the late Telephone Company's Stores as well as of their Factories.

By the absorption of the Factories of the Post Office and those of the National Company as well as the store work of the last-named, the *personnel* of the Post Office Store Department was exactly doubled in one day.

Such, in the briefest possible outline, is the history of the 42 years ending Jan. 1, 1912.

But my paper is concerned with a period of practically 45 years, for on April 1 of the present year, the receipt, custody, and distribution of stamps (but not their manufacture) passed from the Inland Revenue Department to the Post Office; and it is upon the Stores Department that these transferred services have fallen. By this new accretion of work, the *personnel* of the Stores Department has been increased by 120 officers, bringing up the total of the staff to 3,250, and it has already been arranged that before long the transfer of stamp work shall be completed by taking over from the Commissioners of Inland Revenue, the work of stamp manufacture, partly in a Departmental Factory and partly by contractors.

This is confessedly a meagre outline and it would have afforded me much satisfaction to be able to present on this occasion a fuller chronological review of the Stores Department's formative history, but having regard to the extent of the domain which we have to traverse I feel compelled to forego this satisfaction.

I will now endeavour to make clear the many parts which the Stores Department plays in the economy of the Post Office. Briefly, the functions of the Department fall into four main divisions: firstly, Contracts; secondly, Storage and Distribution; thirdly, Manufacture and Repair (chiefly repair) of apparatus and other stores; fourthly, Stamp work. I will deal with these in their order.

Firstly, Contracts. These cover Postal and Telegraph Stores. I shall not use the term "Telegraph Stores" again in this paper but shall substitute the more correct, because more comprehensive, term "Engineering Stores." The Contracts made by the Department are for the purchase and the sale of stores: that is all that I shall say about them at this stage.

Secondly, Storage and Distribution. These are dealt with in five depots. London contains an Engineering Depot and a Postal Depot, and there is a Depot at Birmingham, Dublin, and Edinburgh respectively. The Birmingham Depot is almost entirely for Engineering Stores and the Dublin and Edinburgh Depots cater for both the Postal and Engineering Services in Ireland and Scotland respectively.

Thirdly, Manufacture and Repair. There are three Factories—a London instrument factory at Holloway, a London general factory at Mount Pleasant, and a Birmingham instrument factory which adjoins the Birmingham Depot in Fordrough Lane, Bordesley. A repairs shop will shortly be opened in Edinburgh and Dublin.

Fourthly, Stamps. The Stamps Section is located for the present at Somerset House, and arrangements are in hand for taking over in Dublin and in Edinburgh the stamp work at present under the Commissioners of Inland Revenue in those cities.

Now you have in your minds a little of the history, and of the geography, of the Stores Department, and will perhaps be gaining more interest in my subject than I can otherwise expect you to have.

Let me preface what I have to say about the Contracts Section with the remark—albeit a truism—that it is of supreme importance that a great Contracting Department, such as ours is recognised as being, must preserve close touch with the activities of the Post Office, especially with those of the chief requisitioning Departments, its first duty being to ascertain, and to improve whenever possible the means of ascertaining, with accuracy and despatch either by deduction from carefully collated statistics of consumption, or by direct enquiry of the other Departments concerned, the probable nature and extent of future demands for supplies. It must have regard also to the existing level of stocks both of new and recovered serviceable material, to the assets represented by stores under order and to the state of markets. These important functions are allotted to a staff, specially set apart for the purpose, and constituting what is known as the Supply and Demand Duty attached to the General Correspondence Section, to which I shall have to allude later. Upon the summarised information in possession of the Supply and Demand Duty estimates of the most suitable provision to be made for certain Engineering Stores are framed and these are furnished to the Contracts Section. Fortunate indeed should we be if, gifted with prophetic instinct, we could always strike the happy medium that would, on the one hand, save the Stores Department from a shortage of stock, threatening delay in the execution of requisitions, and, on the other hand, a surplusage representing capital lying idle. We claim that on the whole we are at least fairly successful.

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

About the Contracts Section alone there is enough and more than enough to be said to occupy the entire evening I must content myself with a reference to its main features and the chief principles governing its procedure.

A visitor to this Section at Bedford Street would be shown two Card Indexes of great value. The first is an alphabetical index to the approved firms of contractors, some 3,800 in number, each being the subject of a separate card, and each card indicating the stores for which the relative firm may be invited to tender. The second is an alphabetical index to the items of stores required from time to time, each item being the subject of a separate card, and each card bearing a list of the firms who may be invited to tender for that item. The setting up of these cross indexes has been of incalculable service.

The mention of approved firms reminds me of a vanished feature of the contract work, a feature which melted away more quickly than it grew. It was this: Some years ago a firm, A, applied to be placed upon the Department's list of contractors, furnishing references to one or two other firms, say B and C. A's references being satisfactory, he was duly informed that his name had been added to the list. In course of time it was discovered that the fact of his being on the list was advertised by him on his business stationery. Later on B and C themselves make similar requests, supported by references to, say, D and E and F and G respectively. You can see what this led to: it was a snowball arrangement. But none of these firms again are manufactured in the Departmental Factories; others are manufactured wholly in His Majesty's prisons.

In all nearly 6,000 purchase contracts are placed in a single year and the value of a contract may possibly range from £5 to £200,000. The total amount represented by our last year's purchases of Post Office stores was £2,786,000, of which sum £2,082,000 represented the purchase of Engineering stores.

Tenders are submitted on forms proper to the particular case and approved by the Postmaster-General. The lowest tender is not necessarily the most favourable, the sample accompanying it may not prove acceptable. It is, however, understood that the lowest tender is the lowest for a satisfactory article.

Several considerations have to be taken into account in determining the allotment of contracts, as for instance the desirability of spreading deliveries equally over a prolonged period, not only for the convenience of the Department in arranging for the regulation and storage of supplies but with a view to the equalisation of production, to insure as far as may be uniformity of employment for the wage earners concerned and especially for their employment during periods of the year—principally during the winter months—when the trade affected is ordinarily slack. Again, it may be desirable to keep open at one time more than one source of supply and not to overload one firm whilst another firm that has proved its value to the Department is starving; and again the situation of contractors' works

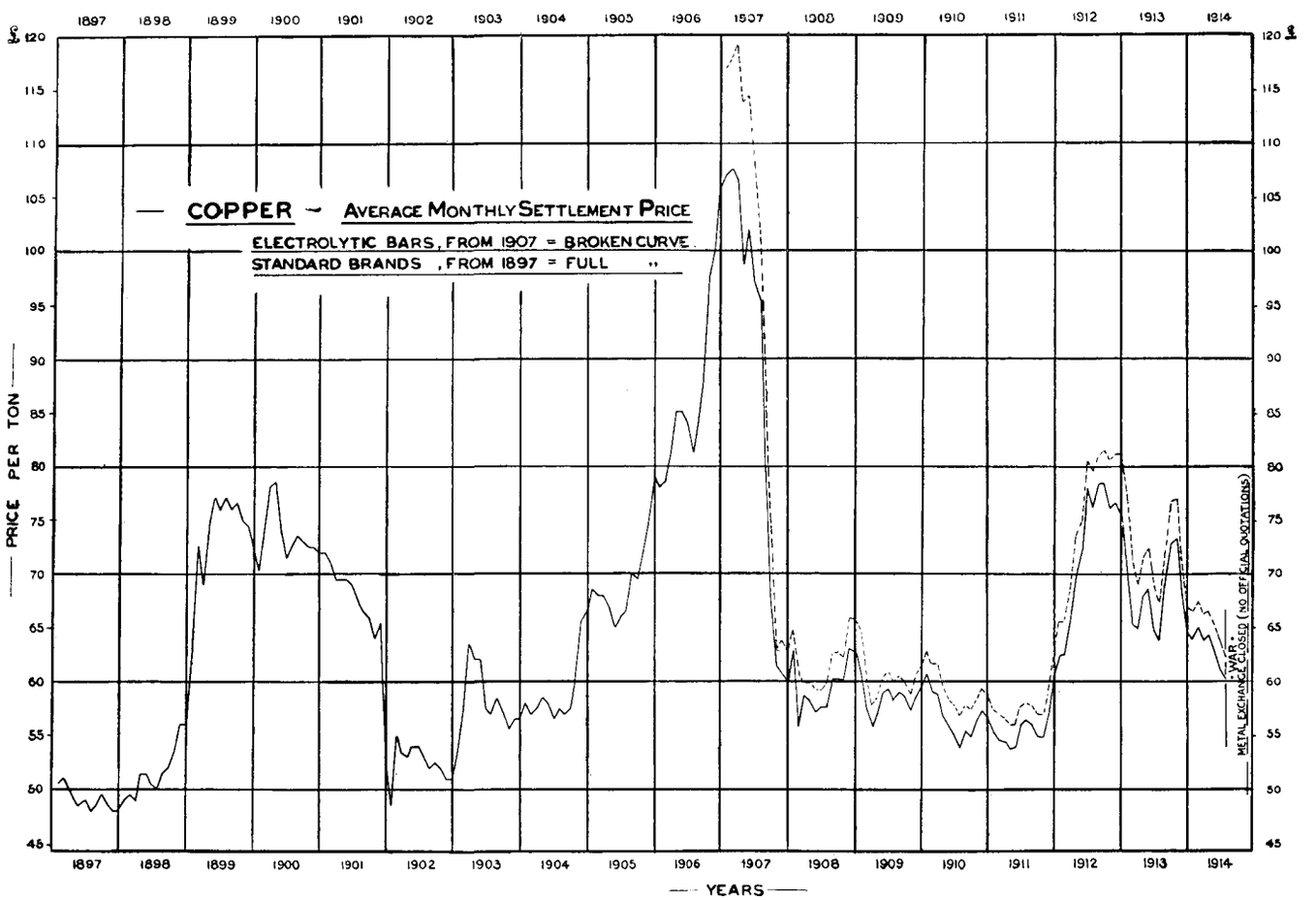


FIG. 1.

evinced a real desire to tender, yet all were advertising, in the manner I have indicated, the fact that they were on the Post Office approved list. The game being recognised we adopted the plan, which has been followed since, of putting no firm upon the approved list until they shall have actually executed, and satisfactorily executed, a departmental contract, all applicants, on their references appearing satisfactory, being now informed that their name has been placed upon the Department's *provisional* list, a fact which none has shown any keenness to advertise.

The plan followed in making contracts is governed by a detailed scheme which comes under the review of the Postmaster-General for his sanction, on the eve of each financial year, and takes cognisance of the fact that stores must necessarily fall into different categories and entail differences of procedure in their acquisition. The general practice is to base contracts upon competitive tenders invited from approved firms; but for certain stores, such as cloth, uniform clothing, boots, head-dresses, Parcel Post baskets, the main supply of Post Office string and telegraph poles, tenders are called for by public advertisement, as well as from firms on the approved list; tenders for patented articles or articles which are the speciality of a particular firm are confined, of course, to the firm concerned, but the desirability of avoiding the use of articles which restrict the Department to a single source of supply is always borne in mind. Timber is purchased at public auctions. Certain articles in relation to the ultimate destination of the stores, having in view any freight charges that may have to be incurred, must not be ignored. Another important consideration is the source of supply, *i.e.*, we must know whether the articles tendered for are of British or of foreign manufacture, and provision is made in the Form of Invitation to Tender to ensure the systematic furnishing of such information. And yet another consideration which is always kept in view is the possibility of the apportionment of the work between British and Irish firms.

I have mentioned the desire to secure winter employment for wage earners engaged in the execution of Post Office contracts, and I am tempted to record here how the suggestion was received by a member of a large firm whose works I had been visiting. On my putting the suggestion before him he implored me to banish the idea from my mind entirely, remarking that it was inconvenient enough now to have winter work interrupted as it was already by the wholesale exodus of his workers to the football field, that the filling up of the works with Government orders in the winter months would not, for one moment, deter the hands from going out in their thousands to watch the game, and that his firm would suffer in more ways than one.

In view of the magnitude of the needs of the Post Office in the direction of commodities such as copper, iron, wool, yarns, and jute, a specially close watch is kept upon the trend of the markets for these, with a view to judicious

buying, and it may interest you if I mention one instance of the gain which resulted to the Post Office from this system of watchfulness. In 1906 there was a rapid rise in the price of copper and feverish anxiety on the part of manufacturers to cover. Every day the price soared upwards. The question with us was: How long is this rise likely to continue? Feeling sure that the movement had not entire regard to the relationship between supply and demand, that there must be something artificial in the situation, that a fall could not be long deferred, and that when it came it would be a sudden one to a comparatively low level, contracts which might on a normal market have been placed were held back. As we had expected, the market collapsed and we entered with contracts by which we saved something like £20,000. Let me not be misunderstood: we do not pose as prophets and we do not speculate, but we do endeavour to buy with all the care that a well-managed commercial house would exercise (see Fig. 1).

Owing to the varied nature of the stores needed for the Post Office Service this Department is necessarily in touch with most of the national industries and feels immediately the effect of industrial troubles. These, as everyone is aware, have come thick and fast during recent years. They call for alertness, initiative, and resourcefulness on the part of the staff in all sections of the Stores Department in order to overcome them, and I could relate some very creditable work done by them to ensure the maintenance of the efficiency of the Service on both the Postal and the Engineering side.

One of the most important duties attaching to the Contracts Section is the investigation of the wages paid by contractors. For some years now there has been attached to my Department an officer, of Deputy Staff Officer rank, whose special duty consists in investigations in connexion with the Fair Wages Resolution of the House of Commons. The results have been in the direction of improvements in the wages and conditions of employment. A systematic record of the investigations is maintained by means of a Card Index so that on a change of officers the newcomer may be able at a glance to see what ground has been covered.

We must now leave the Contracts Section and glance at the work carried on in the depots. At the outset let me explain that a very large proportion of the value of stores ordered represents material which never finds its way into a depot, but is stored generally under Wharfingers' Warrants at the works of contractors, being consigned thence, as required, direct to the locality where they are to be used. This has reference mainly to Engineering stores. One cannot carry this system too far. There is obviously a limit beyond which it would not be economical. The matter is very closely watched so that the border line may not be crossed.

The Mount Pleasant Depot, devoted solely to Engineering purposes, was known as the Central Depot when there existed in each Superintending Engineer's District a District Depot. The closing down of the District Depots was rendered possible by the setting up of stocks, known as section stocks, in the hands of Sectional Engineers, the supplies held there being off-charge so far as the Stores Department is concerned as soon as they are out of the control of the Department, and then being debited to a sub-head of the Post Office Vote.

The Mount Pleasant Depot was formerly the main depot for the whole of the United Kingdom, but with the setting up of the Birmingham, Dublin, and Edinburgh Depots its sphere of influence is now restricted to London and the South. It provides warehouse accommodation for telephone instruments and parts, telegraph instruments and parts, testing and protective apparatus, pneumatic apparatus, fire alarm apparatus, house bell apparatus, line wire and underground cable, wiring, cabling and underground stores, some cast-iron pipes and kindred stores, batteries, oils and paints, and miscellaneous stores. To maintain suitable stocks is not an easy matter, especially in the case of telephone apparatus, which constantly becomes out of date or requires modification. A new invention may lead to the recovery of more costly or less efficient stores, so that to the necessity of keeping up stocks of the new item is added the difficulty of disposing of the superseded one, either by issue to areas which are not up to date, or by sale. All this calls for constant vigilance.

The examination of stores received into the depot from contractors or from the Stores Department Factories (and this applies also to the stores delivered into the other depots) is in the hands of the Engineering Department, save as regards those stores which are subjected to a merely visual examination. Nothing is put into stock until after approval. The approved stores are dealt with under the descriptions given in the Rate Book. This book, which I shall again mention, enables the Stores Department to advise the values, when advising the quantities issued, in order that the Engineering Department may charge the proper amounts to the relative Works Orders. In each section of the depot the items are arranged in Rate Book, *i.e.* alphabetical, order, the racks, &c., being numbered. A vocabulary indicating the position of an item is kept on each stores section, thus enabling officers dealing with any emergency requirements arising after business hours to locate the stores quickly. Each rack, bin, &c., bears a card giving the Rate Book description of the items and the minimum stock. The minimum stock itself is taped off, and when reached the storeman knows that it is now his duty to call attention to the fact that the stock needs replenishing. The ledger clerk in the office also has instructions to draw attention to stocks falling to the minimum. His advice is thus a check on that due from the storeman.

Engineers are authorised to present over-the-counter requisitions—*i.e.*, requisitions for stores by bearer—for small quantities of stores not proper to be supplied from section stock. About 5,000 of such requisitions, for approximately 8,500 items, are now received in a year at Mount Pleasant alone.

The Maintenance Exchange system by means of which unserviceable stores, chiefly apparatus, may be exchanged without book entries for new or repaired stores is proving more and more valuable. About 35,000 maintenance exchange requisitions for nearly 80,000 items were received at Mount Pleasant alone during the last financial year.

The transactions in recovered stores are on a large scale. Approximately one million items of stores advised on priced delivery notes were recovered and returned to the London Depot during the last financial year. A large proportion of these being found after tests to be fit for re-issue are put into stock; the rest are scrapped for sale in bulk. Instrument stores recovered go to the Holloway branch of the Mount Pleasant Depot. There they are at once subjected to a joint examination at the hands of officers of the Engineering Department and of the Stores Department and classified under the following heads:—

(*a*) For repair, major or minor, or conversion in the Stores Department Factories.
(*b*) For repair or conversion by the makers.
(*c*) To be held in suspense until it can be decided whether they shall be repaired, converted, or scrapped.
(*d*) To be wiped up or cleaned in depot.
(*e*) To be broken up or otherwise disposed of.

In this connexion it will be noted with interest that during the last calendar year no less than 715,949 items of apparatus of the Rate Book value of £358,866 came under review.

The Mount Pleasant Depot has been for some time and continues to be a disappearing depot, the site being required for the London Postal Service. There is, therefore, going on a gradual transfer of the stores work to Birmingham, and when the extension of the Studd Street Depot premises, now in progress, is completed the main London Depot will be permanently located at Studd Street.

The Birmingham Depot was occupied so far as the first block is concerned in 1908. Situated as it is in the centre of the hardware industry, and served as it is by several main lines of railway, it has proved an immense boon to the Engineering Service, amply justifying its establishment. Upon a site of four acres in Fordrough Lane, Bordesley Green, there have already been erected three huge ferro-concrete blocks of warehouses, consisting of four floors and a basement.

Much that I have said in relation to the work in the Mount Pleasant Depot applies to the Birmingham Depot, which is already shifting the centre of gravity of the depot work of the Department. The Birmingham Depot is under a staff officer who, having charge of the Provincial Depots, is responsible also for the Dublin and Edinburgh establishments, each of which is under the immediate charge of a first class clerk.

I ought to say a few words about cycles which, although Postal stores, are dealt with at this depot, Birmingham being the national home of the cycle industry. These form a very important feature of our work. There are at the present time about 17,000 Post Office cycles on the road in the United Kingdom. The average distance covered per machine is between 10,000 and 12,000 miles per annum—say, 11,000. Although the distance covered by Post Office machines thus totals to some 187 million miles per annum, there has been an entire immunity from fatal accidents due to a defective machine. The utmost care in fact is taken in their examination, and it must not be forgotten that one machine is frequently used by several riders, sometimes a dozen in one day. They are subjected to extremely hard usage. The ordinary cyclist uses a machine in fine weather, but Post Office machines are used in all weathers and on all classes of roads. We have even heard of postmen having to traverse ploughed fields. It has been found necessary to issue a definite instruction that Post Office machines are not to be ridden by more than one person at a time, and are not to be used for the performance of tricks.

The motor cycle is now being introduced into the Post Office Service; already twenty such machines are on trial on the road, superseding the light-horsed cart service. It is too early to predict the result of the trial.

The Dublin Depot is accommodated at Aldborough House, which was erected about the year 1826, and must in its time have been a most attractive mansion. There is a history attaching to it. If I am correctly informed, it was built for the gratification of an actress wife of a nobleman. The lady insisted upon having a fine residence. Her demands exceeded the limit that her husband had contemplated, and in a fit of pique he yielded to his spouse's ambition for a gorgeous abode, but spitefully chose for its site a neighbourhood which could not conceivably be regarded as aristocratic. In course of time the property came into the possession first of the Military authorities and afterwards of the Post Office. As you face the building, a theatre flanks it on the left, a chapel on the right, and I am told that it does not require a keen observation to recognise how much more the steps leading to the theatre are worn than are those leading to the chapel.

The Edinburgh Depot is situated in Roseburn Place, Murrayfield, about a mile west of the General Post Office. The building had been designed for the purposes of accommodating the Scottish Christmas parcel work and had been so used for some years. When the Stores Department scheme of an Edinburgh Depot was in formation, the suitability of this building for store purposes could not fail to attract us; indeed, had it been planned for our purpose it could scarcely perhaps have been improved upon. Surely I am justified in suggesting that the Stores Department cherub which sits up aloft was looking after our future interests when the premises were designed. We took possession of them four years ago.

In connexion with depot work generally the Department owns a fleet of ten motor vans, seven being garaged at Studd Street, two at Birmingham, and one at Dublin. These have proved invaluable, and we contemplate additions. They have rendered excellent service during the labour troubles of the past year or two, especially in Ireland. We have an underground petrol tank of 3,000 gallons capacity at Studd Street.

Since the outbreak of war the Engineering Depots, one and all, have had

many and urgent claims made upon them for stores for the Admiralty and War Office, and one and all have risen to the occasion. When war was in the air the possibility of these calls led to the setting up of an organisation in the Stores Department to provide for night as well as day attention being given to any sudden demand. The clerk-in-waiting in the Secretary's Office being furnished with details of the scheme even the night requirements were met without a hitch. Our motor vans were on the road all night, and we were able to enlist the good offices of railway and steamship officials so that special trains were chartered without difficulty, unprecedentedly heavy and unthought-of consignments of Engineering material were conveyed by passenger trains to ensure speedy delivery, and even the sailing of steamships was held back whilst stores were on their way by road or rail to the port of despatch. Concerning our contractors themselves, there are instances on record of their turning out of their beds at night, opening their warehouses, and calling their staff together in order to assist the Department in meeting sudden and urgent demands for special items.

The depot work of the Stores Department on the Postal side is important and extensive. It embraces the reception and distribution of all the printed

FIG. 2.

matter, stationery, and other stores required, not only in the Headquarters Departments and the offices of Surveyors, District Managers, Superintending Engineers and Sectional Engineers, but also in the 25,000 different post offices scattered throughout the United Kingdom. Tuesday is always a busy day with the Studd Street Depot. The Post Office Circular with its various enclosures is distributed on that day, the supplies being destined for every post office in the United Kingdom. The making up of the varying sets is an interesting example of organisation, the efficiency of which is best exemplified by the fact that it sometimes happens that as many as 150,000 documents are handled in a single day, the entire issue being dealt with in time for the Tuesday evening mails.

During the recent crisis the War Office has made free use of the Post Office organisation and of our facilities for distribution, so that in the course of the first few weeks of the war we distributed throughout the United Kingdom some two and a half million notices, posters, and leaflets relating to the questions of recruiting, currency, &c.

The equipment of all the British Army Post Offices in France recently has been quite an undertaking. For the Field Post Offices 100 sets of stationery stores have already been issued, to say nothing of about 30 tons of such stores for the Army Base Office.

We also supply uniform, in all about three-quarters of a million articles per annum, to about 110,000 individuals. Accurate records of the measurements of each uniform wearing officer are kept at Studd Street, the garments being allotted to individuals by what is known as a "Fitting Sizes" scheme. Briefly the basis of this scheme is this: that among a number of men of one height will be found a certain number also alike in respect of all other measurements. These form one group and the majority of the rest of the uniform wearing staff are found by experience to fall into other similar groups. The number of fitting sizes is so large and the gradations so fine that under the scheme men can be at least as well fitted as if the clothing were made to their individual measurements. This is not surprising when I tell you that the fitting sizes scheme provides for no less than 1,800 different sizes of postmen's coats. The number of men who cannot be provided for under the fitting sizes scheme is extremely small and comprise only the excessively stout, the excessively long, and so on.

Let me show you two examples which illustrate the extremes that the Studd Street Depot has had to cater for. Here is a pair of trousers—not knickerbockers—made some few years ago for a rural postman in Derbyshire who had ceased growing when he attained the height of four feet, and here is an overcoat made for a London Mail Cart driver, with a chest and waist measurement of 60 inches (Fig. 2). Here again is a gorgeous habit, such as was at one time supplied to river postmen. It has a very full skirt which was used in its entirety for carrying the letters. I show it as a matter of archaic interest merely.

The Stores Department claims to be a better fitting tailor than most of us can boast of having. The misfits do not exceed 2 per cent.

Some curious facts come to light in the course of our business as outfitters. In the matter of head and footgear it may interest you to know that there was a time not very remote when the heads and feet of Boy Messengers were credited with increasing in size the farther North you went until you came to Glasgow, where the boys were found to be endowed with the largest heads and feet in the United Kingdom. Will it disappoint the Scotsmen present to know that later records show that they are now outclassed and that in the matter of heads London comes first, and, in the matter of feet, Brighton!

At present, the issue of Post Office uniform is suspended for the most part to assist the War Office whose needs are so much more important, and not only have we handed over to the War Office authorities a stock of material enabling them to clothe 100,000 men, but we have just undertaken to examine 20,000 garments a week for them and to despatch these direct to military units. Besides this, for some weeks past we have been engaged in collecting and despatching the gloves and mittens provided by the Grand Duke Michael's Fund and the mufflers provided by Lady French's Fund for the troops at the front. These supplies have run into perhaps 200,000 articles altogether already.

Before I leave the subject of uniform clothing, I should like to mention an honour which only this morning I heard had been won by a Third Class Clerk on the Uniform Clothing Records duty. He is one of eighteen candidates who passed in the first division of the final B.Sc. Examination held this year. The subjects he took were Pure and Applied Mathemathics, and Physics. His excessive knowledge of mathematics is not really necessary for the checking of the garments, but who can tell the part which the fitting sizes scheme played in the development of his mathematical faculties?

I cannot give more than an indication of the great variety of the Postal Stores. We issue about a million bags every year, about 800 tons of string, and about 675 tons of lead seals. In all, some 8,300 different items are stocked. They include typewriting and duplicating apparatus, all kinds of household stores, crockery, glass, cleansing and disinfecting materials, fire extinguishing apparatus, letter boxes, scales and weights, mathematical instruments, notice plates, date stamps, seals, accessories to stamping machines, and Parcel Post receptacles.

I have already mentioned the fact that the Postal Stores were at one time located in the basement of the General Post Office, East. That was at a time when it seemed to be thought that any place was good enough (or shall I say bad enough) for a store. There could not be a greater mistake and it is gratifying to find that this has been recognised in the later policy of the Department. I am persuaded that very large sums are saved by accommodating stores in premises designed for the purpose. It leads to better and more economical administration, which means economy in force and the more efficient performance of store work, which must act beneficially upon the Service as a whole.

One of the most important duties falling upon the staff at Studd Street is the scrutiny of all Post Office demands for printing. Since it was laid down that these should all pass through the Stores Department, very considerable economies have, as will be seen by Fig. 3, resulted from this scrutiny, which is undertaken by officers with an intimate knowledge of the printing industry.

Under the Telephone Transfer the Post Office took over the National Telephone Company's contracts for the work of printing and obtaining advertisements for the Telephone Directory, which work respectively was then being undertaken by two firms for the National Company. The pressure of work in connexion with the general arrangements for the transfer rendered it desirable not to disturb the general conditions of those contracts; and the Post Office merely sought through the Stores Department—and with success—to keep the contracts alive for a brief period beyond the time to which they were originally limited, but in so doing secured appreciably better terms in the matter of prices.

The Telephone Directory is the largest single printing contract in the United Kingdom, and each year the work in connexion with this gigantic publication increases. The number of books printed reaches close upon a million and a half per annum; the paper used in printing each issue weighs approximately 400 tons, and the type 25 tons, with an additional 12½ tons

for the stereotype. The process of printing is distributed over six of the contractors' works situated in various parts of the country, and the number of hands engaged by them upon the work is upwards of 850.

It may be said that this Department is the editor of the Telephone Directory. It deals with all questions relating to the make-up, ordering and delivery of the books, including the accounts, scrutinises the copy and proofs received from the various Districts, and regularises any deviations from the standard style The advertisements, on which the Stores Department acts as Censor, bring into the coffers of the Treasury about £14,000 per annum. They consist of approximately 7,000 displayed and 14,000 special entry advertisements, and it will be readily understood that the dealing with these must occupy a considerable portion of the Department's time.

In addition to the many establishments of the Stores Department, there is a class of depot which plays an important part in the organisation. The importation and delivery into the yard by creosoting contractors of poles in a rough state, necessitates the employment of men to dress the poles, *i.e.*, to remove the inner bark and all rough knots and excrescences. This work of dressing was performed under inspectors by gangs of men in the pay of the Department, the inspectors being practically gangers as well as examiners;

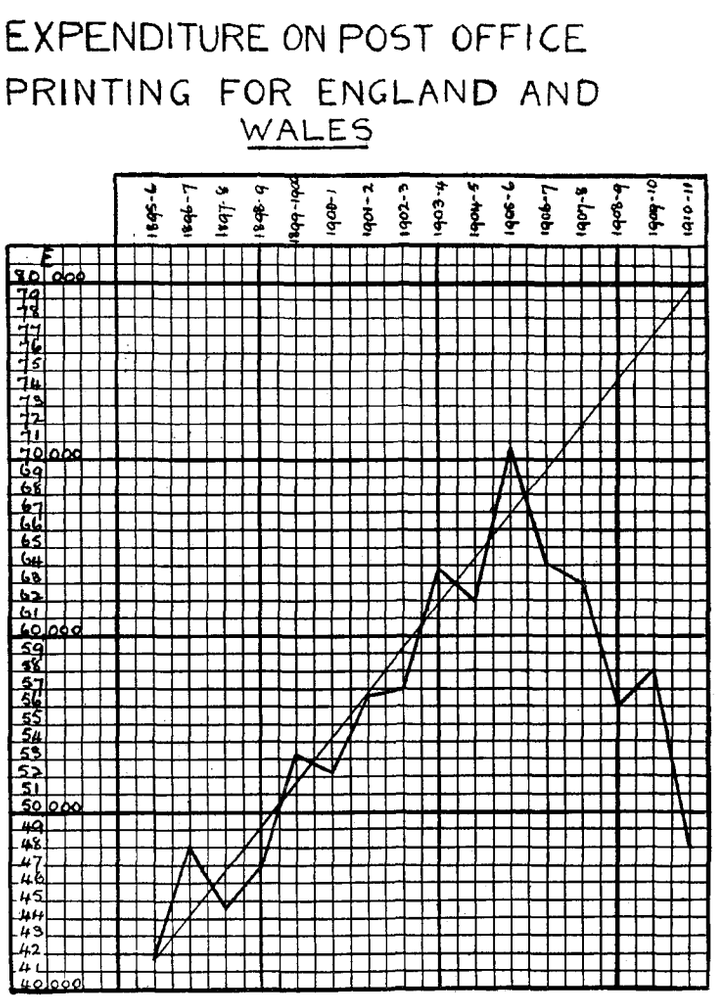


FIG. 3

and whenever a proposition came forward that we might open a new depot we were confronted with this difficulty, that the depot would not have attached to it an inspector to keep a constant eye upon the dressers. The difficulty was solved in a very simple manner. Our dressers were working in the same yard as those in the employment of the creosoting contractors. This in itself was not a desirable arrangement, and in spite of a long-standing prejudice against the departmental dressing work being done under contract, the change to the present state of things was made in one comprehensive scheme, that is to say the gangs were taken into the employment of the contractors, who undertook the work at tendered prices. Under the new sustem the inspectors were immediately released for the pursuit of their legitimate function of inspecting and it was possible to send them from one depot to another as required. Besides relieving the Department of all the clerical and other work attaching to the employment of its own gangs, the freedom that it gave the inspectors rendered it at once possible to establish new depots, whereby savings in freight (freightage on poles is a heavy item in annual expenditure) were obtainable, and now, in addition to the depots which then existed in London, Hull, Hartlepool, Shields, Methil (in Fifeshire), and Newport (Monmouthshire), we have depots at Ardrossan, Ellesmere Port, Southampton, Tilbury, Grays, and Belfast.

I ought not to leave the subject of poles and creosoting without a reference to the endeavour of the Postmaster-General to encourage the home grower to supply the Department with telegraph poles. As a result of tenders invited in the autumn, contracts for 23 per cent. of the poles for supply next year have been placed with home growers, and I venture to suggest to those of my audience who come into contact with owners of woodlands that they would be furthering the desire of the Postmaster-General in making known to such the renewed efforts, for they are renewed efforts, of the Department to encourage the native grower. The subject is of enhanced importance on account of the stoppage of the supplies of poles from the Baltic.

Accounts.—It will be obvious that out of all these transactions Accounting must loom large. The Accounts Section deals with a miscellany of work bringing it into relationship with almost every branch of the Post Office. Every invoice and certificate for supplies under stores contracts passes through its hands and is examined in the minutest detail. The magnitude of this portion of the work alone will be appreciated when it is remembered that accounts and certificates for stores to the value of nearly £3,000,000 come under scrutiny in a single year.

Then there are the accounts for freightage by rail, road, sea, and canal incurred by Postmasters, by Engineers, by the Savings Bank, and by the Stores Department itself. These come under the scrutiny of some sixteen or seventeen officers, and it is interesting to note that the salaries of these officers are more than covered by the charges detected and deleted by them as wrongly included in the accounts against the Postmaster-General, such charges being properly debitable to general traders.

The Accounts Section is the means of saving thousands of pounds debited by the carrying companies in respect of other forms of overcharge in the shape of excessive rates or weights or the inclusion of collection and delivery rates where neither collection nor delivery is a legitimate charge against the Postmaster-General, and again in respect of loss of. or damage to, stores in transit

All these claims involve a mass of correspondence, but the Department's relations to the companies are excellent, which is a matter for congratulation, when it is borne in mind that the record of freight business is one constant record of claim and counterclaim, assertion and denial, unavoidable perhaps where so great a volume of traffic is involved.

The largest freightage dispute with which the Department has been concerned arose out of an attempt on the part of the companies about twelve or fourteen years ago to exact an additional percentage of freightage on creosoted poles in respect of the creosote they contained. The companies assumed that a creosoted pole was heavier than an unseasoned and untreated pole; the Department contended that the opposite was the fact. The dispute had gone on for about three years when a solution, proposed by the Department, was acquiesced in by the companies. This involved a series of practical trials lasting for another three years, which trials proved to demonstration that a creosoted pole was, as had been contended by the Department, lighter than an unseasoned and uncreosoted pole. The amount at stake so far as the Postmaster-General was concerned was about £400 per annum. Naturally, the experiments were followed with keen interest by the trade as well as by our friends, the late National Telephone Company, who had a stake in the decision.

We now come to another branch of the work of the Accounts Section. In so vast an organisation as that of the Post Office the quantity of old and condemned stores is necessarily large and varied in description. Our sales may comprise everything from waste paper to a steam engine and take place several times a year, and you may accept it from me that their conduct calls for astuteness and caution on the part of those immediately concerned with the duty. The waste trade world is not free from wiles and subtleties.

Yet another of the functions of the Accounts Section which must be mentioned is the provision, control, and distribution of Parcel Post receptacles, both Inland and Foreign. Those who are best acquainted with the plethora of work falling upon the Post Office during the Christmas season will best appreciate the responsibility of the Accounts Section in this connexion. The work of providing a sufficiency of suitable receptacles this year for the parcels and mails for our gallant soldiers in the Expeditionary Force has led to the purchase of a large number of special bags, many thousands of which had to be produced at short notice. It is here that the value of organised prison labour is illustrated. But for the fact that the Home Office had an abundant reserve of prisoners to make these bags, their supply at the time they were required would have presented a very ugly problem, and there is surely pathos in the fact that the unfortunate fellows for whom this employment had to be found worked with undisguised enthusiasm when informed of the destined object of their labour.

Perhaps I may say here what I have to say on the subject of prison labour generally, as it affects the Post Office. The advantage to the State of being able to utilise such labour is a factor which cannot be ignored. The Stores Department is required to assist the Prison Commissioners by placing with them the manufacture of such articles as can be properly produced in penal establishments. Under this arrangement all mail bags are made by prison labour, and other articles, representing in all about 400 varieties, are obtained in the same way. Of two items, mail bags and pouches, nearly one million are issued annually to meet postal requirements.

Still another duty attaching to the Accounts Section is the preparation of the Parliamentary Estimates proper to the Stores Department, the watching of expenditure throughout the year to ensure that these estimates be not exceeded, and that suitable records of expenditure are maintained with a view to the appropriation of the amounts expended being readily available.

Finally, not the least interesting of the Accounting duties is the payment of the salaries and wages of the 3,250 members of the staff of the Stores Depart-

ment, and if the promptness with which this duty is performed be an indication of the general efficiency of the Section, I can assure you that there can be no arrears of work to record against it.

During the last session of this society there was given a very full and interesting paper by Mr. Mansbridge on the subject of the Factories, and I am relieved to some extent, therefore, from dwelling at any length on this very important branch of the Stores Department. Since Jan. 1, 1912, the organisation of the Factory establishments has been the subject of constant study and solicitude, and it may fairly be claimed that great success has attended our efforts to reach the end looked for in their attachment to this Department. As is well-known, one of the lines of policy to be followed is the general abandonment of construction work, in other words, the restoration of the Factories to their original purpose of being repairing establishments. We have travelled far in this direction, and it is expected that before long construction work will be reduced to the minimum.

The repairs side of the Factories shows a marked and continuous increase. In 1912 the annual wages bill was about £21,000, and now it is £30,000.

The Holloway Factory is nearing its maximum capacity, and within the last few weeks there has been opened at Birmingham on a 9-acre site, alongside the Fordrough Lane Depot, a new Factory constructed on modern lines capable of accommodating eventually about 1,000 hands. This Factory will be devoted almost entirely to the repair of telephones, and there is of course ample room for its extension.

I mentioned in the early part of my paper that the Stores Department took over the management of the Factories of the National Telephone Company. These were at Dalston and Nottingham. The Holloway Factory has absorbed the work that was carried on on the Dalston premises which, except so far as they are in the occupation of the Engineering Department, are devoted to the purpose of a depot, whilst the work which was carried on in the National Factory at Nottingham has been transferred to Birmingham, where we have the advantage of its being adjacent to the Birmingham Depot.

The number of Factory hands in London reaches 695, and in Birmingham 441. Total 1,136.

[The paper dealt at some length with the newly acquired Stamp Section, but the claims upon our space preclude us from inserting this portion in a journal devoted mainly to the Telephone and Telegraph sides of the Post Office.—ED.]

In all large organisations there must of necessity be work which does not fall wholly into one marked division. This is the case in the Stores Department. We have our Contract Section, our Depots, our Factory Accounts Section, our Stamp Section; but there is a large amount of work which touches one or other of these in some measure and may be common to all, therefore it is essential that the controlling officers should have in close touch with them a general branch, and the volume of work which falls within this category is so great as to necessitate the setting up of a separate section known as the General Correspondence Section under a staff officer. To this section is assigned work not wholly dealt with in any one of the sections I have named. The General Correspondence Section deals with all staff matters (no small duty when you consider that the *personnel* of the Stores Department numbers well over 3,000). It deals with buildings (and I have already shown you the extent to which for stores purposes these have been carried), with stocktaking (certain officers from the duty being engaged on continuous stocktaking, so arranged that the whole of the stock is gone over once in each year), with audit (other members of the section making each year a complete check of all bookwork over a small period taken in their discretion—a duty to which the utmost importance is attached as keeping the controlling officers in touch with the routine work of the Department), and, as I have already mentioned, it deals with supply and demand (as leading up to the placing of contracts by the Contract Section).

The officers attached to the General Correspondence Section, in common with those of the Stores Department generally, recognise that it is the wish of the control that as far as may be possible, personal relations with the responsible officers of other Departments are encouraged as tending to facilitate business, and a clear understanding of the requirements of the outside Departments.

The officers of the Stocktaking and Audit Duty are in a position to secure the very important object of supplying a common standard to store-keeping procedure throughout the Stores Department, and are able to put their fingers upon any weak spot in the system, and to bring under consideration the general adoption of any new feature regarded as an improvement.

From all this it will be obvious that to the General Correspondence Section belongs the function of preparing and revising the Engineering Stores Instructions, which are issued for the guidance of members of the Engineering Department.

I come now to the subject of the staff required to cope with the multifarious duties imposed upon our many-sided Department. Time puts a limit to the length of my paper and permits me to do no more perhaps than present you with one or two typical sections showing the allocation of staff. For example, the Telephone parts section has a second class clerk in charge, having under him three third class clerks, three and a half assistant clerks, and a boy clerk. The Despatching, Correspondence, and Staff Statement, Stocktaking Investigations, and Record Room has a second class clerk in charge, four third class clerks, two assistant clerks, and five boy clerks, and so on. There is often a disparity between the proportion of thirds to assistant clerks. This is due to the particular nature of the work dealt with in the section; some sections of work, and the last example is a case in point, involve a larger proportion of superior work. The utmost care is taken in grading, and constant watch is being kept upon the development of each section in order to determine what changes may be called for in the apportionment of the work amongst the different grades.

Each section is under the immediate charge of a second class clerk, who may be said to act as captain of a company. For the smooth and efficient working of his section, he with other second class clerks is responsible to a first class clerk. The second class clerk in a depot has under him not only the third class clerks, assistant clerks, and boy clerks, but the manipulative staff engaged upon the particular section of which he has charge.

The greatest importance is attached to the selection of second class clerks. They should be the backbone of the Department. It must be remembered that the head of the Department has no voice in the selection of new entrants into his clerical establishment. He must make the best of the officers assigned to him on their appointment after they have passed the Civil Service examination, and remembering that they are the saplings he must do all in his power to give them the opportunity of becoming tough, hardy, and full of fibre. It is our aim, therefore, to give every man the best possible opportunity for developing his qualities. The opportunity for strengthening the staff in the higher ranks comes to the Chief when promotions are rendered possible. Then it is that he must exercise his judgment and, without favour, select for promotion those officers who show proof of the superiority of their merit. Seniority stands for something, but efficiency, other things being equal, must prevail when the pros and cons have to be considered.

LONDON TELEPHONE SERVICE NOTES.

IN the last issue of this JOURNAL a corespondent from the Cable Room of the C.T.O. takes long draughts of satisfaction in the fact that in the title of this publication the *senior* Service (Telegraph) is given the premier position. It would ill become us to quarrel with this attitude, for as the Telegraph apologist points out the account is squared in the title of the society. But since he is out seeking crumbs of comfort we might draw his attention to the further fact that whereas his notes are accorded the dignity of "small pica" or "long primer," our news hides its diminished head in unostentatious "nonpareil," or it may be "ruby." But why labour the seniority question—has not the Department once for all decided that promotion is to be by merit and not by seniority. Perhaps the view of the Telegraph Service on this subject is similar to that of one whose experience in the matter having been unfortunate described promotion as *going by merit* much in the same way as a motor goes by a foot passenger on the road, *i.e.*, it not only goes by, but insists on splashing with mud the object it passes.

Anyhow the *Telephone* and Telegraph Society has met once more and its members were treated to an extremely interesting discourse from the Controller of Stores. That it was interesting was fully established by the almost universal desire amongst the audience to ask questions or pass comments. Those who were unable to be present are anxiously awaiting an opportunity to see a printed copy of the lecture.

The January meeting of the Telephonists' Society was devoted to the reading of some of the competition papers, and excellent they were. In the class for junior telephonists, Miss Toms, of London Wall, had secured the honours with a description of her first impressions of the Telephone Service. Amongst the clerical exchange officers, Miss Honey, of Gerrard, scored a success with her dissertation on the whole art of preparing and balancing the wages sheet. The prize essay in the class for supervisors was contributed by Miss A. E. Carpenter, who is, by the way, secretary of the Croydon District Telephonist's Society. Her paper was entitled "Aspirations." All three ladies showed that not only could they write well but they were capable speakers also.

The Croydon Telephonists' Society enjoyed two good papers on Jan. 7. One was read by Miss Ball, of Purley Exchange, entitled "Would some Power the giftie gie us to see ourselves as others see us," and the other was Miss Carpenter's competition paper on "Aspirations." The next meeting takes place on Feb. 11, when Miss Longford, of Croydon, and Mr. Horace Dive, the president of the London Telephonists' Society, will cross swords in debate. The subject chosen is, "Are Authorised Expressions Necessary?" A large attendance is anticipated.

The next meeting of the London Telephonists' Society is the *Social*, which is fixed for Feb. 6, and which is to be honoured with the presence of Mrs. Hobhouse. The arrangements are well forward, and the evening must prove a success, because so much effort is being put forward to make it such. Sub-committees sit daily. The G.P.O. South Refreshment Club Committee are lending most valuable aid in that they have consented to loan all the crockery and table requirements without charge, and the capable manageress and several of her assistants are going to add further laurels to their brows by affording help and guidance in the difficult task of feeding multitudes. That they shine in this line is demonstrated by the fact that during Christmas week they provided a festive repast far over 1,400 persons, and satisfied every one. A collection taken in the club on that occasion for the benefit of distressed Belgians amounted to close on £23—surely a splendid effort.

Several of the exchanges have excelled themselves in their response to the second appeal of the P.O. Relief Fund. At Gerrard, for instance, the weekly contribution was increased fourfold, and is now over £2. That exchange is also organising a concert in aid of the Fund, and Putney and Wimbledon are doing the same.

There has been a sort of "general post" recently amongst Exchange Managers and supervisors, and it is difficult at times to remember exactly what exchange one is speaking with when one hears a voice always associated with "City," but undoubtedly reaching one over a "London Wall" junction

It makes no difference however at the monthly Exchange Manager's meeting, when they all foregather. At the last such meeting a question of the colour of a peg for use in the multiple entailed an unusually exhaustive discussion, and at the close of the meeting the lines which follow were found in one of the corridors.

PINK PEGS.

(Lines suggested at a discussion at a recent Exchange Managers' meeting.)

This is a story of "business"
And, when you have heard it through,
Thank fate it sends no task like this
To try the brains of you.

At the Managers' monthly meeting,
Which starts on midday's stroke,
There are manifold problems to settle—
But then they're clever folk!

Yet when *this* subtle problem
Was burst upon them all,
A murmur—could it be of fear?—
Travelled around the hall.

The Chairman read a memo,
In tones that all could hear,
Of the area corrections
To be made in this half-year.

And the question to be settled,
To which he then referred,
Was the colour of the special peg
To mark a line transferred.

The relative instruction
Set forth in typing ink
That the colour duly authorised
Was a most delicious pink.

But a speaker quickly pointed out
That pink is sometimes red,
Whilst red is very nearly black,
At least so some one said.

It seems that when the multiple
Is pegged with red and pink,
The colours are so near akin,
Telephonists must think.

Or else they may, Oh dreaded act,
Advise a calling sub.
A transferred line is temp'r'ly dis.
And rouse a vast hubbub.

To avoid this awful danger
It appeared at London Wall,
They used a peg which known as *pink*
Was yet not pink at all.

But on a ground of purest white
A line of red is placed,
It answers every purpose
And is most extremely chaste.

The line though mostly vertical
May be *horizontal too.*
In either case telephonists
Know exactly what to do.

'Twas then a speaker pointed out
Petition had been made
Against the use of certain pegs
Which too much white displayed.

So he who's ever on the Hop
Then to the rescue came,
Suggested spots of red on black,
Or pink spots on the same.

'Twas then that the "Facilities"
Their views were asked to state.
And Pink established pink was best,
But still they hesitate.

And some one calls aloud for White,
Whose wits are sharp as teasles.
"Absence" suggests pink spots on white,
(His boy has got the measles).

See how the hours tick slowly by
Till eyes begin to blink,
One vital point at last confirmed—
The pegs remain in pink.

PERSONALIA.

NEWS OF THE TRAFFIC STAFF.

LONDON TELEPHONE SERVICE.

Promotions

Miss L. M. JUDGE promoted to be Assistant Supervisor, Class II, Hampstead Exchange.

Miss F. M. CARTER promoted to be Assistant Supervisor, Class II, Hampstead Exchange.

Miss HETTY EVERETT promoted to be Assistant Supervisor, Class II, Mayfair Exchange.

Miss ELIZABETH W. PAINTER promoted to be Assistant Supervisor, Class II, Mayfair Exchange.

Miss EDITH A. BOWIE promoted to be Assistant Supervisor, Class II, Mayfair Exchange.

Miss K. FITZGERALD promoted to be Assistant Supervisor, Class II, City Exchange.

Miss M. E. MORRIS promoted to be Assistant Supervisor, Class II, City Exchange.

Miss A. M. WHITE promoted to be Assistant Supervisor, Class II, City Exchange.

Miss M. D. EDWARDS promoted to be Assistant Supervisor, Class II, Park Exchange.

Miss G. E. WOODWARD promoted to be Assistant Supervisor, Class II, Park Exchange.

Transfers

Mr. H. L. POULNEY, Exchange Manager, from Park Exchange to Western Exchange.

Mr. A. H. DYER, who has been transferred from Holborn to the Central Exchange, was presented with an oak clock as a mark of esteem from the staff.

Marriages—

Miss HILDA J. WOODHURST, Museum Exchange, has resigned in view of her approaching marriage.

Miss E. W. GREAVES, Hampstead Exchange, who resigned on account of her approaching marriage, was presented with a cruet, butter dish, and cutlery.

Miss DOROTHY J. EASTAUGH, Ilford Exchange, who resigned on account of her approaching marriage, was presented with a silver cake basket.

Miss W. E. GREAVES, Willesden Exchange, has resigned on account of her approaching marriage.

Miss E. LEACH, Hop Exchange, who has resigned to be married, was presented with a dinner service.

Miss R. E. MURTHWAITE, Paddington Exchange, who resigned in view of her approaching marriage, was presented with a double toilet set, fish servers, a pair of silver sauce ladles, a biscuit barrel, butter dish, rose bowl, &c., from her colleagues and friends.

Miss M. H. CHAPMAN, Holborn Exchange, who resigned to be married, was presented with a dinner service.

Miss H. M. SANSOM, Park Exchange, received from her colleagues a silver cake basket and other useful presents on the occasion of her marriage.

PROVINCIAL STAFF.

Appointments

Mr. A. BARKER, Exchange Manager in Training, Leeds, to be Assistant Traffic Superintendent, Class II, Bournemouth.

Mr. ROBERT BAXTER, S.C.T., Carlisle, to be Assistant Traffic Manager, Class II, Leeds.

Resignation

Miss JEAN RUSSELL, Fees Clerk, Belfast, on the occasion of her resigning the Service, was presented by her colleagues in the Belfast office with a gold curb bangle as a token of their regard and esteem.

Promotion

Miss M. H. CAMPBELL, Telephonist, on her promotion to Langside Exchange, Glasgow, as Supervising Telephonist, was presented with a gold bangle by the staff of Charing Exchange.

LIVERPOOL TELEPHONE AND TELEGRAPH SOCIETY.

A very successful meeting was held on Nov. 19, the papers (fourteen in number) being entirely contributed by the ladies. One hundred and fifty members and visitors were present. Three prizes were offered for the best papers, the difficult task of adjudicating being left in the hands of Messrs. W. Webber (Surveyor), E. J. Hidden (District Manager), and C. Surmun (Chief Supt. Telegraphs), whose decision was as follows:—

1. "Some Traits of Good Supervision" ... Miss E. Mathews.
2. "An Extraordinary Week-end" ... ,, E. Smith.
3. "The Instruction Circuit" ... ... ,, A. E. Walker.

Each paper was submitted under a *nom de plume* and was read to the meeting by a special reader. The actual competitors were therefore unknown to those present until they claimed their respective papers towards the close of the meeting. During the evening a collection which realised 17*s.* 6*d.* was made in aid of the Belgian Fund.

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THE CENTRAL TELEGRAPH OFFICE.—STORIES OF OLD F.G.

BY A. TAPLEY (*Assistant-Controller*).

TO-DAY the *personnel* of the Cable Room numbers 400. In the year 1870, when the Telegraphs were transferred to the State, the staff of the old Foreign Gallery consisted only of some 30 persons. As all of the Anglo-Continental circuits were then worked by private cable companies, what even that small staff could find to do was something of a mystery to the uninitiated.

In those far-off days there were no expert guides to conduct visitors over the Central Office, but the duty was entrusted to the stationery clerk. This officer used to wax eloquent in his description of single needle, Morse printer and Wheatstone instruments, but whisked the visitors past the Foreign Gallery, motioning with his right thumb over his shoulder, in a gesture half tolerant and half contemptuous, and ejaculating "Merely F.G.!" There is no record of what our guests thought of the cryptic remark of their cicerone, but it was typical of the mental attitude of not a few persons in the Service towards the old F.G. Fortunately the Department looked upon it with more favour, regarding the work of the section as of a special character, and as requiring two superintendents. Each of these, like several members of the rank and file, by the way, was a character of a very distinct type. Perhaps the mose noticeable of them all was the superintendent of German birth, Mr. Weygang. He was Bismarckian in appearance, with a bias towards greater rotundity, and a suggestion of benevolence, when unruffled, that is not usually associated with that statesman. He possessed a nose of rosy hue and remarkable flexibility, and when charged with emotion he spoke his mind more freely through the movements of his nasal organ, than by mere ordinary speech.

On one occasion when he had sent a note by a messenger the boy was asked, on his return, if he had given the note to Miss Black, and replied, "No, sir; I couldn't find Miss Black, so I thought I better give it to Miss White." There was at once great activity on the part of the nasal organ, and the boy trembled more at the convulsive workings of the nostrils than at the jerky speech which accompanied them—"You should *not* tink; you are not paid to tink; you have no right to tink; you are no *tinker*."

Whilst the Franco-Prussian War was in progress two young aristocrats found their way as birds of passage on to the Foreign Gallery staff. They did not intend making a career of telegraphy, and generally acted with the rollicking freedom of medical students rather than with the decorum of the average F.G. officer. Whenever a French victory was announced the two gentlemen used to hum the *Marseillaise*, commencing with the softest *pianissimo* and increasing the volume of sound in a gradual *crescendo*, watching eagerly meanwhile the effect, not so much upon the ears as upon the nose of the chief seated some few yards off. When the olfactory became active the strains suddenly died down, only to be renewed again and again until at last the culprits were caught in the act and charged with the irregularity.

Some years later there was a bird of passage of another type. He was a keen young student who in after life would have adorned the pulpit, the bar or the House of Commons, had he set his heart upon achieving distinction in any of those vocations. He was short and slim, with dark hair and flashing eyes, suggestive of the orator. For several years he studied medicine in the morning, and did evening duty in the Foreign Gallery. By dint of persistent application he ultimately succeeded in taking the degree of doctor of medicine, and for many years he has been a successful practitioner in the Midlands.

Once during a slack time our young student was improving the occasion by writing an essay, and became so engrossed in his literary exercise as to fail to notice for a minute or so a telegram that was awaiting his attention. His superintendent came down upon him with a "Here! you gives that to me," and, suiting the action to the word, seized the manuscript. When the inspiration had come upon the young author he had utilised the piece of paper nearest to hand, a yellow service form; so the chief was within his right in impounding the official paper. Great was his indignation as he pounced upon the spoil, but words fail to describe his rising anger as he read a description of "The Old War Horse," and how "the glory of his nostrils is terrible: he saith among the trumpets, Ha, ha; and he smelleth the battle afar off." Alas! the too obvious direct reference to his own prominent feature did not escape him, and he rushed the young criminal into the presence of the Assistant-Controller. "You blasphemous young rascal! you are parodying the Psalms," declaimed that august official. Not a bad shot for an Assistant-Controller: but the quotation is really from the book of Job. The onslaught failed from its very intensity, the youthful student remarking that if addressed in such a manner again he would communicate with a member of Parliament: for there was no association in those days to champion the grievances of the staff; and the whole affair fizzled out with a severe reprimand.

The superintendent had the qualities of his defects. If quick to take offence he was equally quick to sympathise with and help those in trouble. He was an able and devoted servant of the State and to the last stuck manfully to his duties.

THE RAID BY GERMAN AIRSHIPS ON THE NORFOLK COAST.

ON Jan. 19 three German airships made a raid on the Yarmouth, Lowestoft, Kings Lynn, and Sheringham areas. No damage, however, was done to any of the exchanges concerned.

At about 8.30 p.m. two of the Yarmouth routes were broken down by bombs and about 100 subscribers' service was stopped, including the Naval Air Station, War Signal Station and the Lowestoft Junctions. All electric lighting was cut off by the authorities, and the exchange was for a short time plunged in darkness. There was some delay in answering calls owing to the light failing, to the number of false signals and to the large number of subscribers calling, and it was impossible to know which was the legitimate signal to answer. Candles were requisitioned from the Post Office, and after about half an hour all calls had been attended to, and the night staff, who had by this time been augmented by two day telephonists, were able to cope with the flow of traffic. The day telephonists remained on duty until 11.30 p.m. On the morning of the 20th the general officer commanding made a complaint of delay, but when he was taken into the switchroom and the matter was explained to him he was satisfied. So far as is known no other complaints were made.

Mention should be made of the conduct of Miss Ward (Clerk-in-Charge) and Miss Emmerson (Telephonist), of Yarmouth, during the air raid of Jan. 19. They had gone off duty and were at home at the time of the raid, but, at great personal risk and without being sent for, both returned to the exchange and remained on duty until normal conditions obtained. They have been specially commended.

SOME TRAITS OF GOOD SUPERVISION.*

BY EDITH M. MATTHEWS (*Liverpool*).

IN writing this paper I am not attempting to delineate a perfect supervisor. Were I capable of doing so, no useful purpose would be served, for such an unapproachable being would only sadden us. On the contrary, I hope by emphasising a few practical qualities within the reach of anyone caring to strive for them, to widen the outlook of our future controlling officers who are with us in such numbers this evening.

First, I would place the faculty of *decision*. Those who have had the misfortune to work under a vacillating superior will understand the feeling of powerlessness which is communicated whenever such a person is appealed to to settle a dispute. However just the operator's cause, well directed pressure in the shape of a judicious outburst of fury from an angry subscriber, or a piteous tale of woe, will in all likelihood move such an one to a hasty promise of redress, which facts disclosed later prove quite unnecessary, leaving a sting in the mind of the operator concerned, if she be a conscientious one, at the reflection cast upon her work, and implanting in the breast of a certain type of business man the idea that the more he complains the more he'll get for his money.

The necessity for decision meets one at the outset of a supervising career. As an operator, one has very little responsibility; it is a matter of rule that every important decision should be settled by the supervisor. To be suddenly transferred to the position of *making* the decisions is a very radical change, and the temptation to consult someone with longer experience rather than to take a definite stand for one's self, is sometimes a very strong one. How can the faculty of quickly assimilating a number of conflicting statements and giving a just judgment be acquired? One's natural powers of discrimination and firmness, of course, enter largely into the question, but these can be considerably strengthened by practice. Mental wobbling is highly infectious. Once get thoroughly unsettled mentally in a dispute as to the rights and wrongs of a particular case, and it is curious to note how clouded the judgment becomes for succeeding knotty points, until finally, to make up one's mind definitely becomes the hardest thing in the world. What is the antidote? Wait for sufficient information to get a thorough knowledge of the facts but, having seen one's duty in relation to them, act promptly and *abide* by the decision.

The next point I would enforce is *justice*.

"Deliver me from my friends" is a well-known saying, and is peculiarly applicable in this connexion, for although some might find it difficult to judge their enemies without prejudice, the majority feel the pinch most acutely in rebuking the faults of their friends. Of course, no supervisor, in business relations, should recognise either enemies or friends, but as a human being, psychic conditions will incline her towards some of her staff and repel her from others. She must conquer these tendencies absolutely in her dealings, holding the scales with unflinching impartiality if she desires to retain her own self-respect and that of her operators, for once let a feeling of "favouritism" creep in and her whole authority will be undermined.

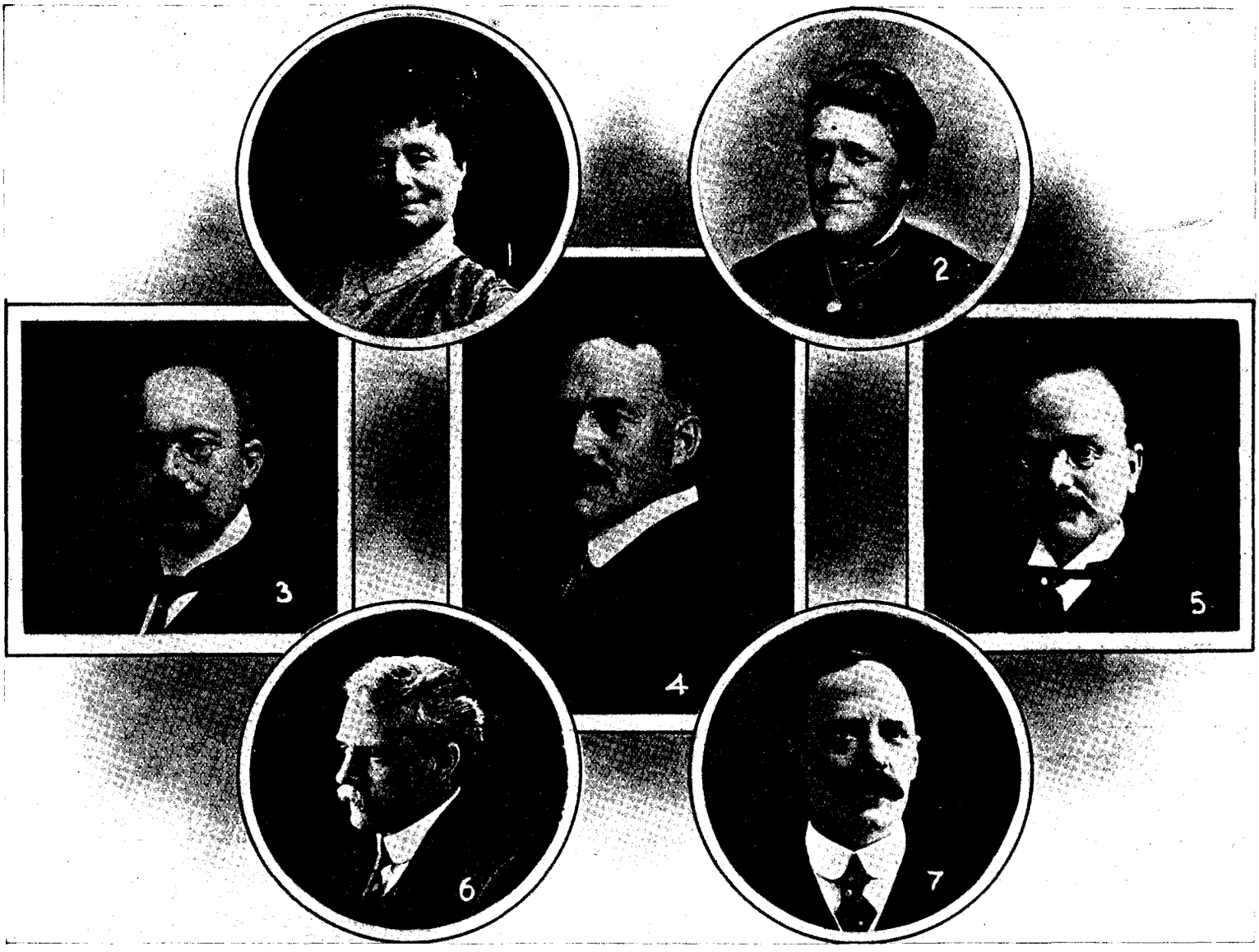
Self-control is another item which cannot be too strongly insisted upon. To make an operator understand that she must not answer back in the face of provocation is one of the hardest conceivable lessons: some of them never master it. I well remember as an operator the feeling of amusement I experienced on reading for the first time, in a small neatly compiled rule book which had been distributed to the staff, the instruction that "No irregularity on the part of a subscriber must be treated otherwise than courteously by the operator, as his conduct was often the result of a misapprehension of the circumstances." That seemed all right for the subscriber, but when his irregularities took the form of abuse, bad language, violent ringing, &c., it seemed a counsel of perfection that only angels could attain to. Years of experience changed my views, but operating human nature remains very much the same, and if a supervisor expects a high standard of self-control from her operators, I am sure she will only obtain it by keeping her own example continually before them. Many are the causes of annoyance to ruffle her temper, some unavoidable, some deliberately inflicted, but she can never give vent to irritation, however greatly provoked, without weakening her influence, and lowering her character in their estimation.

Lastly, *co-operation*. In dealing with this final point it is necessary to view the work first from the operators' standpoint. Telephony, being made up so largely of a number of reiterated movements, has a tendency to degenerate into a merely mechanical procedure, the actions being performed from force of habit and without any mental participation. This is particularly the case with local working and short-distance trunk lines, the calls over which resemble one another to such an extent that it requires a strong effort of will to concentrate the attention sufficiently to individualise them. The feeling of monotony this induces results in a low estimate of the character of the work. No definite results are visible, and the tendency is to feel that it is not worth while putting one's *heart* into the task. Needless to say this does not provide the best work, and it is here that the supervisor has her opportunity. Once again, example will speak with a force that no precepts could inculcate. Her own work, cheerfully and thoroughly done, down to its smallest details, is a challenge to those working under her which seldom fails to evoke a loyal response. Further, her commendation of honest effort, her word of encouragement in the face of difficulties, her help willingly rendered whenever required, make her a factor to be relied upon in any emergency, and obtain the truest results of co-operation in lightened work and decreased strain.

Let me conclude with a brief illustration.

Two French army officers in charge of their respective regiments and both highly esteemed by their men had signally different results in action which could only be attributed to one cause. The first having issued explicit commands to his soldiers dismissed them with the words "Go on, my children." The second in slightly different phraseology said "Come on, my children," and led them himself.

* This paper was read before a meeting of the Liverpool Telephone and Telegraph Society.



CHIEF OFFICERS OF THE CENTRAL TELEGRAPH OFFICE.

(1) Miss LYNCH (Chief Supervisor), (2) Miss BRIAULT (Supervisor), (3) Mr. V. M. DUNFORD (Deputy Controller), (4) Mr. J. NEWLANDS, C.I.E. (Controller), (5) Mr. J. BAILEY, (6) Mr. A. TAPLEY and (7) Mr. A. W. EDWARDS (Assistant Controllers).

OBITUARY.

THE friends of Mr. WILLIAM WHIGHT, late Assistant-Controller at the Central Telegraph Office, will regret to hear of his death at the age of 70, after a short illness, on Feb. 7 last.

Mr. Whight joined the service of the Electric and International Telegraph Company on Nov. 5, 1859. He was appointed telegraph clerk at the Central Telegraph Office at the time of the general transfer in 1870, and passed through the various grades, ultimately attaining the rank of Assistant-Controller, higher grade, on Oct. 30, 1902. He was for some years in charge of the Stock Exchange and Threadneedle Street B.O., and during the absence of the present Controller, on special service in India for a period of two years, was appointed by the Postmaster-General to act as Deputy-Controller. It was at the conclusion of his term in that capacity that Mr. Whight terminated his association with the Central Telegraph Office on Nov. 7, 1909, after completing half a century of service.

WE regret to record the death of Mr. ROBERT HEYWOOD CLAXTON, at his home in New Brighton, Liverpool, on Feb. 17, in his 75th year. Mr. Claxton's biography appeared as No. III in the series of "Telephone Men" in the *National Telephone Journal* for August 1906, with a characteristic photograph. This *doyen* among English telephone men started telephone work in 1879, and simply lived and breathed telephones for the 33 years to the Transfer at the end of 1911. Deep sympathy will be felt with Mrs. Claxton, as Mr. and Mrs. Claxton—themselves without a family—were a father and mother to hundreds of younger telephone men and women with whom they both came into frequent touch. By all his co-workers Robert Heywood Claxton's memory will be affectionately treasured.

SHEFFIELD DISTRICT NEWS.

ON Saturday, Dec. 12, a very successful Bohemian concert was held at the King's Head Hotel, Sheffield, by the members of the "A.S.T.E." and "P.T. and C.A." The labour of organising the entertainment and preparing the programme was in the hands of a very energetic committee, consisting of the Misses G. Hewson, M. Newboult, B. Flintoff, W. Holt, E. Orrell, and P. Somerfield, with Mr. G. Hamer as secretary. A large and enthusiastic audience fully justified the hard work of the committee, and showed unstintedly their appreciation of the events which were excellently rendered by the following artists, all amateurs and members or friends of the Post Office staff:—Misses K. Steel, D. Bannister, E. Priest, F. Milner, M. Inkson, M. Kemshall, L. Harding, L. Hill, D. Hill, M. Puttrell, F. Breedon, W. Hewitt, B. Petrie, L. Webb; Messrs. J. Poole, J. Bloor, W. Thyne, B. Marsden, and T. A. Francis, with Miss J. Edmandson, A.L.C.M., at the piano.

Mr. J. W. Swithinbank, our new District Manager, officiated as chairman, and judging by the courteous and efficient way he controlled a crowded audience and kept the programme swinging along, he is no stranger to such a position. Mr. Swithinbank took the opportunity during the evening of saying a few words of appreciation of the kind reception he had received from the Telephone and Post Office staff and officials on taking up his new duties at Sheffield. The Chairman was supported by Mr. Herbert, the Sectional Engineer, Mr. Thyne, Chief Clerk, and other officials, who one and all contributed to the success of the evening. Mr. W. Thyne proposed the toast of "The King," and later on Mr. Herbert made an eloquent appeal on behalf of the Local Relief Fund, for which a collection was afterwards taken, and realised the handsome sum of £5 10s. The evening closed with a hearty vote of thanks to the chairman and artists.

WALL DAMAGED BY POLE CARRYING 200 WIRES AT BERMONDSEY WALL.

HEAVY POLE CARRYING 96 WIRES.

POLE CARRYING 50 WIRES.

SNOWSTORM DAMAGE TO THE LONDON TELEPHONE SERVICE.

THE unusually heavy snowstorm which prevailed in London on Jan. 22 last had a very destructive effect upon overhead telephone lines. Ordinary storms of wind and rain and of even dry snow have few terrors for the telegraph engineer, for he knows that the factors of safety allowed in the building of the lines are sufficient to withstand all normal weather conditions, but very heavy falls of snow of the adhesive order, which coat the wires and supports with excessive weights, usually spell disaster. Such visitations rarely occur in London. The storm of the 22nd ultimo soon developed into one of the worst experienced in recent years.

Although North London escaped to a large extent, the snowfall reaching a maximum of not more than 2 inches at Ealing, localities south of the Thames suffered severely. The record showed 4 inches at Battersea, 6 inches at Sydenham, and a slightly greater fall a little farther south. As the day wore on the thin bronze wires, where they had not already broken, began to assume the appearance of whitened clothes lines, the accumulations of snow which they carried varying in diameter from ¾-inch to 1½ inches. Late in the afternoon the fault reports from the various exchanges on the south side of the river indicated that very considerable damage had been done. When the tests were completed it was found that, excepting some damage in the Tilbury, Romford, East, Stratford and East Ham exchange areas, the breakdown was confined to South London exchanges, none of which escaped.

Amongst the worst sufferers were the undermentioned exchanges :—

	Total lines.	Lines out of order.	Percentage of lines out of order.
Battersea ...	1,935	1,421	73
Brixton ...	2,685	1,260	49
Lee Green ...	1,911	1,020	53
New Cross ...	1,872	1,047	56
Streatham ...	2,290	1,284	56
Sydenham ...	1,994	1,000	50

The following statement shows the total number of lines interrupted in the London telephone area :—

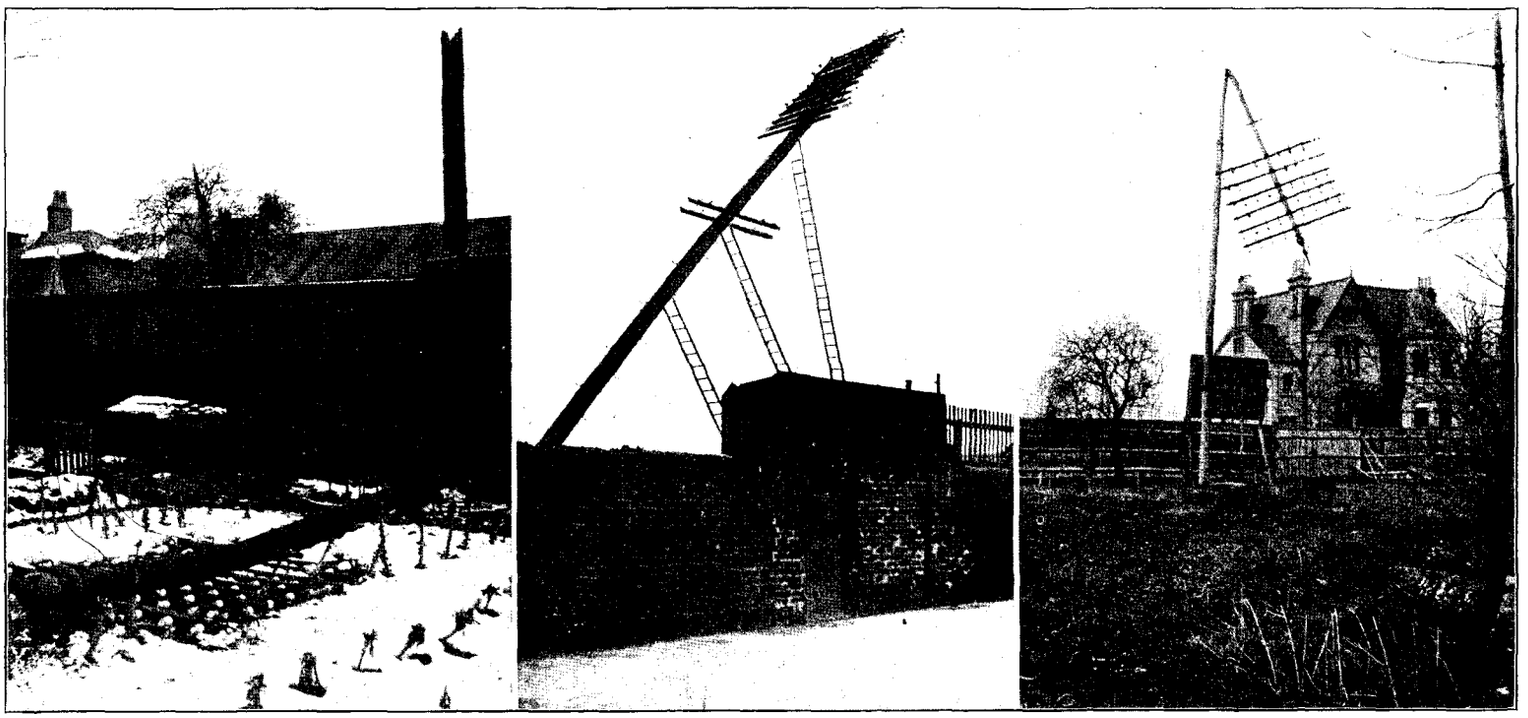
Engineering districts.	Circuits interrupted			
	Subscribers.	Junctions.	Miscellaneous.	Total.
London	8,934	24	344	9,302
South-Eastern ...	2,204	85	—	2,289
South Midland ...	381	26	—	407
Eastern	300	9	—	309
Total ...	11,819	144	344	12,307

An inspection of the overhead routes indicated that the damage was of no ordinary character. Practically the whole of the heavier routes acquired from the National Telephone Company, supported either on very high poles or on roofstandards, and carrying anything up to 120 wires, each were partially destroyed. Not a very great number of poles or standards were actually broken, but it was quite the exception to find any which had not been more or less deflected from the perpendicular, while the conductors were either lying in complete contact on the roofs of buildings or hanging in bunches from the supports. At street crossings the wires had been cut away by the police and other persons, so as to prevent damage to wheeled traffic and foot passengers. Notwithstanding the extent of the damage, it is gratifying to be able to state that no injuries to persons took place, although there was considerable damage to private property.

The work of restoration was put in hand without delay, but for the first few days the energies of the workmen were mostly taken up in pulling into safe positions poles and wires, which were threatening the public safety. Thereafter several days were occupied in renewing and re-staying the main route poles, for until this was done no good purpose could be served by mending the endless number of broken branch lines. Preferential treatment was then given to War Office, fire alarm, doctor's and hospital circuits. The following figures indicate the rate at which the circuits were restored in the London engineering district :—

Subscribers' circuits faulty	Jan. 24	... ...	9,302
,, ,,	,, 30	... ...	7,083
,, ,,	Feb. 6	... ...	4,510
,, ,,	,, 13	... ...	2,340

Before the end of February things were practically normal.



60-FEET POLE CARRYING 97 WIRES, BROKE IN TWO.

100-WIRE JUNCTION ROUTE.

IRON POLE, N.T.Co.'s PATTERN CARRYING 64 WIRES.

Although the rate of progress in restoring faulty circuits was considerable, in view of the extent of the damage, it would have been much greater but for the fact that nearly a thousand workmen belonging to the London district had joined the colours. The services of 117 Royal Engineers were obtained from the War Office on loan, and their assistance proved to be of great value, but no help could be obtained from elsewhere, as large numbers of workmen in the Provincial districts had also joined the Army. By drafting all available workmen &c. from the north to the south of the Thames it was possible to place 569 men, divided into 97 gangs, at work upon the renewals.

The breakdown of January last cannot be compared in extent to the great snowstorm of December 1886, which seriously interrupted the telegraph and telephone services throughout the country, but comparison is possible with the snowstorm which visited London in February 1900 and put out of use over 15,000 subscribers' lines, mainly in South London. On that occasion the National Telephone Company were in a position to draft workmen into London from Provincial districts to help in the restoration of the plant, but even then seven weeks were occupied in completing the work. In view of the war conditions prevailing at present the Post Office engineers have reason to feel satisfied with the results of the energy thrown into the work of making good the effects of the storm.

It may be mentioned that 170 special transfer circuits had to be joined up for use of the traffic staff to provide additional information positions, and that 750,000 paper sleeves had to be brought into use for plugging up the multiples.

The public generally bore the inconvenience to which they were subjected by the loss of telephone service with great patience. 11,800 letters were issued by the Controller to affected subscribers, as against 15,000 issued by the Company in 1900, explaining the position of affairs, and doubtless these letters and the frank descriptions of the extent of the damage which appeared in the Press satisfied those affected by the unavoidable delay in restoring the service.

LONDON TELEGRAPH AND TELEPHONE SOCIETY'S LIBRARY.

ARRANGEMENTS have now been made for the transmission of library books and periodicals, free of postage, between members of the Telephone and Telegraph Society of London and the Society's Library. Full particulars and catalogues of the library can be obtained by members from Mr. Harvey A. Smith, Superintending Engineer's Office, Denman Street, London, S.E.

HIC ET UBIQUE.

WE congratulate Mr. John Scott, one of the Provincial Superintendents attached to the Telephone staff of the Secreta y's office, on his appointment to the postmastership of Sheffield We look upon this appoin m nt as an interesting proof of the thorough fusion which has taken place of the late National Telephone Company's staff with the main body of the Post Office staff. That one of the chief postmasterships should be filled in this way is conclusive evidence that the old lines of cleavage are rapidly disappearing.

CORRESPONDENCE has arisen in the *Westminster Gazette* on the subject of the indemnity which Germany will pay at the conclusion of the war, when that happy consummation is achieved. Mr. Moreton Frewin suggests that the State Railways of Germany, worth nearly a thousand million sterling, are likely to be one of the first items in the indemnity. He also mentions mines and forests. But what of the Telegraph and Telephone systems ? These surely are very productive assets. Perhaps some of the more ambitious of our colleagues already see themselves in the mind's eye as *Extra-Oberpost-inspektors*, assisting the Verwaltung, and with a watching brief for British interests.

AN interesting development of the telephone is its use as a substitute for X-rays in locating the position of bullets in the wounded. *Lloyds*, quoting from the "*Journal*" of Paris, says :

In the course of a lecture at the Conservatoire des Arts et Metiers, Professor Voille stated that the Hughes balance was now being used to locate bullets in wounds. It was enough, he declared, to pass one of the bobbins over the body of the wounded man and to listen at the telephone to find the exact spot in which was the bullet or splinter of shell. The system was very simple and very certain, and would be of inestimable value where radiographic apparatus was not available. The Hughes balance is composed of two bobbins connected so as to make a balance between their primaries and secondaries. When the balance is established the telephone apparatus, which is fixed between them, makes no sound, but when one of the bobbins comes near a metallic body the equilibrium is destroyed and the telephone vibrates.

THE annual conference of District Managers and the Telegraph and Telephone staff dinner will not be held this year. This perhaps will hardly occasion surprise. The inadvisability of drawing all Surveyors and District Managers together in London and denuding the principal Provincial cities of their chief officers for a couple of days, in times like the present, will be apparent.

WESTERN ELECTRIC COMPANY MULTIPLEX TELEGRAPH SYSTEM.

BY J. H. BELL (*Western Electric Co., late of P.O. Engineering Staff.*)

FOR some time a new printing telegraph system, designed by the engineers of the Western Electric and Western Union Telegraph Companies, has been working on a New York-Boston circuit of the We tern Union Company. A similar installation is being set up between London and Manchester, and it has been thought that the following brief description of the new system would be of interest to the readers of this JOURNAL.

A summarised description of the system might be boiled down to twelve words—namely, "tape transmission, column printing, Baudot multiplex with improved means for maintaining synchronism."

Dealing first with the multiplex principle, imagine a flat metal ring divided into four quadrants, and having a revolving arm carrying a contact brush, so that as the arm revolves the brush rubs over the quadrants of the ring. With a similar device at a distant office, and the revolving arms connected by means of a wire, it would be possible to transmit telegraph signals, provided that the contact brushes started from the same relative position on the rings, and the arms revolved at exactly the same rate. For instance, while the contact brush at station Y is passing over quadrant A^1

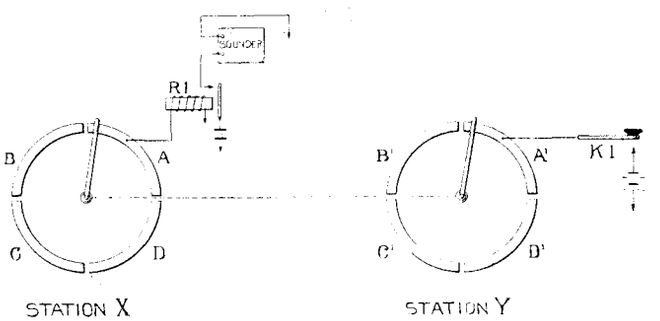


FIG. No. 1

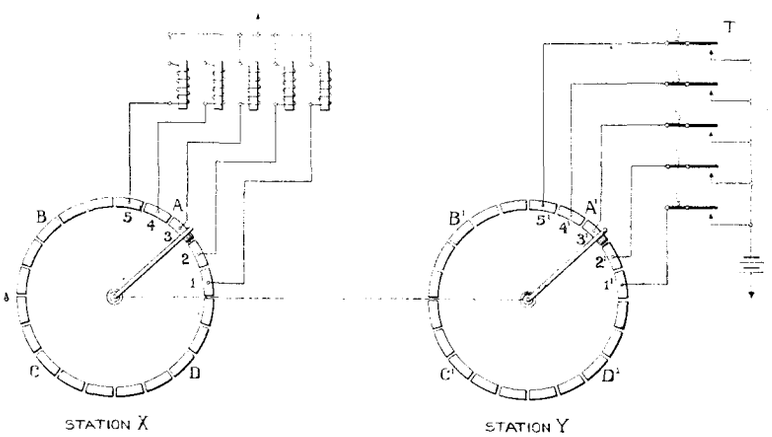


FIG. No. 2

(Fig. 1) and the contact brush at station X is passing over quadrant A, it could be arranged to transmit from key K^1 1 to relay R 1, either a word or a letter as may be desired. Similarly, transmission could be effected by means of apparatus sets connected to segments B B^1, C C^1 and D D^1, thus providing means for sending four messages over one wire. Now the contact brushes sweep over the quadrants at a uniform rate, so that it would not be a practical arrangement to send a complete word at each quadrant, as words vary in length from one letter to more than twenty letters, and it would be necessary with this method to have the brushes moving slowly enough for the longest words to be transmitted. Hence, there would be a great amount of lost time in the transmission of the shorter words. Similarly, it would be impracticable to employ the Morse code to send one letter per quadrant, as the lengths of the various letters and figures in that code range from one unit to nineteen units. It is therefore necessary that a different code should be used, one in which all the letters, figures and symbols are of the same length. Such a code was invented many years ago by Gauss and Weber. It was never made practical use of, however, until Baudot adopted it, and is now generally known as the five-unit Baudot code. To utilise this five-unit code in multiplex

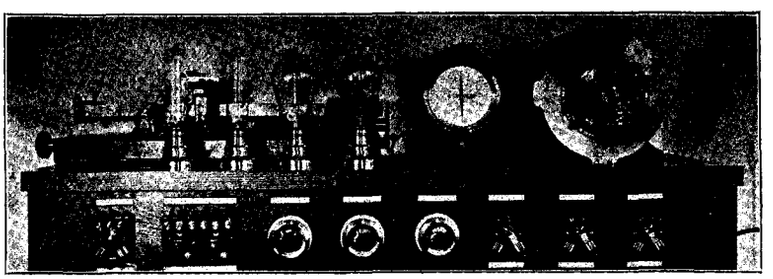


FIG. 3.

operation each quadrant is divided into five segments, as shown in Fig. 2. It will be obvious that as the contact brush sweeps over the five segments of one quadrant a letter combination in the five-unit code can be transmitted to the distant station; and in making a complete revolution over four quadrants four letters can be transmitted without any lost time whatever. If the contact brush at station Y sweeps over the five segments, 1^1, 2^1, 3^1, 4^1, 5^1, at the same time that the brush at station X sweeps over segments 1, 2, 3, 4, 5, then the five units of the combination set up on the segments at station Y by the transmitter T will be distributed to the five selecting relays connected to the segments at station X. These five relays form part of the selecting mechanism of a printer which will be referred to later.

In like manner five-unit combinations can be transmitted from transmitters connected to the five segments of each of the three other quadrants at station Y to printers connected to the segments of the three other quadrants at station X, as the contact brushes sweep over them.

Such a system as this requires that the rotating arms carrying the contact brushes shall move at practically the same speed. No ordinary clockwork with a daily adjustment could be made to provide the desired uniformity in speed. Were the rotating arms so driven, and the accuracy of the clockworks such that only one second difference would exist between the clockworks at the two stations at the end of 24 hours, then if the rotating arms started from the same relative positions they would be far enough out of phase relationship to disorganise the working of the system in less than four and a half minutes. Obviously something more reliable than this is essential. It could be obtained in two ways—either by having more accurately made clockwork, or else by providing for more frequent adjustment. The latter is much the simpler and is the method generally employed in printing systems of this type.

In order to obtain frequent adjustment of the speed, advantage is taken of a means for generating what are termed "correcting impulses" from the line signals. A description of the method employed in doing this would introduce technical details, and is beyond the scope of this non-technical article.

A quadruple duplex set consists of a distributor driven by a special type of electric motor, four printers, four transmitters, four keyboard perforators, and four automatic transmitter control

devices, with the usual duplex balancing apparatus. A message is first prepared by an operator upon a keyboard perforator which perforates a paper tape. The perforations are dependent upon the key struck, and the characteristic of the perforation determines

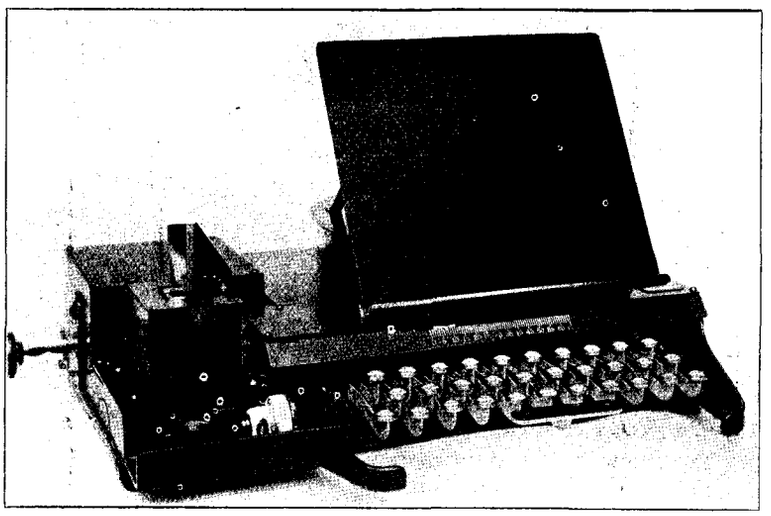


FIG. 4.

the letter to be printed. This tape is then fed into a transmitter which translates the perforations into combinations of positive and negative impulses, which are taken up by the distributor and transmitted over the line. At the distant station these impulses operate a polarised line relay, which, working in conjunction with the distributor at that station, distributes the pulses in proper sequence to the selecting relays of a receiving printer. The selecting mechanism of the printer is caused to operate and select the predetermined letters on the typewheel, which are printed in plain Roman characters. The printing is in column form, and the message is completed by the printer ready for delivery to the public.

Fig. 3 is a photograph of a distributor.

Fig. 4 is a photograph of the keyboard perforator. This instrument has a keyboard similar to the standard typewriter. The stroke of the keys is short so that it can be operated without fatigue. The selecting mechanism consists of five horizontal bars placed beneath the keys, and so arranged that each key, when depressed will engage one or more of the various bars and depress them by the movement of the key. The depression of these bars selects the punches in the punch head. After the selection of punches has been made, a contact is closed, which operates a magnet. This throws an anvil forward and forces the selected punches through the paper tape.

The tape is perforated crosswise instead of lengthwise, thereby effecting a considerable saving in the amount of tape used.

The photograph also shows an indicator, the purpose of which is to indicate to the operator the number of letters that have been punched on the line. This is a ratchet mechanism which is operated one tooth for each operation of the punching mechanism. It carries a pointer across a graduated scale, and is returned to normal position at any time the "carriage return" key is depressed. This perforator has been operated accurately up to 92 words per minute which was the limiting speed of the operator.

Transmitter.—A general outline of the transmitter is shown in Fig. 5. The purpose of this instrument is to set up the various combinations of impulses, as determined by the perforations on the tape, so that they may be taken off by the distributor and sent to the line in the proper sequence.

As the tape is fed through the transmitter, five contact fingers are pressed against it. If a hole presents itself to any finger the finger will pass through and positive battery will be connected to a particular segment on the distributor associated with that finger, but if no hole is presented the contact finger is held in such a position that negative battery will be associated with the segment on the distributor associated with the finger. In this manner the particular arrangement of perforations in the tape determines the polarity of the pulses which are sent to the line.

The possible speed of the transmitter greatly exceeds that of the normal speed of the distributor, giving a wide margin in this respect.

Normally the speed of the transmitter is about 40 words per minute, and at this rate a skilled operator finds no difficulty in keeping it fed continuously. In order, however, that no mutilation of the tape may take place in the event of the transmitter overtaking the operator, a small switching device is introduced between the keyboard perforator and the transmitter. Before the tape becomes taut it causes a small lever to rise and to open the circuit of an electromagnet which operates the transmitter, so that the latter immediately stops feeding forward the tape. As soon as the tape becomes loose again the contact lever falls, the circuit is restored and the tape is again stepped forward.

Printer.—The printer is shown in Fig. 6. A printer is arranged to print the message in column form on paper $8\frac{1}{2}$ inches wide. The speed of the printer is determined by the speed of the distributors, which may be 30, 40 or 45 words per minute, but the printer can be run at a speed of 70 words per minute providing the operating impulses come along at that rate.

The machine is of the type in which the paper moves and the typewheel is stationary as far as longitudinal movement is concerned. The typewheel is mounted on a vertical shaft, which is driven by a spring kept under a constant torque by a small motor. The typeshaft is released after the letter has been selected and revolves until it strikes a stop thrown up in its path. The position of the stop is determined by the letter selected, and as soon as the

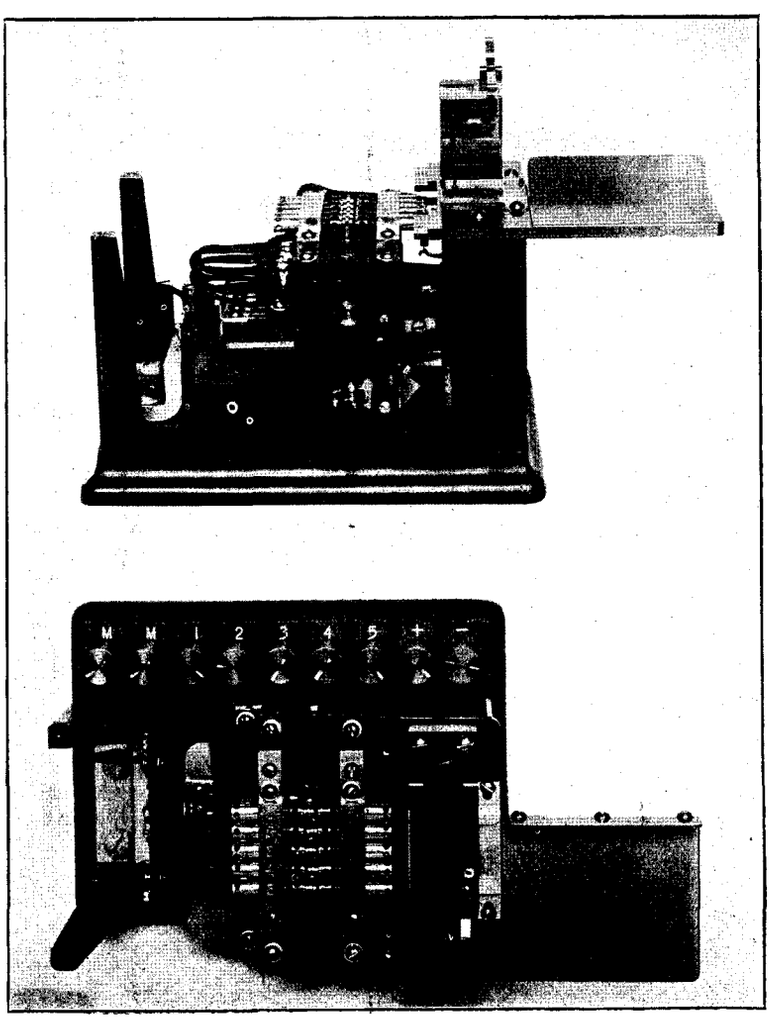


FIG. 5

stop is reached, the paper is forced against the typewheel by a plunger, and the letter is printed. The wheel is inked by two rollers which have been saturated in ink and held against the typewheel by spring pressure.

The stops are selected by a movement of some combinations of five discs, which in various positions allow different levers to enter slots in the disc, and thereby move into path of an arm rigidly fixed on the typewheel shaft. The discs are selected by combinations of positive and negative impulses from the distributor. These combinations are sent out by the transmitter through the distributor at the sending end. The various functions of letter spacing, line spacing, return carriage for a new line, and shifting of the typewheel so that letters or figures may be printed are performed by electromagnets mounted in the machine and operated by contacts which are selected in a manner similar to the selection of the type selecting stops.

Prior to the installation of the Boston-New York multiplex circuit, a number of female operators were trained to use the keyboard perforators, adopting the touch system. This method of

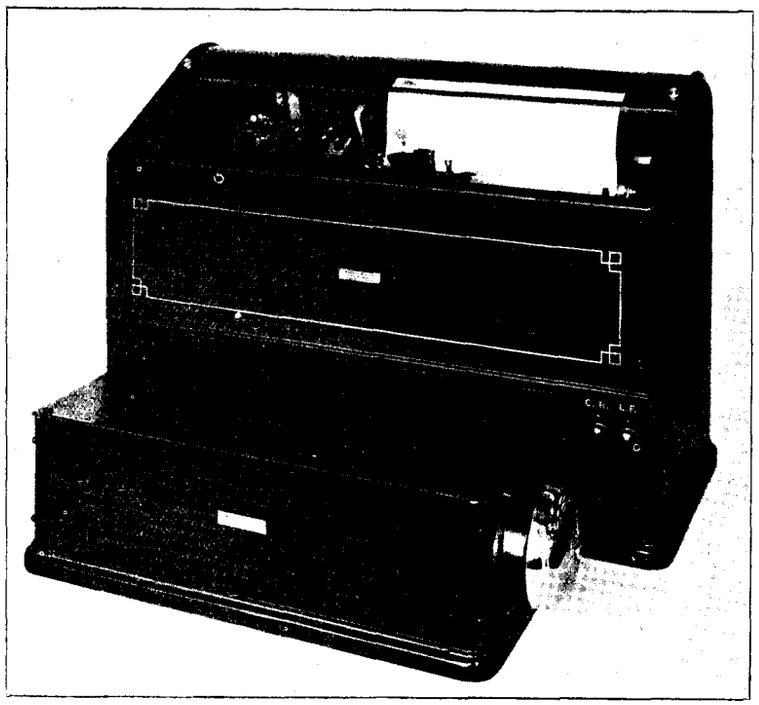


FIG 6.

operating keyboard machines of any sort has been proved vastly superior to the older methods, by making use of all fingers of both hands the physical exertion is spread over a greater number of members and it has been found that such operation produces much less fatigue than any other method of telegraph transmission. The eyes need not be taken from the message form, with the result that fewer errors are made. Operators who have never previously worked keyboard machines can become expert "touch" system punchers within two or three months. It may be of interest to note that some wonderful records have been made by "touch" operators on keyboard machines of another system. One operator maintained an output of 150 messages per hour for nine hours. Throughout America there are a number of operators who daily handle 100 messages per hour during the four or five hours they are working on keyboard perforators. On the multiplex system the practice has been for the operators to change duties at the end of each two hours, so that part time is spent in punching and part time at a printer. The Boston-New York circuit probably carries a heavier load of traffic than any other circuit in the world, as will be seen from the following data furnished by the Traffic Department of the Western Union Company. This circuit is worked between 8 a.m. and 1 a.m., seventeen hours per day. In the evening a large portion of the traffic consists of "night letters" which are considerably longer than the ordinary telegram. In calculating the traffic loads these "letters" have been equated to the general average of 30 words per message. In order that a comparison may be drawn between these traffic loads and traffic loads on British circuits, columns have been added under which these loads are equated to 21 words per message, which is the average length of a British message.

Best day. Date.	8 a.m. to 6 p.m.			Equated to 21 words per message.	
	Sent.	Received.	Total.	Total.	Average per hour.
March 3, 1914	2028	2197	4225	6036	603

Weekly load.	8 a.m. to 5.30 p.m.		5.30 p.m. to 1 a.m.		Total.		
	Sent.	Received.	Sent.	Received.			
Aug. 21	1688	1919	1095	987	5689	8127	478
„ 25	1641	1821	943	786	5191	7416	436
„ 26	1485	1603	1022	824	4934	7048	414
„ 27	1598	1694	1087	760	5139	7341	432
„ 28	1660	1717	1278	696	5353	7647	450
„ 29	1523	1502	995	724	4744	6777	398

For the whole week the average hourly load is 432.

For the day hours only the average is 497 per hour.

The following figures show the number of messages handled over a period of three months :—

	Working days.	8 a.m. to 5.30 p.m.	5.30 p.m. to 1 a.m.	Total.	Equated to 21 words per message per day.
June	26	81653	40854	122507	6731
July	26	74720	47019	121739	6691
August	26	85466	46946	132412	7275

It will be observed that no deductions have been made for idle time, although in the early morning and late evening hours the circuit is far from being loaded to its full capacity.

Two other factors must not be overlooked—namely, accuracy and speed of service. Accuracy depends upon both the operator and the machine, and may to a certain extent be determined by the ratio existing between the number of "rqs." required and the volume of traffic handled. No definite data are yet available on this point. It will be recognised, however, that if a circuit is working badly and the number of "rqs." is high, its daily output will be seriously affected. The foregoing figures are therefore some indication of the efficiency of the system in this direction.

The foregoing description of the system is necesssarily incomplete. It includes many novel features which cannot be described in a short article. Suffice it to say that the system is one in the operation on which the operators need have no fear of telegraphist's cramp and yet they are able to show a considerable increase in the number of messages handled with much less mental fatigue than is produced by operation of the older systems.

THE CENTRAL TELEGRAPH OFFICE.—PENALTIES; THEN AND NOW.

BY A. W. EDWARDS (*Assistant-Controller*).

AMONG a large body of men and women, more particularly in their earlier years, in whatever sphere of business life they may be engaged, there will always be found some who give considerable trouble, either by their want of care and discretion or through some unfortunate bias which bids them to endeavour to get the better of the master-hand by one means or another.

It has ever been a recognised and universal principle that unless some notice be taken of such irregularities and some penalty be exacted in an attempt to check them, discredit must unquestionably fall upon the concern, whatever it may be, endangering not only its fabric but jeopardising the interests of the steady and more devoted employees.

In the outside commercial world the measures taken are of a more drastic character than in a Government Office, and there is little doubt that the perpetrators of many of what, in the latter, rank as serious offences would, if committed in a commercial house, receive short shrift against which appeals would be fruitless. Government employees are therefore more favourably placed in regard to their security of tenure than their fellows in commercial business houses, for the percentage of dismissals for flagrant offences is remarkably small, while lesser irregularities are nowadays passed with greater leniency than in former days; at least, this may be claimed so far as the Central Telegraph Office is concerned.

In this connexion it may not be amiss to review the past and contrast it with the present. The first Controller of Telegraphs, the late Sir Henry C. Fischer, C.M.G., spent the greater part of his life in building up and improving the Telegraph System, and particularly that of his own immediate concern, the Central Telegraph Office. There can be little question that the tasks he was called upon to perform at the initial stages, one of which was the welding together of the somewhat cosmopolitan staffs of the various telegraph companies taken over by the Government, required firm and careful handling, and that one of the essentials was the maintenance of strict discipline. That Mr. Fischer (as he then was) was a strict disciplinarian will not for one moment be gainsaid His methods were distinctly autocratic, and he had a peculiar means of dealing with the individual who appealed against the punishment awarded. One of these was that of requiring the appellant to make good the time lost in an enquiry when the appeal in his opinion was frivolous. As a result a man had need of an exceedlingly good case before venturing to ask for a reconsideration of the notice taken, and consequently appeals were seldom put forward.

Such was the man who reigned as Controller of the Central Telegraph Office from 1870 to 1898, and under whose firm administration it was built up. During this period and for some years subsequently each case of irregularity was dealt with on its merits, and the conduct record of the particular officer in fault ruled, to a considerable extent, the notice taken of the offence committed. Thus an officer habitually careless or prone to give trouble received a more severe punishment than one who seldom came under notice, and this course of action, in contradistinction to the present method of scheduled punishments, was in some measure the cause of the exaction of the relatively more drastic penalty. In these earlier days an officer would be attached to a division or section of the office for a considerably longer period than at present, and as each division or section was practically self-contained, with its Assistant Superintendents more permanently in charge, the more careless or troublesome officer was better known to his immediate chief than under the system established in later years. As a result the greater the trouble given, the greater the punishment recommended.

With the retirement of Mr. Fischer the iron rule relaxed to some extent, and the succeeding years have seen the adoption of a more lenient policy, more particularly in regard to errors, omissions, &c. There is perhaps good reason for this, for it is questionable whether the heavy extra duty punishments inflicted in the earlier days for minor offences acted as a real deterrent, as after all the most careful individual is liable to error, and the heavy penalty held over an officer may often have been the means of engendering nervousness, with unfortunate consequences. Viewed in this light, therefore, there is perhaps a good case for the less stringent though systematic notice now taken of the more minor irregularities committed.

The discipline record books of earlier days make interesting reading, inasmuch as they show to what extent telegraphists were dealt with for various irregularities during the "Fischer" *regime*. For example, an error "Belfast" for "Byfleet" necessitated the performance by the delinquent of two hours extra duty, while for such errors as "Brentwood" for "Brentford" and "Waterford" for "Wexford" four hours extra duty were given in each case. The same punishment was meted out for such irregularities as signing and timing an unsent message, misplacement of a telegram, and responsibility for the non-delivery of a message. A case in which a telegraphist so far forgot himself as to question his colleague's sanity at the distant end of the wire required him to pay one shilling for the irregular remark with the addition of two hours extra duty. A case of obstructive working realised four hours extra duty: miscounting a telegram, one hour; conversing with a telegraphist engaged in transmitting a telegram, one hour; and hanging up an unfinished telegram, two hours. An unfortunate officer who, on a second occasion, caused the non-delivery of a telegram was required to perform a full Sunday duty of eight hours, in addition to a serious warning. In each case the extra duty was performed without pay.

These examples might be continued *ad libitum*, but they will serve as contrasts to the present-day treatment of identical cases, which in the ordinary course, with one or two exceptions, would pass under the "schedule" with a caution to the officer in fault.

Compared with their compeers of a generation ago, present-day telegraphists may probably see reason for thankfulness that their sins of omission and commission are not visited upon them at commercial value, and that more rational regard is now had to the liability to error in connexion with which telegraphists are, unfortunately, no exception.

COMPARATIVE STATEMENT OF C.T.O. TRAFFIC DURING CHRISTMAS SEASONS OF 1913 AND 1914.

1913. Date.	Total traffic.	1914. Date.	Total traffic.	Increase in 1914.
Wed., Dec. 17	125,243	Wed. Dec. 16	150,856	25,613
Thurs. ,, 18	124,778	Thurs. ,, 17	147,985	23,207
Fri. ,, 19	135,080	Fri. ,, 18	149,595	14,515
Sat. ,, 20	115,893	Sat. ,, 19	135,542	19,649
Sun. ,, 21	14,293	Sun. ,, 20	22,993	8,700
		Mon. ,, 21	161,052	
Mon. ,, 22	148,774	Tues. ,, 22	168,010	19,236
Tues. ,, 23	146,889	Wed. ,, 23	195,218	48,329
Wed. ,, 24	167,837	Thurs. ,, 24	212,660	44,823
Thurs. ,, 25	31,526	Fri. ,, 25	54,303	22,777
Fri. ,, 26	59,439	Sat. ,, 26	98,978	39,539
Sat. ,, 27	100,575			
Sun. ,, 28	13,062	Sun. ,, 27	26,086	13,024
Mon. ,, 29	123,837	Mon. ,, 28	146,460	22,623
Tues. ,, 30	117,205	Tues. ,, 29	142,737	25,532
Wed. ,, 31	125,437	Wed. ,, 30	145,004	19,567
Thurs., Jan. 1 (1914)	101,702	Thurs. ,, 31	158,957	57,255
Totals ..	1,651,570		2,116,436	404.389

It should be borne in mind in comparing the figures of 1913 and 1914 that the war had closed down all Stock Exchange work and greatly reduced the foreign traffic, as of course direct telegraphing to Germany and Austria has entirely ceased. Notwithstanding this, however, the total increase of traffic for the brief period dealt with amounts to no less than 404.389 telegrams.

Note.—Each transmitted message is reckoned as one only.

THE TELEPHONE STAFF HOSPITAL COLLECTIONS.

THE annual general meeting of the Telephone Staff Hospital Collections was held at G.P.O. South, Carter Lane, on Wednesday, Feb. 3. Mr. A. C. Greening, the chairman of the delegates' committee, presided. The report for the year ending 1914 was presented and showed an increase of £63 4*s.* 1*d.* in the collections as compared with 1913. The secretaries reported that the collections in the Traffic Department had increased by £55, and in the Controllers' Office by £6. The collections in the Contract, Stores and Electrophone Departments all showed an increase. The total staff collections amounted to £711 19*s.* 5½*d.*

Miss A. Heap was unanimously elected chairman of the delegates' committee. Mr. J. Leslie was re-elected hon. treasurer, and Miss A. Reekie and H. Wormald hon. secretaries for the ensuing year.

[Photo by ELLIS & WALERY, 51a, Baker St., W.

UNVEILING OF THE ROLL OF HONOUR AT THE CENTRAL TELEGRAPH OFFICE.

A LARGE and representative gathering of the staff of the Central Telegraph Office assembled in one of the dining-rooms on Jan. 21 to witness the unveiling by Colonel Ogilvie, C.B., Second Secretary, of a Roll of Honour containing the names of 447 of their colleagues who are serving with His Majesty's Forces at home or abroad.

The Roll, which was first suggested by Mr. A. W. Edwards, by whom also the whole of the arrangements connected with it were successfully carried out, is the work of Mr. E. F. Poole and is very artistic. Owing to the continued withdrawals of staff, however, it is not sufficiently large to contain all the names of those who are on active service and it will be supplemented in due course.

The unveiling ceremony, which appropriately took place in front of the Roll of Honour commemorating those members of the C.T.O. staff who lost their lives in the South African War, was presided over by the Controller who, in calling upon Colonel Ogilvie to unveil the Roll, said that prior to Aug. 4, 1914, it was possible to think, speak, or write on almost any subject, but since that date all our speaking, thinking and writing had been dominated by one subject—namely, the war. Nearly everything we did nowadays seemed to be either directly or indirectly connected with the war. There had been an admirable response by hundreds of thousands to the call to serve their King and Country. The armies of to-day consisted of many units, but we were chiefly concerned with the Signallers and more particularly with those who had gone from the C.T.O., and who number over 500. (Applause.) Although Signallers, as such, may not belong to the regular fighters, yet many of them had been in the fighting line and unfortunately one, Private Holder, had been killed. So far as was known his was the only death among those who had gone out from our midst. In happy contrast Private Hastings, who singularly enough belonged to the same regiment—the Oxfordshire and Bucks Light Infantry—at about the same time so distinguished himself by shooting no fewer than 23 Germans—(Applause)—that he had gained the Distinguished Conduct Medal. The suggestion as to the desirability of having a Roll of Honour first came from Mr. Edwards, and it is worthy of mention that it was not necessary to send outside for the artist. He was found within the office and the result had amply justified the confidence placed in Mr. Poole in entrusting him with the execution of the Roll. Miss Lynch, Chief Supervisor, suggested that the ladies would like to undertake to defray the cost of the production and framing and to present the Roll of Honour to the office as a mark of appreciation of the services their male colleagues were rendering to their King and Country. The Roll of Honour will be placed in a prominent position in the Instrument Gallery so that it will be a memento of the great war for many a year to come.

Colonel Ogilvie, who was received with much applause, said that in the course of his long official career it had been his pleasure to be at many office gatherings, but he did not think he had ever assisted at one which had given him more sincere pleasure and gratification than this. Ever since he entered the Service he had been on the Telegraph side of the Post Office, and had been associated with the C.T.O. not only in the ordinary official way but in the old 24th Middlesex Volunteers, and knew how keen had been the spirit of the C.T.O. to serve their country, both officially and in military duty, and he had always felt proud of belonging to the Post Office Telegraph Staff. The nation had been going through the greatest crisis that had ever occurred, and the C.T.O. had risen splendidly to the occasion and was taking a share in the national burden which would bear comparison with that of any other part of the community. (Loud applause.) Mr. Newlands had pointed out that the C.T.O. had already sent some 500 men to the Army or to the Territorial Forces. Colonel Ogilvie said that he had been informed by Brigadier-General Fowler, who was in charge of the Army Telegraph arrangements, that the men had done excellently and had rendered service which no one who had not had lifelong training in telegraphy could have rendered. He was glad and proud to be asked to unveil this memorial, which was a fitting and worthy testimony to the splendid effort made by the C.T.O. It was very interesting to learn that it had been given by the ladies. It had not as yet been necessary to ask the ladies of the C.T.O. to take their places in the fighting line, but he had no doubt that if such necessity arose there would be as many volunteers from their ranks as among their brethren. As it was they had nobly borne their share in the great national effort. During the first month or so of the war Colonel Ogilvie said he had, in the course of his work, to be in the C.T.O. at rather exceptional hours at night and at hours when, as a rule, most of the ladies had gone home, but when he came he found that there were a large number of them on duty and that they had declared their intention of stopping at any inconvenience to themselves so long as there was need for their services, and he expressed the sentiment that whatever credit there was due to those fighting there was also great credit due to those who have had to stop at home to bear their share of the national burden by carrying on their ordinary duties. He, therefore, had much pleasure in unveiling the memorial. (Loud and prolonged cheering as the Roll of Honour was unveiled.) After viewing the Roll of Honour Colonel Ogilvie said that his audience would all agree that the artist's work was done well. The only criticism he had to make was that it would before long need to be larger.

Miss Lynch, Chief Supervisor, then presented the Roll of Honour on behalf of the Lady Supervisors and staff, and said that it was a pleasure and privilege to make the presentation of this exquisite work of art to the C.T.O. as a testimony and lasting memorial of the valour and courage of the men who had gone to the Front to answer the call of duty, to face danger in distant lands, and who were now fighting for the honour of their country, avenging cruelty and wrong, and doing their best to uphold the glorious traditions of the British Army. They fervently trusted that the thin black line which encircled the name of one brave fallen comrade would still be the only one of its kind when our soldiers came home. The pleasure which it had given the women of the C.T.O. to present this testimonial was greatly enhanced by the presence of Colonel Ogilvie at the unveiling ceremony and by that of the Controller, who was always interested in the work of the office and in the welfare of his staff, and who was ever ready to recognise genius and bravery.

Mr. Parker, in moving a vote of thanks to the ladies, said he felt that in some degree in responding for the staff on this occasion he was sailing under false colours, because obviously the men for whom the Roll was intended could not be present. Perhaps when they had returned, when the victory was won, there would be a re-union. On that occasion it would be interesting if the ladies would consent to give the Roll of Honour to the men themselves. Mr. Parker then moved a formal and very hearty vote of thanks.

Mr. Dunford, Deputy Controller, moved a vote of thanks to Colonel Ogilvie. He was sure the staff would look upon it as no

empty compliment, for there were others besides those at the Front who had had a strenuous time, and chief amongst them was Colonel Ogilvie. (Hear, hear.)

At the close of the ceremony, which terminated with the spontaneous singing of the National Anthem, Colonel Ogilvie very kindly offered to re-frame the South African Memorial to harmonise with the new Roll of Honour. It is worthy of remark also that Colonel Ogilvie has at all times the interest of the Telegraph Service at heart, and has been greatly instrumental in procuring many commissions for officers of that Service.

THE CENTRAL TELEGRAPH OFFICE.—SOME REMINISCENCES OF THE EARLY SEVENTIES.

BY J. BAILEY (*Assistant-Controller*).

WHEN I was a small boy, attending school at St. Martin's-in-the-Fields, I often looked at the West Strand Telegraph Office and wondered how they sent the messages through the wires, but it never occured to me that I should start my career inside its portals. At that time the office belonged to the Electric and International Telegraph Company, which was competing with the British Magnetic, the United Kingdom, the London District and one or two other small concerns, but of these the Electric was the most important, and its head office in Telegraph Street formed the hub of the service at the time the Government took over the amalgamation in 1870. The staff for the London section after 8 p.m. consisted of an elderly telegraphist, appropriately called Gloomy Jones, and a small boy, aged thirteen, who came to an untimely end through trying to descend a spiral staircase upside down. In the Metropolitan Gallery there was a very high pulpit occupied by the lady supervisor as a point of vantage suitable for watchful supervision. Now in those days there was socially a wide gulf fixed between the female and male staffs, the former performing duty between 9 a.m. and 8 p.m., and the latter between 8 p.m. and 8 a.m., and those on the day staff knew not those on the night, the reason being that those on the day simply came to the office as a pastime, or for chocolates (which were expensive at that period), while those on the night staff came for filthy lucre—what there was of it, and therefore when it happened one morning between 9 a.m. and 10 a.m. that the doors below the pulpit opened with a crash and a ghostly looking individual, with long hair and beard unkempt, rolled out and disappeared through the doors opposite like a flash of lightning, it was popularly supposed that the pulpit was haunted, as the strict search which followed the hysterical outburst failed to disclose any trace of the gloomy individual who had overslept himself.

At the transfer, the night staff consisted of eight people assisted by a few who stayed on overtime, 8 p.m. till released. At present the night staff numbers 200 assisted by about 400 whose duties expire at different hours between 9 p.m. and 2 a.m. Such was the state of affairs when, at the age of fourteen, I presented myself one day at Cannon Row to be examined for an appointment to the Registered Letter Branch, but I was unsuccessful. I always ascribe my failure to my having placed on record my belief that Oban was a place leading from the City to the West End, but, of course, there may have been other reasons. However, I was asked to attend at the General Post Office and have a shot at the Telegraph Service. The late Col. Du Plat Taylor was the chief examiner, and the questions were a scratch lot, one was to add together the figures on the clock, the others were not much more difficult. Then followed a sartorial examination conducted by the colonel, but as I wore a green Melton cloth coat with brass buttons, of which I was very proud, I passed, and shortly afterwards received a blue paper informing me that I had achieved the proud distinction of becoming a telegraph clerk, and so I fondly believed I had all the rights and privileges of a Civil servant. However, the whole business was horribly irregular and it needed an Act of Parliament four years later to legalise the appointments. After three months in the Telegraph School, the good kind head informed me that I was appointed to the Central Telegraph Office, he wished me well, but thought I was too small ever to get on. So I wished him goodbye with chastened and subdued feelings, and presented myself with the humility which befitted the occasion, was introduced to the lady supervisor and installed at the Newcastle-on-Tyne circuit to punch foreign messages on the service of the Great Northern Cable Company. It was then I found that my smallness was my most precious asset, for the amount of mischief I possessed at that time was as the inverse cube of my size, so much so, that whenever the perpetrator of a practical joke could not be discovered, it was thought to be perfectly safe to report and punish me for it. I remember on one occasion when an elderly operator, who had been struck on the head with a crust while descending the staircase, was unable to discover the offender, he looked up the list of those at dinner and finding that I was on it, reported me as the culprit, and I promptly received four hours' extra duty without pay; on proving my innocence I was informed that the matter would not be re-considered, the punishment would do for something that I had done which had not been found out!

After about a week at the Newcastle circuit there began a liberal course of overtime, 8 a.m. to 8 p.m. as a fixed duty, and after 8 p.m. at the News. It was the period of Scotch Water Bills and other municipal undertakings, and one would receive a message of about three or four columns to go on with! It was the time of the Franco-Prussian War and the increase in News traffic was so rapid that it outstripped all staff provision, and men had to stop night and day, and some of us went home three nights a week, and stopped at the office the other four, getting a few hours' sleep between 1 a.m. and 7 a.m. That lasted until one young man was so ill-advised as to go home and die, and the subsequent inquest put a stop to staying all night, without lessening the number of hours of duty. For several years it was about sixteen hours a day including Sunday, but as the pay was round about threepence per hour the staff did not grow rich. We attribute the excellent health we enjoy to strenuous labour and long hours, all my youthful colleagues of those strenuous days are still flourishing, those who preferred eight hours and the pursuits of pleasure, have, alas, fallen victims to the evils which pursue the unfit. Therefore we may sing, with Carlyle, the praises of labour. The extension of the News service rendered it necessary to prepare three slips, and as there were no pneumatics for the purpose, we were supplied with steel sticks weighing half a pound each! The touch of the Gell keyboard is now too heavy to allow of more than two hours' continuous work, in early days one punched with sticks for sixteen hours and did not know it, but, alas, there was no one to persuade us we were tired. Messrs. F. I. Scudamore and F. E. Baines were constantly on view, if a piece of furniture wanted shifting the former would take his coat off and help, he would also give the signal for starting the "Queen's Speech," which served as a sort of telegraphist's Blue Ribbon, the winner of which enjoyed a certain amount of fame. Mr. F. E. Baines used to treat the staff employed on Good Friday to hot cross buns. He went abroad for some years afterwards, and the supply ceased, but on his return he renewed the order, the difference in the number of the staff however came as a shock and the gift was not repeated the following year.

At the transfer to the Government Mr. H. C. Fischer was appointed superintendent with Mr. E. May, of the Electric, and Mr. T. Barlow, of the Magnetic, as assistants. The free breakfasts and teas which are still supplied are a relic of the old Electric Company.

The Franco-Prussian War led to the institution of what is now a very extensive section of the C.T.O., viz., the News division. At the same time the Wheatstone system was making its appearance and was regarded much as the five-unit code system is now. The speed was at first very low, about 70 words per minute. Owing to the dearth of "punchers" a bonus of £2 was offered to those who made themselves efficient, the test being 30 messages with four erasures. There were some archaic instruments in use, one was "the embosser" which embossed dots and dashes on the tape, another was the "double needle." The "sounder" was unknown,

and anyone who attempted to read by sound instead of by slip was promptly reported, so was the man who attempted to adjust his own instrument! The test officer in those days was a very uncertain quantity, there was one who was a great favourite, because if you told him that the wire was failing he promptly took it for testing purposes, and it was not restored again that day, and when the wire was taken one had nothing to do, as there were no spares, and no Wheatstone to resort to! Other systems in vogue were the "Bell" and the "single needle." The code of the "Bell" differed from the Morse and in the hands of an expert operator the instrument was capable of good work. A singular characteristic of all Bell operators was the excellence of their handwriting.

Much of the overtime bill was defrayed by means of extra duty without pay, and I used to believe that many of the supervisors owed their appointments to the amount of extra duty they had been the means of inflicting—it was their sole recommendation. Among the numerous occasions on which I was the victim was one where I was engaged with a colleague, who is now an esteemed superintendent, in reading the *Boys of England* during prohibited hours. Our disgust can be imagined at being disturbed, just at the moment when "the villain raised his hand to strike," by a foreign voice exclaiming: "Here! I catch dese boys reading sly. Vat time are you off?" "Four o'clock, Sir." "Den you vill stay till eight"—and we did. A Sunday's extra duty was a common punishment, but except for the detention, it was not an arduous one, as there were no split duties, and work, except on the railway wires, generally ceased between 10 a.m. and 6 p.m., which period was usually spent in reading, sleeping and smoking. Some of the messengers found other means of passing the Sunday pleasantly, for when two were missed one morning, a close search found them disporting themselves in the cistern which served the needs of the C.T.O.!

They were bad old days, full of tyranny and injustice. Many a man when he got to the top of the third class found that some 300 outsiders, men with less qualifications and service, had been imported into the office and placed in front of him. One was a man from the Persian Gulf, who appeared one morning as a full-pledged superintendent! He had some peculiar methods of control which earned him the general dislike of the staff, but he was not insensible to a joke, as the following instance will show. A youngster had been to the medical officer and obtained three days' leave for a bilious attack. His joy was such that on getting outside the doctor's room he did a breakdown on the mat, when the aforesaid superintendent appeared and the following dialogue ensued:—Superintendent: "Hullo! What game do you call that?" Small boy (placing his hands on his diaphragm): "Sudden paroxysm of pain, Sir." Superintendent (with a twinkle in his eye and pointing to the paper): "What have you got there?" Small boy: "A certificate for three days, Sir." Superintendent: "Well if you have any more of those paroxysms you'll go back to your circuit. Off you go." Exit small boy hurriedly.

The means of obtaining refreshment were very bad, except on Sundays, when anything could be obtained over the house leads from an adjacent public-house, until the police intervened! Dinners were ordered and despatched from local caterers, notably "Sally's Chop House" in Telegraph Street, and the "Fifeshire" in London Wall. The meals were eaten in the senior and junior cloak rooms, each of which would accommodate about twenty people. There was a cloak room attendant who eked out his small salary by retailing cakes and buns from Webster's in Moorgate Street; if you had no ready money you could have nine for a shilling on the deferred payment system. One morning just as the supply arrived, a messenger informed the attendant that he was wanted in the superintendent's office at once. He went, but was unable to find the person who had sent for him, whereupon he rushed back with misgivings as to his stock, which had indeed vanished. The only clue to the perpetrators was the discovery of the empty basket on the girls' spiral staircase! But the attendant tried to find if any of the boys had lost their appetites! Cakes and buns merely act as an *hors d'œuvre* on small boys.

The pay in 1870 was very low, a mere matter of shillings, in fact one person who afterwards retired on a pension of £388 per annum, expressed the opinion that he would be in clover if ever he got to 30*s*. a week. It can therefore scarcely be wondered at that widespread dissatisfaction existed, which resulted in a strike at the large towns, but owing to want of organisation, and the help given to the Department by the men of the C.T.O., the strike collapsed.

In September, 1872, a classification scheme was promulgated in which the staff was divided into classes, senior class £160, first class £130, second class £90 and third class £65. It was an ingenious scheme for detaining a man some years at the top of each class! Feb. 27, 1872, was the Thanksgiving Day for the recovery of the Prince of Wales, and an amusing story is told of Mr. F. I. Scudamore commandeering a mail van, filling it with wire, apparatus, and his family, and getting a comfortable view of the illuminations under the plea to the police of urgent telegraphic repairs.

The aspirants to histrionic fame established the St. Martin's Dramatic Club, which lasted six years. Its chief difficulty was the female element, for no sooner had a good-looking girl been secured to play the heroine, than the Matron sent for her and pointed out the iniquity of the whole proceeding, whereupon she yielded to pressure and withdrew from the club.

The transfer of the Telegraphs from Telegraph Street to St. Martin's le Grand took place on Feb. 4, 1874, and was preceded by a *conversazione* to the staff. The place allotted was already too small and another floor had to be built, in spite of which the Telegraph section has been gradually elbowing the other occupants out of the building.

In the seventies the City streets were practically deserted until nine o'clock; the means of early locomotion was confined to the railway; there was no tramways, omnibuses did not run till after half-past eight, and London took its pleasures sadly. There were about five theatres, mostly in a state of bankruptcy, and three music halls, while the chief sights of London were Temple Bar and the dark arches under the Adelphi!

THE CENTRAL TELEGRAPH OFFICE.—"IMPRESSIONS."

BY GEORGINA S. LYNCH (*Chief Supervisor*).

How well I can recall my first impressions of the Telegraph Service, and the wonder and delight I experienced on seeing an instrument working for the first time! How amazing is the contrast presented to-day when one looks back upon that period when single and double needles and printers with embossed slip practically represented the whole stock in trade of the Telegraph system. There was plenty of work even in those early days, for employees were few, and the direct wires were kept fully occupied with traffic for transmission to less important offices which had no communication with London. The public too were just beginning to realise the enormous facilities for conducting business and private enterprise which were opening up to them, and which they were not slow to grasp so soon as the benefits to be derived from the use of telegraph wires had forced themselves under notice. Women as operators held a prominent position in those days, and except for the presence of the Controller, Mr. Fischer (afterwards Sir Henry), men were rarely seen in the instrument gallery before 8 p.m., when they would leisurely take up their appointed reliefs on alternate nights year in and year out, and always, it seemed to me, without variation in the monotony of their duties. There was ever a good feeling existing between the two staffs.

No involved machinery had been introduced then, no Wheatstones, sounders, Murray multiplex, Creeds, telewriters, Baudots, Siemens-Halske or typewriters, and there were no problems to solve, where all the work was done on one floor, as to the relative advantages of cord-carriers *versus* girl probationers, nor automatic tubes *versus* boy messengers as delay savers.

I remember too, when Wheatstones first came into operation, with what intense satisfaction we learned that the munificent sum of two guineas would be paid to any member of the staff who could punch a certain number of words in a given time, and how eager

many of us were to win the coveted prize which represented great riches in those days.

The circulation arrangements were somewhat crude, two tables only for this purpose being provided dividing the Provincial from the Metropolitan sections, and the supervisor in charge, methinks, must have combined circulation with clerical duties, for I once had the mortification to receive a severe reprimand from this austere lady on the committal of my first telegraphic error, an error which suggested a compact with the evil one at the dread hour of midnight, but which doubtless had reference only to a lunching or shopping expedition by day, my disgraced telegram reading "Coming with a fiend at 12," instead of "with a friend." The punishment inflicted probably duly fitted the crime, but the obloquy of the latter has never faded from my memory. We have grown so accustomed to the advance of progress as each successive administrator has within the past few years striven to "go one better" than his predecessor, that it seems hard to believe that there was a time when every received telegram was numbered independently before circulating and also recorded on a sheet. The delay which would follow on such a course if re-adopted, now that hundreds of messages are cleared by smart officers in a minimum of time, is inconceivable.

How much could be told of the men and women, co-workers with ourselves in times of stress, who having fulfilled their allotted tasks in this "hive of industry" have passed from our vision but not from our remembrance. The events which have demanded their best energies are recalled, many of which history will relate in the years to come, of heavy storms and breakdowns, political disturbances and General Elections, the death of good Queen Victoria towards the end of the Boer War, the illness of King Edward, and the suddenly postponed Coronation affecting some millions of people, when, as usual, crowds flocked to the telegraph wires for relief from their difficulties which a loyal staff did their best to assuage. The C.T.O. with its up to date apparatus, engineering triumphs and labyrinth of underground wires has steadily reached its present stage of efficiency by the thoughtful care for detail which has characterised all that has been attempted in past years.

A revolution has been effected, if I may pass to another phase of the subject, by the introduction of powerful bread-cutters for preparing the free meals, a great saving of time and labour resulting. Indeed it would have been a matter of much concern had the bread cutting by hand been in force during the recent mobilisation period, when 1,500 additional meals were served daily.

Much has been done of late for bettering the conditions of the women, who now enjoy the comforts of a much desired tea room with its cosy wicker chairs, separate tables and facilities for writing, and the cheerful newly furnished rest room also offers great advantages to tired and suffering workers seeking temporary quietude and repose.

It is gratifying to see how women are encouraged to learn the intricate workings of new inventions which constantly find their way to the C.T.O., and the measure of success attending their efforts, for it has been said that knowledge is power, and no calling in life can earn the dignity of being termed an art or a science when brain and work are not put into it. Surely this is exemplified in no greater degree than in the study of telegraphy, which (having gained the essential knowledge) is a power ensuring us a living even at the uttermost ends of the earth, whereby we can maintain that independence which is so dear to every true Briton.

TELEPHONING FROM ATLANTIC TO PACIFIC.

THE *New York Sun* of Jan. 26 says:

Dr. Alexander Graham Bell, who first talked over the telephone, his invention, in 1875, leaned over to an instrument in the office of President Theodore N. Vail, on the fifteenth floor of the American Telephone and Telegraph Company building, at 15, Dey Street, yesterday afternoon, and said:

"Mr. Watson, are you there?"

And out on the Western edge of the continent, in San Francisco, 3,400 miles away, Thomas W. Watson, Mr. Bell's assistant in his first experiments, threw up his hand with a whoop of joy. To him had come as clearly as if he had been only across town the tones of Dr Bell's voice.

"Indeed, I am!" he said.

"All right, I am glad of that," said the inventor. "Your enunciation seems perfectly clear here. It sounds as if you were in the other room, or in another part of New York, instead of 3,400 miles away."

The first official talk between the Eastern and Western gateways of the United States was a fact. Over busy cities, rolling prairies and the snowy peaks of the Rockies had hummed the words that bridged 3,400 miles in the twitch of an eyelid. And way down South, on Jekyl Island, off the coast of Georgia, Mr. Vail listened to this transcontinental conversation as easily as if he had been in his home office in New York.

Later Mayor Mitchel had his little joke with Mayor James Rolph, of San Francisco, who reminded him of Horace Greeley's advice. "Go west, young man, go west." President Wilson talked with the East, the West and the South, and later in the evening Mayor James Curley, of Boston, joined in the long distance badinage.

It was just 5.45 o'clock when President Wilson picked up the receiver in the White House and bent over the line that stretched to the East to Dr. Bell and to the West to President Moore of the Panama-Pacific Exposition. His coming to the telephone had been heralded by Mr. Carty in the room at 15, Dey Street, who told the watchers that the President was coming down the corridor, and then that he was on the line. To those who had receivers came the President's words clearly as if uttered in the room:

"It appeals to the imagination to speak across the continent. It is a fine omen for the Exposition that the first thing it has done has been to send its voice over from sea to sea. I congratulate you on the fine prospects for a successful Exposition. I am confidently hoping to take part in it after the adjournment of Congress. May I not send my greetings to the management and to all whose work has made it possible and made it the great event it promises to be, and convey my personal congratulations to you."

The receiver in San Francisco was then handed to Mr. Watson, with whom the President exchanged greetings. Mr. Carty then introduced Dr. Bell to President Wilson.

"I am very glad to have the opportunity of talking with you, Mr. President," he said, "over the first transcontinental telephone line."

"I am very much obliged to you," said the President. "I want to congratulate you very warmly on this notable consummation of your long labours and remarkable achievements. You are justified in feeling a great pride in what has been done. I think this will be remembered as a memorable day."

Then the President talked for a few minutes with President Vail, congratulating him on the work of his company.

Later all those on the raised platform where the telephone instruments were placed spoke to the other side of the continent. Mayor Mitchel, Mr. McAneny, Comptroller Prendergast and Mr. Bethell each talked with some one at the San Francisco end of the line.

But of the many interesting moments in the afternoon one that caught the attention of the watchers most closely was when Dr. Bell picked up a duplicate of the original instrument with which he talked to Mr. Watson in 1875, when the distance between the two men was but a few feet. So perfect had been his conception of the transmitter then that yesterday he could talk over it as perfectly as over the modern instrument, the main improvements having been in the wires and other means of transmission.

Dr. Bell's patriarchal face broke into a broad smile of delight as he handled the wooden apparatus built like a box and told of the days when he dreamed of talking over a distance of a few miles. He finally picked up and spoke into it to Watson, who in 1875 caught the first words that Dr. Bell ever said over the telephone. By request he repeated them yesterday on the second greatest day in the history of his invention.

"Watson, come here, I want you," he said, and then Dr. Bell threw back his head and laughed with pure glee.

"He says it would take him a week to come now."

Many receivers had been connected in the directors' room, and around the long table men and their wives, guests of the company, hovered for an hour or two listening to the seemingly magic words that came so clearly they seemed unreal.

Describing the system over which he and his men have laboured for years Mr. Carty said that no one thing had made it possible, but it was due to the constant improvement of all the essentials of telephone mechanism, the cables, the wires, switchboards, other connecting apparatus and transmitters. There are only about ten miles of cable in the entire line, the rest being highly improved copper wires strung overhead, four of them. Over these wires were two circuits, so that two distinct conversations were kept up for more than two hours between New York and San Francisco and for about the same time from Boston.

The transcontinental line will be ready for use about March 1. The rates will be £4 6*s*. for three minutes and £1 8*s*. for each additional minute

Telephony gives the following details of the circuits:—

There are three circuits comprising this line—two physical and one phantom. All circuits are loaded with Pupin coils not much more than four or five inches in diameter. The coils are made of fine iron wire .004 of an inch in diameter, some 13,600 miles of it being on each physical circuit. The two physical circuits are of No. 8 B.W.G. hand-drawn copper wire weighing 870 pounds per circuit mile and being .165 of an inch in diameter. Another statistic of interest relative to the pole line is that there are 130,000 poles in it.

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Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

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

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TELEGRAPHS: FORTY-FIVE YEARS OF STATE CONTROL.

IN this number of our JOURNAL the Central Telegraph Office is enjoying a grand field day, a demonstration in force. The comprehensive sketch on "Some Outstanding Features of the C.T.O." explains the ordinary detail of the office, and when it is read, together with various other briefer articles, the way seems clear for a broader survey of matters telegraphic in order that we may gather up obvious lessons of the past and forecast probable future developments.

The Telegraph Service has been 45 years under State control, and those of us whose memory carries us back to 1870 know that, notwithstanding early predilections, and in spite of that decided tendency towards conservatism of mind which afflicts so many public servants, it was inevitable that certain instruments then in use must disappear and be replaced by others of modern design better adapted for the traffic of to-day. Here, as elsewhere, there must be a survival of the fittest. Amid many changes which have already taken place the Morse sounder still holds the premier place, but even the sounder is in process of gradual displacement. During the past twelve years the trend has been to eliminate the sounder from purely minor circuits, substituting therefor the telephone, while for the busier sounder circuits there have latterly been introduced machine telegraphs operated by keyboards and typewheels or printing mechanism somewhat akin to the typewriter. There have been complex reasons for this line of development such as the emergence of the telephone with its competition on numerous trunk wires; the prime cost of long distance circuits with heavy annual outlay for maintenance; the consequent need for obtaining higher commercial results out of each circuit, and last, though not least, the necessity for adopting on the principal and busier wires suitable forms of improved apparatus giving promise of lessened liability to produce telegraphists' cramp. It is extremely desirable that telegraphists should ponder the reasons for changes they see in progress.

In the battle of modern systems of mechanical telegraphy, as distinguished from older forms of hand manipulation on one or more signalling "keys," it would appear as if the final struggle for supremacy would centre around two principal types; (*a*) fast speed automatic signalling from perforated slip through a single transmitter like Wheatstone or Siemens, or (*b*) multiplex signalling by hand or preferably by keyboard perforated slip over four, eight or twelve channels on a single circuit at regulated speeds as in Baudot, Murray or Western Electric. Another point awaiting final solution is whether the simplicity of typing on slip which can be directly gummed on telegraph forms does not outweigh any apparent advantages derived from "page" printing systems with their more complicated mechanism and additional risk of failure.

The hand manipulation of the "keys" of the Baudot apparatus with its perfect five-unit alphabet will shortly be superseded by a keyboard with perforated slip, accompanied by an increase of speed from 30 to 45 words per minute on each channel—giving enhanced efficiency.

One revelation of the past has been the emergence of telegraphists' cramp. The writer was one of the first telegraph officers to direct attention to the oncoming of this malady. The Department earnestly seeks to combat cramp by the adoption of keyboard and printing telegraphs on the busier circuits. Instructions as to the proper use of the Morse key have been issued broadcast which it behoves the staff to pay diligent heed to as a safeguard. Freer use of the typewriter is desirable, and its obvious utility in other Telegraph Administrations ought to be studied by British telegraphists. Extreme conservatism is apparent in regard to this reform.

Another revelation is that the Press service, which is conducted by a most experienced and skilful staff on some of the best apparatus, has always resulted in a dead loss. The wise men in the Service should suggest a suitable remedy. Newspapers flourish on a low "news" tariff, but the public also reap indirect benefits therefrom.

The most painful lesson of all is contained in the oft-repeated statement that the Telegraphs do not pay, that 25 million pounds have been lost since 1870, and that now, after cleaning the slate and making a fresh start, our highest authority informs us the loss is one million per annum. The staff are not directly concerned with the causes of this gigantic loss, but most of them have a keen interest in the efficiency of their own Department and would be greatly interested if they could read an authoritative answer to a few simple questions, viz.:—

(1) The State paid £7,998,000 for the Telegraphs in 1870. What is their estimated value as a "going concern" in 1915?

(2) The total receipts for inland telegrams last financial year was £2,820,817.

(*a*) What rate was that per word telegraphed?

(*b*) What other State or private Telegraph Administrations, if any, give as good a service at the same tariff?

(3) The total receipts for "Press" telegrams was £140,619 last year for a vast volume of work. What would the revenue have been under the tariff of other large Telegraph Administrations?

Complete answers might possibly demonstrate that while this Department may lose a million, our public, as a telegraphing community, may by comparison with others be saving several million pounds per annum.

Of "Forwarded" telegrams in the United Kingdom 30 per cent. originate in London. The Central Telegraph Office is the hub or binding link of the British system. Its network of underground wires enables it to assist all large Provincial offices when stormy weather dislocates their normal direct circulation. Notwithstanding the encroachment of trunk telephone "calls," telegraph work is going strong. The Service has furnished a host of telegraphists for war purposes, and it is good for our homeland at this juncture that its Telegraphs form a State Department with a loyal and energetic staff. They have done excellent service during the past six months.

J. NEWLANDS.

THE TELEPHONE AND THE WAR.

IT is almost supererogatory to draw attention to the great part which the telephone is playing in the present war. We may truly say that evidence of it is to be found almost daily in the Press. Pictures of field telephones, stories of ingenious concealments of the apparatus and of its invaluable services in directing fire, are part of the staple news of the war. *The Nation*, in an editorial referring to the functions of the aeroplane in warfare, says: "Our ships off the Belgian coast and the big land guns of both sides have done nearly all their work under the direction of the scout in the air, and the equally modern development of the scout or spy who does his work with a portable field-telephone. The telephone is a more familiar and less romantic adjunct of warfare than the aeroplane, but it is probably even more valuable." A typical example of the value of the telephonic system and of the heroism which is required to maintain it is given in the *Daily Chronicle* of Feb. 8 in describing the action before Givenchy: "There is now no secret about the system of telephones by which orders are transmitted to trenches and observation posts. At a certain spot before Givenchy, where at that time the advance trenches were between 300 and 400 yards from the support trenches, a wooden peg, invisible to the enemy, and even to an airman, marked the spot where the telephone wires to various points were intertwined in a bunch about a foot below the surface in a case. Just about dawn the enemy started throwing a few common shells. As luck would have it, one struck the earth close to the wooden peg." The junction box was destroyed, and it seemed probable that communication with the advance trenches was cut off. A soldier-miner set out to repair it, although the half-hour's work involved almost certain death. "With his appliances in a knapsack on his back and rifle in hand," continues the report, "he crept round a traverse, but had not gone many of the 200 yards which separated him from the goal before German bullets began to sing. The officer told off the best shots in the company to do their best with the enemy snipers, who were firing across an open patch of marsh between our advance trenches, while he watched the telephone repairer gliding like a snake over the boggy expanse. The light was still comparatively dim, but through his glasses the officer saw him reach the place where the peg had been and begin digging himself down. Meanwhile shrapnel shells were falling fast, and the bark of the British service rifle answered the rattle of German musketry. The officer saw the daring man more than half enearthed, apparently manipulating the nest of wires as if with difficulty. Next moment communication was restored, and from several quarters came through the warning that there was great activity behind the German lines, and they seemed to be massing in force for an attack. The warning came too late to enable us to get up sufficient reinforcements to be ready for the massed attack, for it was launched only a quarter of an hour after the adventurer by his magnificent courage had mended the telephone junction-box. How attack after attack was launched on Givenchy has already been described; but what would have happened if the advance trenches had found themselves cut off from communication just at the crucial moment? That quarter of an hour's warning may have done more towards tightening our hold on threatened Givenchy than can ever be properly realised. And what became of the little adventurer across that deadly space to the 'telephone-box' of the advanced trenches. In the shock of battle he was lost sight of; and up to Friday last was missing."

Beside the heroic deeds of the battlefield and the histories of lives sacrificed so bravely and alas! so freely, the lesser heroisms of the Service at home lose some of their lustre. But we cannot omit to record with pride and pleasure the behaviour of the telephonists at those places which have been favoured with the unwelcome attentions of the Germans. Voluntary presence at a post of some danger, and intrepid progression through the streets of a shelled town to take up duty, are actions which show that the women of the Service are not found wanting when the call comes.

OPERATING AT PRIVATE BRANCH EXCHANGES.

AT a recent meeting of the Telephone and Telegraph Society of London several speakers bewailed the fact that the Post Office had not continued the National Telephone Company's practice of employing members of its operating staff to work private branch exchanges on private premises. At this stage in the history of Telephony it is impossible to deny that improved operating at private branch exchanges is imperative in the interests of the Telephone Service, and that the average times taken in calling and clearing are not susceptible of much reduction unless such improvement takes place. *Primâ facie*, it appears that if the Post Office supplied trained operators to work these exchanges most of the difficulties would at once be overcome; but if we examine the question more closely it will be found that this is not so. The largest exchanges, such as those at Harrod's Stores, Selfridges, &c., are already staffed by competent and properly trained operators; and, as such subscribers fully realise the fact that they cannot obtain the maximum benefits from their telephone service without efficient operating, it may safely be assumed that this satisfactory state of affairs will continue.

At the other end of the scale there are large numbers of small switchboards, cordless and otherwise, over which there is not sufficient traffic to justify the employment of an operator solely for the purpose of attending to the telephone calls, where, perforce, the telephone work must be added to some other duty. We would fain believe that the day of the office boy or messenger in this capacity is a thing of the past, but traffic statistics belie that optimistic view. Many of these switchboards are either in the care of the diminutive and least responsible of the subscriber's employees or else attention to the telephone is everybody's and nobody's business. We feel that the unlimited or inclusive rate for telephone service is largely responsible for this state of affairs, and that so long as that rate continues in force the number of frivolous calls will handicap the Post Office in its work of persuading subscribers that telephone operating is work unsuitable for irresponsible employees. But with a universal measured rate the frivolous calls on business circuits to a great extent will be eliminated and telephone conversations, each costing a fee, will then be conducted by responsible members of the firms concerned. Subscribers will also realise the need for instantaneous attention to their incoming calls and the prompt clearing of the lines, and, human nature being what it is, they will see that they get proper service from their own staff. Until this halycon day arrives, the only method of securing improvement in the operating at these small exchanges is to continue what we have often heard described as the "missionary work" of pointing out to subscribers as occasion arises that they themselves are responsible for a large proportion of the petty annoyances which regular users of the telephone experience.

Between the large and properly attended private branch exchanges and the small and ill-attended switchboards, there are the private branch exchanges which undoubtedly require the exclusive services of an operator, and should in the opinion of many telephone traffic officers be staffed by Post Office operators.

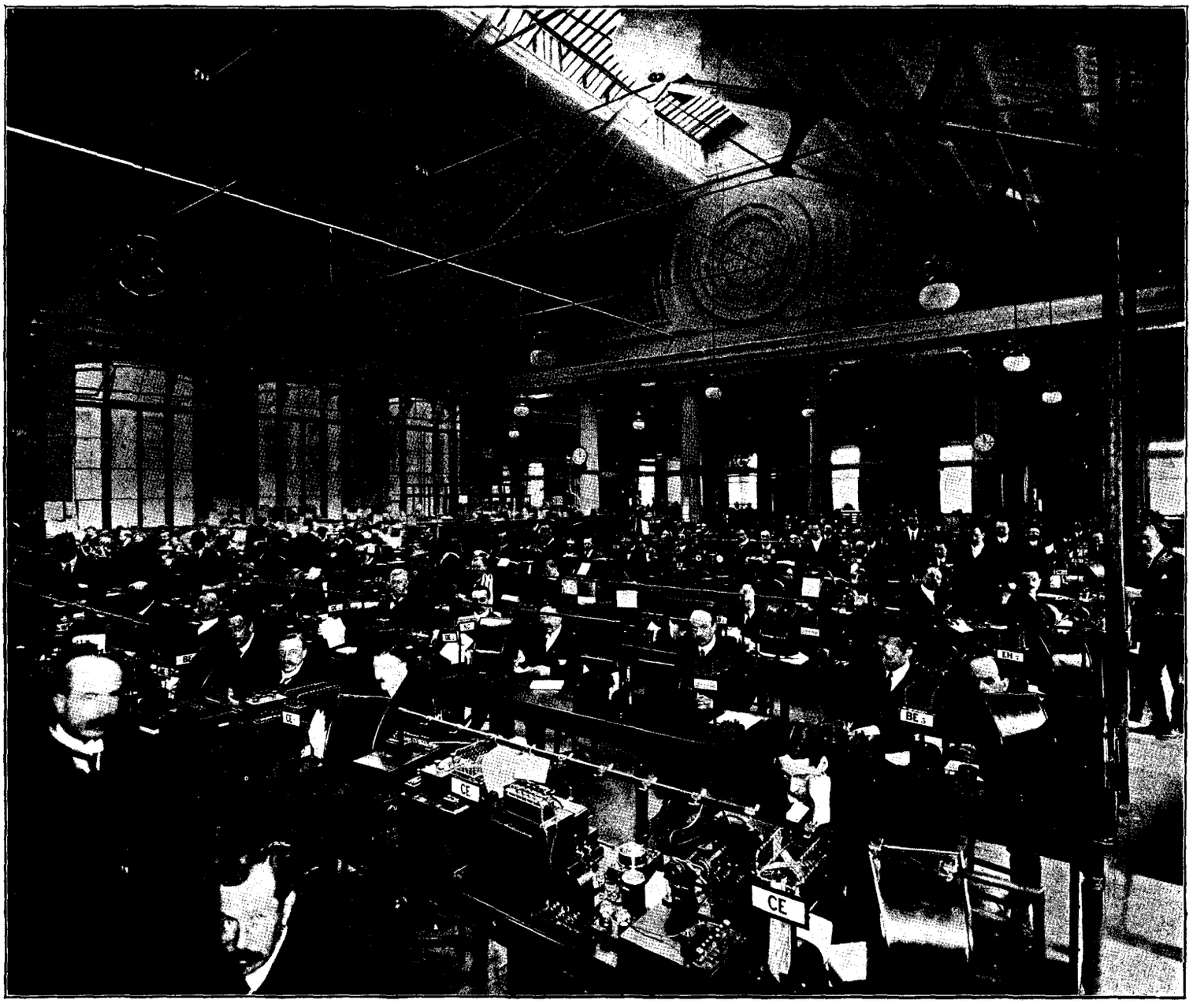
There are, however, difficulties in the way of adopting that course, among which we may enumerate suitability, cost and policy. As regards suitability we propose only to mention the obvious facts that the conditions at many subscribers' offices do not come up to the standard which the Post Office has set for its women employees, and that there are practical difficulties in providing for alternative staff at meal times and during sick and ordinary leave. The cost of Post Office operators is much greater than the cost of National Telephone Company's operators. We do not propose to labour unduly the advantages of State service, such as the pension and gratuity rights, the differences in pay, hours of service, annual and sick leave, &c.; but each of these has a practical money value, and consequently the wages of a Post Office telephonist are only a part of the expense of giving continuous attendance at a telephone switchboard during the ordinary hours of commercial business. In order to recover the whole expenses involved, the Post Office would be obliged to fix its charges for operating at such a figure as would compare unfavourably with the value of such services according to the prices of labour in the open market; and the subscriber could justly urge that he could get as good value for less money. From the point of view of the telephonist, State employment would deprive her of any hope of advancement in the subscriber's business and of her undoubted right of selecting the employer whose conditions are most favourable to her. She might also consider that she would be better off if she received a direct wage of less amount than that paid by the subscriber to the State.

As regards the policy of employing State servants in this capacity, we have neither the space nor the inclination to discuss the general question of the ethics of State employment in the TELEGRAPH AND TELEPHONE JOURNAL. We must be content with expressing the opinion that State employment should, generally speaking, be limited to work for the community as opposed to work for individual profit. Can we regard the work of operating a private branch exchange as work solely or even mainly for the benefit of the community? There is no doubt whatever that efficient operating at a private branch exchange tends towards the greater efficiency of the public telephone service, and in that respect it can be regarded as work for the benefit of the community. But the self-contained traffic of a private branch exchange and the internal distribution of the outward and inward traffic with the public exchange system are obviously works for private profit; while the remainder of the operating duties, *i.e.*, the passing of calls to and the reception of calls from the public exchange, are more properly comparable with the normal duties of a subscriber on a simple line than with the duties of an operator at a public exchange.

We are therefore forced to the conclusion that private branch exchange operating is primarily work for private profit and that the reaction to the benefit of the community is merely what must be expected from all work which is efficiently performed. If the principle be admitted on such slender grounds that the services of a State employee may properly be farmed out for private profit, it is difficult to see where a limit should be drawn. The State might in an extreme case staff the whole of a big business—paying over to the proprietor the difference between the cost of the State labour and the nett revenue of the undertaking. Democracy would in such a case properly demand to know the right of the proprietor to the profits!

The proper course to secure efficient operating at private branch exchanges therefore seems to be that which has already been adopted by the Post Office—the offer of free tuition in operating methods to the employees of subscribers. This teaching at the expense of the Post Office is justifiable because of the advantages accruing to the general telephone service; and it is consistent with the arrangements which have proved so successful in the sister Telegraph Service.

IT will be observed that this month special attention is given in the JOURNAL to the Central Telegraph Office. We think the important and interesting nature of the work of this office, the largest telegraph centre in the world, will be found to justify this departure; we did not anticipate when we projected it that telegraph matter would occupy so much of our space, but we hope to balance matters by devoting the major part of an early issue—probably June—to the London Telephone Service. The larger provincial centres will receive special attention in their turn.



CENTRE GALLERY—CENTRAL TELEGRAPH OFFICE.

SOME OUTSTANDING FEATURES OF THE CENTRAL TELEGRAPH OFFICE.*

BY V. M. DUNFORD (*Deputy Controller*).

"THE largest telegraph office in the world." That expression was used by a well-known contributor in *St. Martin's le Grand* a few months ago, who referred with pride to the fact that for a time he was a member of the staff of that huge centre of instruments and industry known to the initiated as "T.S." In no less a spirit of pride, touched with humility for my shortcomings of expression, do I essay to place before the members of the Telephone and Telegraph Society some account of the place in which I have spent over 30 years of my official life.

The title "T.S." probably needs little explanation. It may not be news to many that the Central Telegraph Office was situated in Founder's Court, Lothbury, on the site now occupied by or adjacent to the present Lothbury office, and for official purposes was designated by the call letters "LY." In 1860 the head office was moved to Telegraph Street and the call letters or code altered to "T.S.," and when in 1874 the General Post Office West was called upon to house the chief telegraph office of the State, the call letters to which all direct working offices had grown accustomed were still retained.

The first things that strike a visitor to the C.T.O. are its immensity and its noise—no fewer than 90,000 square feet of floor space are covered with desks, instruments, pneumatic tubes, intercommunication and concentration switch boards, and the various impedimenta which go to make up an office of first-class size and complexity. The confusion of noises indeed is so great it is difficult for an outsider to realise that telegraphy by sound reading can be carried on under such conditions, in fact, I have known skilled telegraphists transferred from provincial offices to be quite unable to "receive" when first taking duty at T.S.; but one soon gets accustomed to the noise, and the late Mr. Trenam once gave utterance to a sentiment with which I, at least, am in cordial agreement, viz., that one of the most exhilarating sounds on earth is the hum of a busy telegraph office.

The Central Telegraph Office itself occupies the greater part of the ground floor, a portion of the basement and first floor, and the whole of the second, third and fourth floors of the G.P.O. West, while the Telegraph School is situated in an additional building which has been erected on the roof. On the ground floor is a large room known as the Central Hall, into which are led nearly all the main pneumatic tubes working to and from certain City and West-End offices, the phonogram room, the tube switchroom, the telewriter section and also the delivery room and public counter, which is open day and

* Paper read before the London Telephone and Telegraph Society.

night. On the second floor are the administrative offices, the Cable Room and certain circuits working chiefly to seaside towns; on the third floor the main provincial circuits, together with the News division and the Special and Intelligence sections; on the fourth floor the Metropolitan and Home Counties circuits, and on the fifth floor, *i.e.*, on the roof itself, the Telegraph School.

Contrary to usual methods, therefore, a learner upon entering the Telegraph Service instead of beginning at the bottom starts at the top. Under normal circumstances, learners, both male and female, receive four hours' training daily in telegraphy, and perform the remaining four hours duty in collecting or distributing messages in the instrument rooms.

There are places for about 200 learners in the school, and as learners only perform part of their day's attendance there, the number that can be trained at one time is approximately 400.

During the first and second weeks of their training period the learners are given tuition in the Morse alphabet and the various telegraphic symbols, the code time, &c. The correct method of manipulation is shown them, and they are coached in the general system of working in the C.T.O. During the third, fourth and fifth weeks special attention is given to the correct formation of the symbols and to receiving by sound. From the sixth to the eleventh weeks this training is continued with the addition of stick punching and typing, and for the females, circulation, or the correct sorting of messages. After the eleventh week the learners work one to the other, and later on tests are made with dummy messages with a view to ascertaining whether the learner has reached the qualifying standard for passing out of the school, viz., 35 messages in an hour with no errors and not more than 5 corrections.

The average time it takes a learner to reach the present qualifying standard is 34 weeks. The shortest time on record (under the old conditions) was 23 weeks.

There is little difference between boys and girls in the time occupied in qualifying.

Upon leaving the school learners practice at actual circuits for four hours daily, the remaining four hours being occupied in distributing messages as previously, until they can be certified as capable of taking charge of a minor circuit. This certificate can usually be given in about six weeks after leaving the school.

The young telegraphist is then usually placed in a division on the fourth floor, from which floor most of the short distance wires are worked.

Before dealing *seriatim* with the work of the C.T.O. it may be well to say a few words upon the organisation of the office. The Instrument Rooms are divided into divisions, varying slightly in size, but generally including about 200 operators. The divisions are indicated by letters from A to L and there are also the News division. The Special Section, the Intelligence Section, the Central Hall, and the Cable Room, which embraces, or rather did embrace, three divisions within itself, viz., the French, the Dutch and Belgian, and the German. Most divisions are subdivided into three sections, one Overseer and one Assistant Superintendent 2nd class being allotted to each section, while the whole division is under the control of an Assistant Superintendent 1st class. Groups of divisions are under the superior control of Superintendents. Above the Superintendents are two Assistant Controllers for the Inland divisions and one for the Cable Room, while the Deputy Controller and the Controller have jurisdiction over the entire office.

The total staff inclusive of Supervising Officers, male and female telegraphists and the messenger establishment consists of 4,788 persons. Of these about 1,300 are women. The office with the next largest telegraph staff is, I believe, Manchester, with a force of under 1,000.

At the risk of being wearisome to my colleagues it may be well to state for the benefit of those of my readers who have not had the pleasure of a visit to the C.T.O., that the telegrams dealt with consist chiefly of three classes, viz., messages on A forms received by tube from the City and West-End offices for onward transmission; messages received by wire from one office for transmission to another; and messages received by wire for delivery within the area served by the Street Tube System. Including tubes from Cable Companies and one from a News Agency there are 54 street tubes working between the C.T.O. and various offices in the City and West-End extending from Fenchurch Street and Great Tower Street in the East to Oxford Street, Western District, Regent Street, and Piccadilly in the West, and extensions of the system are in progress. Some of these tubes are worked in both directions, and in a number of cases more than one office is served by the same tube.

These tubes shoot into the C.T.O. as many as 30,000 telegrams a day and a somewhat less number of the third class of messages I have referred to are despatched through them for delivery. Most of the street tubes terminate in the Central Hall and incoming messages on arrival there are sorted into trays labelled with the name of the section in which the circuit over which they are to be sent is situated; they are collected by girl probationers (formerly by boy messengers) and conveyed to the house tube terminals, and are then placed in a carrier and are despatched through the tube to the circulation table proper to their section, where they are distributed to the circuit for onward transmission.

Messages for delivery from tube offices follow the same course of circulation but in the reverse direction. On reaching the Central Hall from the Instrument Rooms these telegrams are sorted at a circulation table and distributed thence to the relative tubes.

THE HOUSE TUBE SYSTEM.

The great object aimed at in the C.T.O. is celerity, and with this idea in view the question of a rapid means of transmission between the various floors becomes one of considerable moment. The house tube system as it formerly existed had its good points, but the working of the tube was by signal, and the despatch and receipt of a carrier necessitated eight distinct operations on the part of the attendants. Under the new system, which was installed in March last, the number of operations is reduced to three; the service is continuous and the space occupied by the terminal apparatus is considerably less than that required under the old conditions.

The installation consists of some four miles of brass tubing, of $2\frac{1}{4}$ inches internal diameter, with 110 despatching and 110 receiving terminals.

There are eleven chief tube tables on the various floors, each of which has direct tube communication in both directions with all the others, and, in addition, the Special Section, Intelligence Section, Counter, Delivery, Telewriter Section, Basement Test Room and School are provided with tubes to and from one or more of these eleven tube tables.

The tubes are worked by vacuum varying from about $\frac{1}{4}$ to $\frac{1}{2}$-lb. per square inch. The actual speed of the carriers is less than under the old system, but the time of handling is very much reduced and the service being continuous instead of intermittent the work comes to hand in a regular flow instead of in batches, which is a great advantage at the circulation tables. The tubes have had the important effect of materially decreasing the transit delay in the office, thus placing the C.T.O. in a far more favourable position than formerly as a transmitting centre in comparison with provincial offices.

Cord carriers are also installed in various parts of the Instrument Rooms where they can be usefully employed in lieu of hand service. A Lamson carrier has also been on trial and is giving satisfaction.

THE PROVINCIAL GALLERY.

The most important circuits working to the various large provincial offices are situated on the third floor in a large room commonly known as "the Centre." There is to be found almost every description of telegraphic apparatus that has stood (or is at present standing) the test of time, including Morse, Hughes, Baudot, Creed, Siemens, Murray Multiplex, Western Electric, and Gell Kleinschmidt, and Kotyra perforators. The Centre during the busy hours of the day is a humming, seething mass of instruments and operators. The click of the instruments never ceases there, day or night. Once only have I seen it entirely deserted—and I hope I never shall again—on the night of the fire in the Test Room, Aug. 24, 1912. It was a most remarkable sight—not a soul in evidence, and the only noise the sound of the firemen's hatchets and the crackling of the flames.

If the Provincial Gallery itself with its wonderful array of instruments is an outstanding feature of the C.T.O., I think the rapidity with which communication was restored to the chief telegraph centres on the occasion of the fire referred to must also be considered worthy of remark, and for this we must accord full credit to the Engineering branch which did such excellent service on that occasion.

The chief offices having circuits in the Centre Gallery are Liverpool, Manchester, Birmingham, Newcastle, Grimsby, Cardiff, Swansea, Edinburgh, Glasgow, Aberdeen, Dublin, Belfast and Cork. Other important offices such as Leeds, Bradford, Sheffield, Hull, Bristol and Nottingham are situated in side wings on the same floor.

In an opposite wing is the Special Section where the wires arranged in connexion with any special event are placed. On the occasion of a great speech this section may undoubtedly claim to be an outstanding feature. Page after page of slip, containing in Morse symbols the eloquent utterances of the orator, are rolled off from the Wheatstone, and handed to the telegraphists to transcribe by typewriter or by hand. On a big night it is no uncommon thing for 100 operators to be so employed. The transcription of slip by typewriter is undoubtedly of great advantage. It is quicker and less fatiguing than writing, and twenty copies on flimsies can be struck off at one time without difficulty.

Adjoining the Special Section is the Intelligence Section to which the speech or other "copy" written on flimsy sheets is conveyed by means of a hand carrier. There it is sorted and enveloped for the various newspapers. The Intelligence Section also deals with work handed in by the reporters in London, passing it on to telegraphists who prepare the Wheatstone slip for transmission over the News circuits. Adjoining the News is the Provincial Test Room which was in course of building when the fire in the old test room occurred. The approximate number of lines on the Provincial test board is 450 and on the Metropolitan board on the fourth floor 1,150.

It may be interesting to note that the following diverse forms of apparatus are worked to the Provincial and Metropolitan offices:—

	No. of sets.	
Morse Sounder Simplex	422	
„ „ Duplex	295	
„ „ Quadruplex ...	79	
„ Printer	4	
Wheatstone Auto. Sx.	38	
„ „ Dx.	74	
Creed	6	
Baudot	4	(3 Quad, 1 Sextuple.)
Murray Multiplex	1	
Siemens	1	
Western Electric	1	
Hughes Sx.	1	
„ Dx.	7	
Double Plate Sounder	3	
Phonogram Sets	66	
Telewriters	35	
Teleprinters	2	
Steljes ABC Recorder	1	

INTERCOMMUNICATION SWITCH.

Some time towards the end of the last century the idea was evolved of an intercommunication switch. Telephone experts will not need to have this explained to them.

It simply means that if Hampstead wants to send a message to Lower Sydenham, that office does not, as in the old days, signal it to T.S. for it to be written down and re-signalled, but Hampstead and Lower Sydenham being each connected to an intercommunication board, Hampstead calls up the board operator, asks for Lower Sydenham (by number), is connected through and is thus able to signal the message direct. In this way a large number of messages are transmitted from one office to another within five minutes of the handing-in time. If Hampstead has a message for, say, Southend, which office is not connected with the switch, he is put through to a receiving set on the fourth floor, the Southend circuit being also on that floor; if Hampstead has a message for Manchester, he is connected with a receiving set on the third floor, contiguous to the Manchester circuits. In this way much time which would be lost in transferring the message from one floor to another in the C.T.O. is saved. The same method obtains in the case of forwarded telegrams.

The system was inaugurated in 1904 and the whole installation was completed in 1908. There are at present 490 offices connected to the board, but as some of these have more than one line the total number of lines working is 706. The number of board transactions is estimated at 45,000 daily. The daily number of messages sent and received between the switch offices and the C.T.O. is about 20,000, while the number has reached as many as 30,000.

It may be interesting to remark that intercommunication systems are in operation at both Brussels and Antwerp. Our own intercommunication board is a great improvement upon that in use at Brussels, which office I had the pleasure of visiting so recently as May last.

CONCENTRATION BOARDS.

A somewhat similar idea is carried out, except that there is no intercommunication, in regard to certain offices in the Home district having only a limited amount of traffic. Instead of each office being connected to a separate instrument at the C.T.O. all the lines in the group are brought to a concentration board. A certain number of instrument sets are also connected to the board, and both T.S. set and out office are brought together as occasion demands. This arrangement saves instrument sets and floor space at the C.T.O. and also operators' time, as the work is brought to them instead of their having to move from circuit to circuit. There are two such concentration boards in the C.T.O., to one of which 75 offices are connected, with a maximum provision of 42 sets, while the other has 80 offices and 26 available sets. In some cases there are two or more offices on the one wire. The daily average

HOUSE TUBES—OUTGOING TERMINALS.

of messages dealt with on the first-named concentrator is slightly over 7,000, and on the second about 5,300. An average of 26 and 27 messages per hour per operator has been reached.

The intercommunication switch and also the two concentration boards are situated on the fourth floor.

PHONOGRAM AND TELEWRITER ROOM.

The phonogram and telephone-telegram traffic is a growing one and seems likely to increase rapidly, owing no doubt to the encouragement given by the Department to subscribers to have their messages telephoned, and to the policy of equipping the less important sub-offices with telephone instead of telegraph apparatus. The number of such offices working to the Phonogram Room is 136, and the number is increasing. The Phonogram Room is connected with most of the telephone exchanges within the Metropolitan area, and has 118 (shortly to be increased to 131) junction lines available for inward and outward calls. These calls are received on a concentration board and are put through to telephone sets of which there are 66 in all.

The traffic is of a fluctuating nature and varies from 3,000 to 7,600 messages a day. At the outbreak of the war it reached 10,000.

The Telewriter Section adjoins the Phonogram Room and consists of 35 instruments. The telewriter while interesting as an ingenious form of apparatus does not give very good results from an average point of view. The traffic which in July last was about 1,400 messages a day has fallen off considerably since the war, owing to the business of so many of the subscribers being affected. It is now barely one-half of the July figure.

SOME TRAFFIC STATISTICS.

The telegraph traffic at the C.T.O. at its minimum in January and February gradually increases as the year goes on, reaching its highest point in July and August. As the time of pressures coincides fairly well with the main holiday period of the staff—from March to October—one can have some idea of the difficulties attending the economical working of a large telegraph office. The average daily traffic ranges from 120,000 to 160,000 telegrams (about two-thirds being transmitted telegrams, involving both receiving and sending), but these totals have been at times greatly exceeded. For instance, on the occasion of the Diamond Jubilee of Her late Majesty Queen Victoria in June, 1897, over 195,000 telegrams were dealt with, while nearly 202,000 messages passed through the office on Feb. 1, 1901, in connexion with Her Majesty's funeral. All records both before and since were exceeded, however, on the occasion of the postponement of the Coronation of King Edward in June, 1902. On that occasion the figures were—

June	23	...	...	201,559
„	24	...	...	301,039
„	25	...	...	314,126

The appearance of the C.T.O. on such occasions as these is better imagined than described. Everyone is going at high pressure, and the condition of the instrument rooms at 8 p.m. when usually the great exodus of the female staff takes place, remains exactly the same as at midday. There is the ceaseless busy hum which I have before remarked and which tells the trained ear as clearly as can be that great events are happening in the world outside. Excessive work, excessive play, excessive joy, excessive grief are all reflected immediately in that great nerve centre of the British Empire—the Central Telegraph Office.

It is on such occasions as these that the staff are at their best. Such opportunities enable them to show that their loyalty to the Service when the need arises is another outstanding feature of the C.T.O.

The other two occasions when the traffic totals have been greatly above the normal have both, unfortunately, been connected with wars—the one industrial and the other international. At the time of the railway strike in 1911 the totals on Friday, Aug. 18, reached 210,000 and on Saturday, Aug. 19, 203,000, while in August last, upon war being declared with Germany, the numbers on Aug. 4, 5 and 6 reached, roughly, 248,000, 265,000 and 222,000 respectively.

On certain occasions of late years opportunity has been taken to use the telegraph as a means of advertisement, or to inflict the political views of one or other of the parties upon the electorate. For instance, on Dec. 16 and 17, 1903, *The Times* invited 88,847 persons by telegraph to purchase the *Encyclopedia Britannica*. In March 1912 several newspapers combined to send about 86,000 messages urging householders to vote for certain candidates at the forthcoming L.C.C. election; while last June Mr. Punch was so impressed with the desirability of the purchase by his ordinary subscribers of a special guinea set of caricatures, &c., that he despatched over 30,000 reply-paid telegrams asking them if they would do so.

It appears to me that this idea might be extended to the telephones. It would certainly be cheaper than sending a telegram to call up a subscriber, say, while he was taking his breakfast coffee, and enquire "Have you seen to-day's *Daily Smasher*? Wonderful advertisement of Pelfridge & Co. on page 2. Suggest you read it"—and then ring off. I am not sure whether such a *modus operandi* would tend to defeat rather than promote the object in view, but I present it to advertisers for what it is worth.

The Press work at nights, especially in connexion with Parliamentary debates, is often exceedingly heavy, a total of 500,000 words in one evening being frequently dealt with. For a long time a total of 1,050,000 words on the occasion of the introduction of Mr. Gladstone's Home Rule Bill on April 8, 1886, was the highest recorded, but this figure was exceeded by some 62,000 words on Nov. 27, 1911, on which occasion Sir Edward Grey made his statement before Parliament on the Moroccan crisis.

A FEW RECORDS.

Although high-speed telegraphy is now much in vogue, some excellent performances have been done in the past on the ordinary Morse circuit. For instance, in July 1889 147 messages were signalled from the Stock Exchange office to Glasgow in an hour, and in October 1894 the same officer signalled 156 telegrams in an hour to Edinburgh.

Of individual efforts on the Gell the highest recorded at T.S. is 127 messages in an hour and 111 messages in 47 minutes, or at the rate of 142 in the hour at the Stock Exchange office. An average of 72 per hour has been maintained over a period of four hours. On the Baudot a total of 94 messages has been signalled in the hour by one operator (with an "inscriber" to sign the messages), and on the Hughes 99.

Seventy-one messages have been transcribed from Wheatstone slip on the typewriter in an hour and 16¾ pages of press have also been typed in the same period.

An interesting 30 minutes' test was made recently by operators using the Gell, Murray and Siemens' keyboard perforators. They perforated 60 to 68 messages in the 30 minutes, or at the rate of 120 to 136 per hour. Here again, as in the case of the Baudot, the messages were not timed or signed by the operators themselves. The test, however, shows the possibilities of keyboard perforators.

Some of the best hourly totals obtained on various high-speed instruments are as follows :—

Baudot	Sextuple	(Birmingham) ...	849	(with "inscriber" to sign messages.)
„	Quadruple	(„) ...	608	„ „ „
„	Quadruple	(Liverpool) ...	628	„ „ „
Siemens	...	(„) ...	584	
Creed	...	(Southampton) ...	479	
„	...	(Grimsby) ...	308	(received work only.)
„	...	(Edinburgh) ...	527	
Murray	Multiplex	(Manchester) ...	140	
		2 forwarding arms.		

THE CIRCULATION STAFF.

With such a huge traffic to handle the question of the prompt and accurate disposal of the messages at the various circulation or sorting tables throughout the office is necessarily one of vital importance. If the circulation officers are slow and incompetent—if they have to look up in the books of reference nearly every message that comes into their hands—it follows that not only will many more officers be required to deal with the work than should really be necessary—but what is of even greater importance the transit, or office, delay will be increased.

For many years it was the practice to attach female telegraphists to the circulation staff as vacancies on that staff arose. Some of them had barely attained their qualifying standard as telegraphists when they were placed entirely on circulation duties. The result was that when the efficiency bar was introduced and all telegraphists had to pass certain telegraphic tests difficulties arose, as these so-called telegraphists were practically unable to telegraph. More than one plan was devised for ensuring a supply of competent circulation officers who should also be good telegraphists, but the matter was never in a really satisfactory condition until the appointment of a Committee by Mr. Newlands about two years ago. As a result of the recommendations of that Committee every C.T.O. female learner is now given a complete training in the School in circulation work, and when she leaves the School and qualifies as a telegraphist, performs part of her duty daily on circulation and part on instrument work. The system has had excellent results. The learners, fresh from school classes, assimilate the geographical knowledge of the country and the somewhat complex information required regarding London streets and districts with remarkable quickness; competency at the circulation tables is thereby obtained, while the relief afforded from instrument

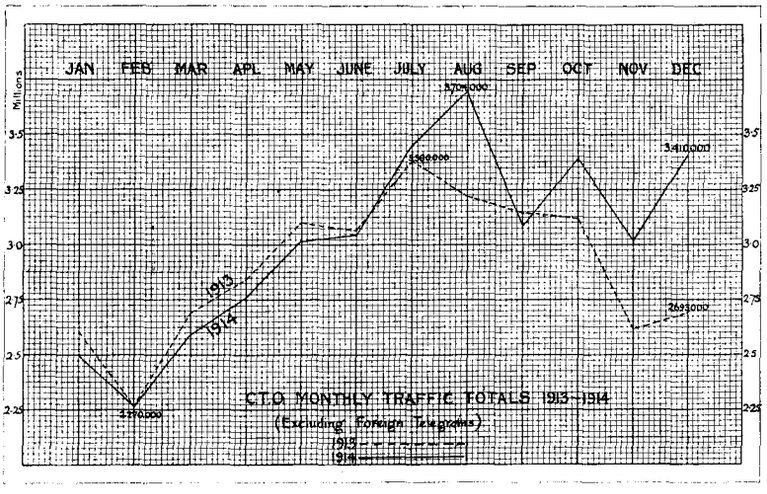


FIG. 1.

work in the early stages of their career is no doubt helpful as a factor in the prevention of telegraphists' cramp. The fact that the circulation work calls for the employment of the equivalent of over 160 full eight-hour duties, which are participated in by over 350 female telegraphists, must be my excuse for introducing it as an outstanding feature of the C.T.O.

THE CABLE ROOM.

An important part of the Central Telegraph Office—and perhaps even more important than ever at the present time—is the section devoted to the Foreign Cables.

This occupies a considerable portion of the second floor—although at the moment its proportions are somewhat reduced by the closing of the German and many of the Belgian circuits. Normally there are nineteen Anglo-Continental Cables working from the Cable Room, viz. :—

7	cables to	France	containing 28 conductors.
3	„	„ Belgium	„ 11 „
3	„	„ *Holland*	„ 12 „
6	„	„ Germany	„ 24 „
			75

Before the war broke out direct working was maintained to most of the large towns in France and Germany, as well as to Antwerp, Brussels, Ghent, and Ostend in Belgium, Amsterdam and Rotterdam in Holland, to Geneva and Zurich in Switzerland, to Genoa, Milan and Rome, and to Budapest

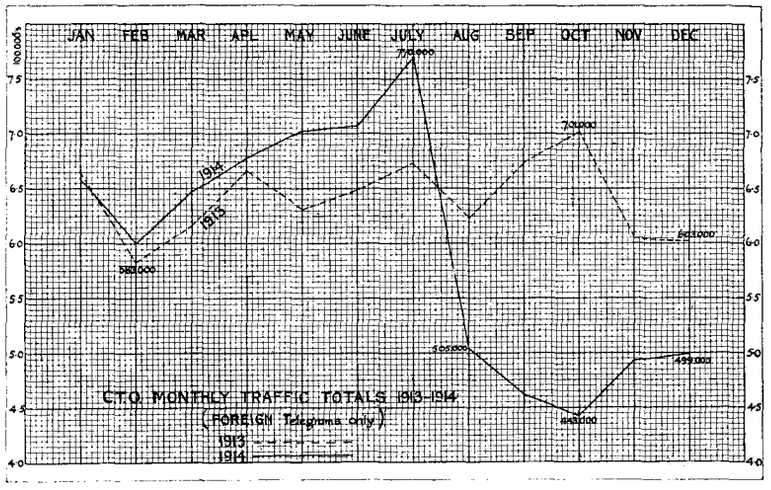


FIG. 2.

and Vienna. *The longest line, that to Budapest, is 1,360 miles in length.* Since the outbreak of war the whole of the German and Austrian communication has of course been severed, traffic for Italy and Switzerland goes to Paris, for censorship purposes, and the only wire now working to Belgium is to Furnes. Communication with Belgium has never been entirely interrupted.

The Cable Room staff, inclusive of Supervisors, consists of 399 persons. Immediately upon the outbreak of war a few of the Supervisors and many of the men were called upon to assist the Military Censors, both at the C.T.O. *itself and also at the War Office, and at various cable companies' offices both* in London and elsewhere. By the end of October the number of officers who had mobilised or who had been drafted to other Departments in this way reached 130, and inclusive of officers on annual and sick leave, &c., the staff of the Cable Room was reduced by 155 men—or nearly 40 per cent. of the entire number. It is true the traffic which in May, June and July last averaged 25,000 telegrams daily was reduced in October, November and December to 15,000 telegrams daily, but as from a return taken in the A.G.D. it appears that the number of words in foreign telegrams in June averaged 11.3, while in August, owing to the prohibition of code, the average was 22.5, the reduction in numbers has been accompanied by an actual increase in the work. I may mention that on July 30 nearly 37,000 telegrams were dealt with, while on July 31 the record figure of 42,350 was reached.

Baudot and Hughes are exclusively worked in the Cable Room with the exception of one Morse normally worked to Calais. Opportunity has been taken to utilise the services of Belgian refugee telegraphists and no fewer than 50 such officers are at present employed.

THE WAR.

I have already spoken of the immense deluge of telegrams which descended upon the C.T.O. on Aug. 4 and the two succeeding days. The war has upset all ordinary duty and traffic conditions, as will be evident from an inspection of the graphs, Figs. 1 and 2. To give some idea of the change it may be well to examine the total traffic figures during the Christmas period in 1913 and in 1914.

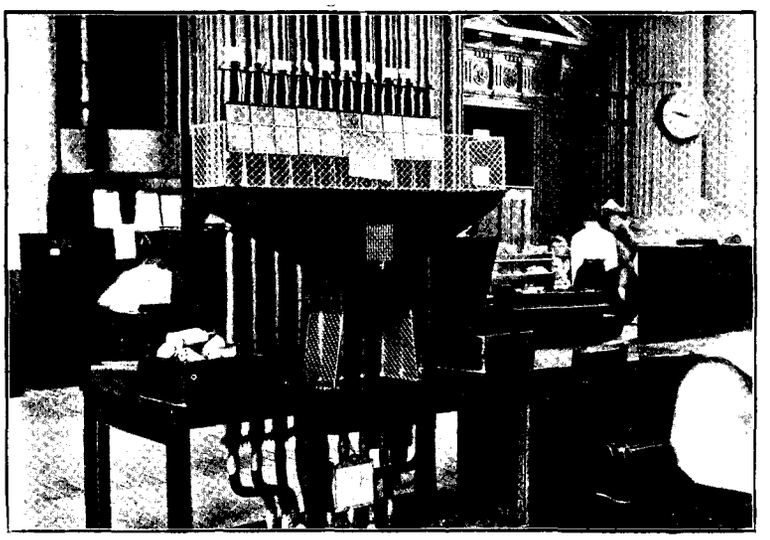
	1913.	1914.	Increase 1914.
Dec. 22	148,774	168,010	19,236
„ 23	146,889	195,218	48,329
„ 24	167,837	212,660	44,823
„ 25	31,526	54,303	22,777
„ 26	59,439	98,978	39,539

If it is remembered, in addition to the above figures, that some 450 telegraphists had, at this time, been mobilised for active service, it will no doubt be conceded that it is not only those who go to the front who deserve credit for responding to the call of duty. Altogether it may be stated that the C.T.O. has lost through officers called upon for military service over 600 men—of whom fifteen have been given commissions.

Owing to the numerous withdrawals of male staff, the cycle system of duties—a definite rota of attendances extending over eight weeks—had to be abandoned in the men's divisions very soon after the beginning of the war. These withdrawals of staff and the excessive amount of traffic have necessitated the performance by both men and women—and particularly the men—of a considerable amount of overtime, which, under the provisions of the Holt Committee, is paid at 1¼ rate for the first six hours, 1½ rate for the next six hours and double rate after twelve hours in a week. I do not know whether this has had a soothing or gladdening effect, but the fact remains that the work done in the Pay Office (which forms part of the Controller's Office) was actually eulogised in the pages of the *Telegraph Record* a few weeks ago. In this connexion it may be stated that the payment to the staff for overtime under the old conditions of payment during a normal summer was about £470 a week, and during a normal winter about £235 a week. The highest amount previously recorded was £2,717 for the week ended Aug. 20, 1911, on the occasion of the railway strike, but for the week ended Aug. 2 last the payment for overtime was £3,142, while for the following week it reached the enormous total of £6,102 9*s*. The wages and other payments to the staff which usually amount to half a million a year reached the sum of £262,092 from Aug. 1 to Dec. 31, 1914, or at the rate of nearly £630,000 per annum.

Another feature of the war has been an influx of Military Censors, who shocked us terribly in the early days by the ruthless way in which they held up and delayed our real live telegrams. We are getting hardened now, but while we appreciate their difficulties, still wonder sometimes whether the system adopted is the most perfect under the sun.

Other extraneous aids to running the C.T.O. in war time have been the Decoders (for foreign code telegrams), of whom there are 80 women and 30 men (for night duty) and the temporary typists—to say nothing of some 250 male and female temporary telegraphists, amongst whom are about 100 former female telegraphists, now happily married. These latter have most usefully stepped into the breach, and if more of them were less insistent about performing a permanent early or midday duty they would be still more acceptable. Such an arrangement throws all the late duties upon the men and the other women. The temporary typists have also done exceedingly good work. They have been employed on telewriter, phonogram and minor circulation work, and also at the Gell and Siemens' keyboard perforators, where some have perforated as many as 73 messages in an hour, after being a few weeks only in the office. One qualified in Gell working (test of ten messages in ten minutes) in four days.



HOUSE TUBES—INCOMING TERMINALS.

The war has also been responsible for the formation in the C.T.O. of a section of the Athletes Volunteer Force, consisting of about 150 members.

A few more outstanding figures in connexion with the work caused by the war may be interesting. On the fourth floor—Home and Metropolitan circuits—no fewer than 15,000 telegrams (9,000 forwarded and 6,000 received) were dealt with on Christmas Eve between 8 and 11 p.m. 1,000 were sent out early on Christmas morning by special messengers to various London offices for delivery, and still there were 6,500 waiting at the circuits when the offices opened at 8.30 a.m.

A very large number of telegrams appealing for subscriptions have been sent on behalf of the Prince of Wales's and other funds. Owing to the enormous influx of traffic it was found impossible to deal with much of this work in the ordinary way, and a multiplying type printing machine was called into requisition. In this way over 30,000 messages were dealt with between Aug. 3 and 15, the highest day's total being 4,631.

A large number of special forms have also been required at short notice and the total number of telegrams and forms thus printed last month reached the respectable figure of 160,000.

Some of the telegrams to the War Office have been of inordinate length, one received from Manchester totalling 7,926 words.

It may be stated that a T.S. telegraphist who was travelling in Germany at the time the war broke out has been interned there as a civil prisoner of war.

STOCK EXCHANGE AND THREADNEEDLE STREET B.O.

Any account of the Central Telegraph Office would be deficient unless it also included some reference to the Stock Exchange and Threadneedle Street B.O., which is under its control. Not only has this office direct communication with all the principal Stock Exchanges in the United Kingdom, but the branch office itself is one of the busiest in the country, the cash remittances totalling £450,000 per annum.

The fluctuations of traffic are, as may be imagined, very great, being so largely influenced by the rise and fall of the market. The office is staffed from T.S. with 136 supervisors and telegraphists and over 130 messengers. Including messages sent into the Stock Exchange the number of messages delivered from this office daily often reaches 6,000 and has at times reached 12,000.

The Commercial Sale Rooms Office, in Mincing Lane, is also under C.T.O. control, and some excellent totals have been dealt with over the direct wire between that office and Liverpool.

SOCIETIES AND ORGANISATIONS.

Amongst a staff of nearly 5,000 there must naturally be a diversity of interests, and this has shown itself in the formation of various societies or organisations which cater for the social, moral or material interests of the C.T.O. First of these in seniority is the C.T.O. Benevolent Fund, which was founded some 40 years ago to assist its members in cases of urgent distress.

Athleticism naturally claims its devotees and it is not surprising to learn that so early as 1873 the St. Martin's Athletic Club was started. The athletic section gradually developed into the "Centels" under which title the club has scored several successes in athletics, cricket, football and swimming. Two of the athletes at the front have been decorated for acts of conspicuous bravery, viz., Mr. F. E. Hewett, who has been awarded the French Military Medal and Mr. H. J. Hastings, who has received the Distinguished Conduct Medal for placing 23 Germans *hors de combat*.

The Women's Branch of the Post Office Ambulance Corps, which was established in 1910 has several successes to its credit. The C.T.O. team bore off the Sir Matthew Nathan shield both in 1912 and 1913 (the competition was not held in 1914). Of the 179 members who have presented themselves for the St. John Ambulance test 174 have passed. In May 1914 a Nursing Division was formed. The 75 members are now gaining practical knowledge in various London Hospitals and the division has already twice been called upon to perform public duty.

Last, but not least—indeed largest—is the London branch of the Postal and Telegraph Clerks' Association. Although the association was founded at Liverpool in 1881 it was not until 1889 that London joined in. The London branch is by far the largest in the organisation and, inclusive of 309 men of the Cable Room branch, the figures last published show a membership of male telegraphists 1,728; female telegraphists 395; male telephonists 185; female telephonists 275—a total of 2,582.

SOME ITEMS OF INTEREST.

The Central Telegraph Office has been visited by Royal personages on several occasions, notably by King Edward and Queen Alexandra, when Prince and Princess of Wales in 1873, and by the present King and Queen in March, 1911.

It may be of interest to state that some 32,000 abbreviated addresses are recorded at the C.T.O. for firms and persons in London. The standard list has recently been transferred from books to index cards with considerable advantage. Index cards have also displaced books in the delivery room, and have been in use at the Stock Exchange office for the last three years. The indicator system in connexion with abbreviated addresses denoting the delivery office—thus "Eureka, Ox, London"—saves much time in circulation as it obviates the use of reference books. Its use should be made compulsory instead of being optional as at present.

Coffee or tea with bread and butter is served to the staff on duty between 7 and 9 a.m. and 5 and 6 p.m. The cost to the Department is about £3,000 a year, which is held to be counterbalanced by the advantage gained by the staff being enabled to remain at their work.

The dining rooms are situated in an adjoining building to the G.P.O West in Roman Bath Street, access being gained by covered bridges thrown across the street. The male staff dining room has seating accommodation for 394 persons and the female staff for 270. The number of dinners served to the male staff is about 1,450 daily and to the female staff about 1,300.

In addition to the dining rooms, tea rooms were opened for the male and female staffs in 1908 and 1912 respectively. Each is highly appreciated and made good use of. I trust, however, that when the Bath Street premises are rebuilt it will be possible to give the staff more suitable refreshment and retiring rooms than they now possess.

The C.T.O. staff is always ready to respond sympathetically to a charitable appeal, and it will come as no surprise to my hearers to learn that a collection made recently on behalf of the Belgian Refugee Fund realised in one day over £100, while the amount subscribed weekly by the C.T.O. staff towards the Post Office Relief Fund amounts to over £60

On the occasion of every big speech, race meeting or other important event a special staff is sent down to deal with the large increase of telegraph work which follows. This staff, called the Special Event Staff, is recruited largely from the C.T.O. and is composed of picked men. They are given a certain subsistence allowance when away from headquarters.

T.S. also is often called upon to assist by sending staff to other offices temporarily during times of local pressure. We are very jealous of our good reputation on these occasions, and it is a source of gratification to us when we receive communications from the Postmaster like the following :—"The "Controller would no doubt like to know that I cannot speak in terms of "too high praise concerning the manner in which Messrs.——— have assisted "in meeting the pressure of work here. They have been zealous in the "highest degree, and have taken the greatest possible interest in disposing "of the work to the best advantage." I need scarcely say that these two officers were selected shortly afterwards for another special duty of an even more remunerative character. And here I should like to remark that we are constantly on the look-out for *outstanding* officers—men and women of character and ability, officers with enthusiasm for their work and filled with a desire to excel. As a rule such officers make their mark and are well known, but in a large and varied staff some may be overlooked for a time, and I want to assure such officers of our readiness to know them and to appreciate their merit. Their opportunity will come—let them be ready to embrace it.

I was much impressed by an address given recently by Mr. A. S. Renshaw upon "The Ethics of Supervision." He points out that the various Departmental rules mean this—that the service rendered should be diligent, wholehearted and efficient, that is, honest service. That is exactly my idea. I don't believe in the man who does as little as he can—the man about whom it is said in T.S. parlance "He doesn't rush after a job." Those outstanding men are known too. To quote Mr. Renshaw again, "Some of them can be "relied upon absolutely, some must be watched, some need pressure or "coercion—or shall we say the judicious stimulation of prudential and "self-regarding considerations." "Official time is, in the strictest sense of the word, money. It is as important to prevent the loss or wastage of time as to prevent, say, the loss of copper wire, and it is the first task of supervision to prevent such loss." I commend these most excellent words to both supervisors and supervised.

To turn to a lighter subject, I am not sure whether it is generally known that we have two cats on the establishment of the C.T.O. These were originally obtained for catching mice, but presumably the supply of mice ran short, for we gather from official files that authority was sought for the expenditure of 1*s.* 2*d.* per week for cats' meat. The Secretary considered that one shilling per week should suffice, but it was pointed out that the cats also required dinner on Sundays. The full amount asked for was then authorised, Treasury sanction presumably having been obtained.

Of stories in T.S. there is no end. One or two, however, must suffice. A hard-worked Superintendent endeavouring to clear off a block of telegrams instructed the T.S. telegraphist to ask the distant station to take 4 to 1 in order to clear. Returning later to note progress he asked, "Well, did he take 4 to 1 ?" "Yes, sir, and he says he will take 100 to 8 against the chance of being clear this side of eight o'clock !"

The efforts of the juniors to grapple with the terrors of their first reports are sometimes pathetically funny and a sample of the result of much cogitation is furnished by the girl who was called upon for an explanation of her late arrival. "Sir, the reason I was late this morning is because all our three "clocks were the same. When I left home it was 8 o'clock, but as it was 8.30 "I should have started at 7.30. I will try and not do so again." The other extreme is furnished by an older hand, who, on being invited to reply to an elaborate indictment of dereliction of duty and general lack of zeal, displayed admirable discretion in avoiding the pitfalls of voluminous endorsements by replying "The Controller, You have been misinformed.—Yours obediently."—

One or two errors, and I have done. The London letter writer whose copy was transmitted in the following form :—"I hear to-night that the "condition of the price of ales is considerably improved," would have felt much aggrieved if his Editor had not rendered the reference correctly as the Prince of Wales. Another famous "bull" which the watchful Press suppressed but which almost seems to have been "made in Germany" was the information based on illegible copy that the "Almighty has given orders "for the commissioning of two bruisers." A telegram addressed "Hog "Office Wine *All*" might also have seemed to be intended for the Fatherland, had not a circulation expert correctly translated it as for "Home Office Whitehall."

CONTROLLERS—PAST AND PRESENT.

The following particulars of the past and present holders of the "blue riband of the Telegraph Service" may be interesting :—

	Appointed Controller.	Retired.
Sir H. C. Fischer, C.M.G....	Jan. 29, 1870	Feb. 15, 1898
Mr. E. May...	Feb. 17, 1898	Sept. 30, 1902
Mr. E. Trenam, I.S.O. ...	Oct. 1, 1902	Oct. 31, 1905
Mr. A. E. Eames, I.S.O. ...	Nov. 1, 1905	June 30, 1910
Mr. J. Newlands, C.I.E. ...	July 1, 1910	

Before concluding I should like to express my thanks to those who have so kindly helped me with facts and figures for this paper. I feel I have not done justice to an important subject, but I have at least, I trust, enabled my readers to realise some of the outstanding features of "the largest telegraph office in the world."

CORRESPONDENCE.

STANDARDISATION OF CONTRACT DEPARTMENTS.

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

MR. J. R. BROWN in his article in the January issue of the JOURNAL, under the above heading, advances several strong objections to some of the recently issued printed forms of standard letters for use in Contract Departments and against the new standardisation methods generally.

His arguments, which are based upon modern business practice, will be difficult to set aside, and will be supported by all practical contract men throughout the country.

Standardisation is doubtless necessary to some extent in a great concern like the Telephone Department. Indeed, lack of uniformity of practice would be a weakness in many directions, but, as presently applied to contract working, it is surely overdone when, as shown by Mr. Brown, its tendency is to defeat the real objects of the Contract Department, viz., to get new business, to retain and extend existing business.

Take, for example, the contract officer's note book, which is intended to be an aid to canvassing, but, as a matter of fact, is found in practice to be a real hindrance. The note book increases the clerical work of the contract officer, keeping him indoors, when he is essentially an outdoor officer, and this without any corresponding advantage in making his work of getting *contracts easier.*

It is meant to supplement the existing Unsuccessful Interview card records, but is, in reality, duplicating that record to little purpose. The card record provides the Contract Manager with the information he requires regarding the possible telephone development in any particular district, and enables the contract officer to make a thorough and systematic canvass. The utility of the same record in book form is difficult to see.

The printed instruction in the note book indicates that the entries must be made in ink, which makes it, in reality, an office record. Pencil notes require to be rubbed out after being re-written in ink. It is not good canvassing to make notes in the presence of a prospective subscriber. These have to be made outside the office, shop, or house, and the tendency is for an officer who is neat and careful in his work to leave the note book in the office, as its constant usage in all kinds of weather depreciates its value as a readable, permanent record. An ordinary rough note book serves the purpose, and is indeed necessary even with the other, for the contract officer has to make many calls which are outside the scope of the note book. One of the most important things in canvassing is to keep appointments with scrupulous punctuality. An ordinary diary is found to be the most useful for that purpose. It is consulted daily, and the note of appointment is at hand, without having to hunt through the many entries of the note book under review.

The note book might work well for some kinds of canvassing where the calls are made in rotation, but it is thought to be too unwieldy for the nature of telephone canvassing, and becomes more involved with each fresh entry.

"STATUS QUO."

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

IT is helpful and invigorating to me to find by a perusal of Mr. Brown's able article on "Standardisation of Contract Departments" that I am not the only Contract Manager who is forced by the courage of his convictions to raise a protesting voice on the "hand-leading" and "spoon-feeding" meted out to Contract Managers, as a result of the decisions of "three Contract Managers and a Statistician, who are well able to look after themselves."

The forms, in lieu of letters, showered on Contract Managers, as a means of helping them to handle promiscuous correspondence with a highly strung and fastidious public on the one hand, and the burden that is laid upon the shoulders of each individual contract officer on the other, in the form of *compiling a note book theoretically invaluable and practically impossible,* is bound to draw from the average man who *does* understand, and who *does* want to progress, a shower of criticism.

I would therefore like to reinforce Mr. Brown, if that be necessary, and by doing so I will only (if the Editor will be so obliging in the question of space) quote exactly from my monthly report of September, as follows :—

> I am of opinion that the general use of the majority of the 48 Forms, as per Circular Instruction No. 38 recently issued, will be exceedingly prejudicial to the proper working of a Contract Office, and that the absence of records in connexion with information supplied to the general public, as at present given by actual carbon copies, will tend to render the Contract Department more *insecure* and less complete in its general working than formerly.

Whilst it is agreed that several of the forms are of real value, notably C.M. 1, and C.M. 2, the following are quoted as a few examples of what the regular use is likely to create :—

> *D.M.* (*c*) 22, *and D.M.* (*c*) 8.—The forwarding of such forms for quotation purposes to residents or business men is greatly deplored, inasmuch as a business man requires a quotation in plain language, and accompanied with some explanatory statements; likewise when these forms are filled in no copy is held in contract records of what has been stated or quoted to the prospective subscriber; as in many instances the forms will be filled up by a contract clerk, there is no evidence on record of what has been actually quoted.

D.M. (*c*) 1.—This will only bring a further enquiry from the intending ceasing subscriber, as there is no explanation of the notice required by his contract (a copy of which, be it noted, he has not had), and it is to be deplored further that there is a suggestion to acknowledge notices to cease with no less than four different forms.

C.M. 6.—This, to be used in connexion with supersedings and forwarded to the chief clerk, leaves no record of the history of the case for future requirements in the Contract Section.

C.M. 32.—The object of this is not apparent, nor does it seem necessary for a contract officer to obtain information as to a deposit held when a subscriber is superseding his own service by a transfer agreement.

D.M. (*c*) 11.—It is pointed out that this form cannot be used in a considerable number of Post Office contracts, where there is no clause relating to the recovery of the instrument contained in the contract.

D.M. (*c*) 13.—From experience it is proved that what a busy user requires is a plain letter showing him that he is losing business, and if a form be forwarded, little or no notice will be taken of it by the average business man.

D.M. (*c*) 17.—Numbers have only in the past been allotted by the Traffic Section, and the Contract Department refrains from quoting numbers to the general public. It is not seen why the Contract Department should first of all evidently obtain the number when the line is completed, and send a form to the intending subscriber.

C.M. 16 *and C.M.* 18.—It is considered that as in the past the agreement in all cases should show the date the service comes into force, inasmuch as complete confusion is likely to ensue from the use of forms which may or may not remain attached to the contract.

D.M. (*c*) 21.—It is thought that this is a very injudicious form of printed circular to issue to the general public, announcing that telephone supply cannot be arranged for, and it is thought that a diplomatic explanation from a capable contract officer would be much more the correct method.

C.M. 1001.—If this book is to be in addition to the "Notice to Cease" cards it is welcomed, but if it supersedes the cards it is not clear how that any record can be kept satisfactorily when a large number of notices to cease have been booked, as they should of necessity be kept in proper date order to be attended to regularly and automatically, otherwise the record is useless.

With regard to the note book, Mr. Brown states it "requires an article to itself." I do not intend to carry flattery so far, but content myself by quoting from the Contract Monthly Report for October last, with an addition of a few other observations subsequently enquired for :—

> I would now like to make a few remarks with reference to the new note books issued to contract officers, copies of which are now held for each man. The books have been thoroughly gone into with each contract officer, and I shall be glad if it can be authorised that the daily use of these be postponed for some time, chiefly for the following reasons :—
>
> (1) Seemingly, to use these books properly, a distinct house to house canvass for all streets and roads in the district should be started on, and as orders at present are few and far between I think that the time should be occupied only in calling on strong possible prospects *on hand*.
>
> (2) Over half of the territory in this district showing possible telephone increase is at present blocked to canvassing.

Two points out of several arising on the use of the books which might perhaps be made a little more clear are :—

(1) Each line of the book will seemingly show an existing subscriber, or a possible subscriber (hence the necessity for a systematic house to house canvass). In very few cases, however, can a contract officer definitely state the actual apparatus existing, and fill in the information accordingly; and if this work is to be thrown on the clerical staff of any section it will give a large increase in duties.

(2) In very many cases the line will be filled by the name of an existing subscriber who, in conjunction with many others, will have left that particular address in six months, or twelve, as the case may be. No provision seems to be made for this "certainty." In Brighton district there are a large number of such cases.

(3) In memory notes when the officer has well booked up certain cases for any definite date, it is not seen what is to draw his attention to them promptly, and he would seem to require to go through each page and line of his memory notes day by day, which is a slow process (as shown by the Unsuccessful Interview cards at present)—this in order to obtain the particular interviews noted for each particular date.

Contract officers deal with many items of duty in addition to new business canvassing as :—

(*a*) Superseding contracts (a very large number in this district for its size).

(*b*) Removals.

(*c*) Ceasings. (More important in my opinion that new line contracts is the retention of an existing subscriber.)

None of these three items, or calls, or particulars for the formation of reports on them, must appear in this book; and a definite instruction has been issued that no other note book whatsoever is to be used. How then is an officer to remember appointments, new tenants' names, particulars of rental, particulars of deposits, and other daily items so necessary to deal with, if these are not recorded in writing ?

Writing down by pencil in a note book in a gate-way, a door-way, an office, or perhaps the street itself, in wintry weather, notes which are to form a record for all time is not conducive to the production of a record of the nature required, and as the officer later on in the day is required to write over these pencilled notes with a pen, and at the same time make out new business cards for the same identical reports (as the cards must, on instructions, be carried on likewise), is to me a useless duplication of work.

I assert, weighing the pros and cons, that the book (whilst containing the germ of an excellent idealism) is, in its present condition and on the present rules governing it, impossible as a practical and workable arrangement, and tends to confuse the contract officer, and thus lessen his advance in the production of new business.

D. WALLACE,
Contract Manager.

Brighton, Jan. 8.

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

THE article by my friend Mr. J. R. Brown, of Glasgow, in the January issue of the JOURNAL, stirs up happy memories of the pages he contributed to the old *National Journal*. Mr. Brown has lost none of that light journalistic touch which has always characterised his articles and which makes them so pre-eminently readable, whether one agrees with all his arguments or not. It is evident that he, at any rate, has not been overcome by the miasma of which he so eloquently writes, but is prepared to fight valiantly against such startling innovations as sending printed replies to subscribers' letters and making every contract officer responsible for all classes of work in the area allotted to him.

I would like to say *en passant* that I am surprised to note in one of the editorials in the same issue some references to the four quietest, most unassuming, and innocent members of a certain committee. How can one take it out of an editor, or rather several of them, as like a committee they are a nebulous body, having neither body to be kicked nor soul to be condemned ?

It may as well be confessed at once that I have the greatest sympathy for Mr. Brown's points of view, but there is a strong case for the other side.

Had Mr. Brown accompanied the Contract Committee in its tour of investigation, it is thought that he would have been the first to admit that standardisation was essential in certain directions.

The fear that officers may lose their individuality, it is submitted, is not warranted. There is no intention to suppress individuality, which, if properly applied, is a thing to be encouraged by every possible means. The matters complained of scarcely amount to "spoon-feeding" the staff, and are rather in the first case an aid to digestion, and in the second a powerful tonic to be valued rather than despised.

The British soldier is a treasured and highly trained member of a magnificent force. He is an example of standardisation at its best. He is drilled in sections, in platoons, in companies, in battalions, and so on, and his every movement is guided by some rule in the drill book or army regulations. Has his individuality been checked thereby ? I think not. His fame is growing daily by leaps and bounds the wide world o'er for that very quality, when called upon to act on his own initiative. There is no more reason why members of the contract staff should lose their initiative because certain rules are laid down for their guidance and help with the sole aim of producing greater efficiency in contract branches as a whole.

When Mr. Brown says that printed letters are provided for almost every conceivable sort of case, he does not mean it to be taken literally, as he must know of plenty of cases which are not covered. Prior to the issue of these letters, replies were dictated by an officer, clerical or otherwise, to a shorthand typist. It is thought that an examination of these letters will show that they bear a striking family resemblance to one another, and that the personal touch is wanting. In other words, the act of dictating replies to ordinary ceasement and other cases simply became mechanical, and individuality would have to be searched for with a microscope.

If then it is found that these letters resemble one another closely, all that has occurred is that a printed letter has taken the place of a typewritten one, and as a result, both the time of the dictator and the typist have been saved.

Now Mr. Brown, being a good Scotsman, is no doubt as careful of the bawbees as the rest of us and he will appreciate this point.

It cannot be made too clear that there is no question of insisting on a printed letter being sent in cases which do not fall within orthodox lines, and the individuality of the writer of the reply in such cases may still find full scope, indeed he will have more time to consider carefully the terms of the replies he does dictate, which is all to the good.

Form D.M. (C) 1 is quoted specially as likely to hurt the retention of business. The best argument in reply is that a letter on somewhat similar lines has been in use in London for several years without any of the baleful results attributed to it having been noticed.

Mr. Brown seems troubled about the feelings of the recipient of a printed reply, and I have and still have qualms myself on this subject. It must be admitted that a letter in cold print is more or less a dead thing, and the recipient might be apt to feel that his case was being neglected. However far from the truth this feeling may be, that it does exist in certain cases there can be no doubt. It can be reduced to a minimum, however, if the use of stock letters is carefully regulated, care being taken to see for instance if a printed acknowledgment of a letter has been sent and, before the necessary enquiries to enable a full reply to be despatched have been completed, a further letter is received that the same printed form is not sent again, but that a fuller

acknowledgment, or if thought necessary, a letter sent even although the full information desired is not available.

If the subscriber receiving a printed reply to a letter is of a very economical turn of mind, he will be quite pleased, as a taxpayer, that the Department saves 5*d*. or thereabouts of his money where it can do so without inconvenience. I have mentioned the 5*d*. because, as Mr. Brown will recollect, it was one of the stock arguments in the old days in Glasgow that every typewritten letter cost about that sum, whereas a telephone message could be sent for 1*d*. and so on. If true then the statement is no doubt true now, and Mr. Brown will appreciate the saving.

Printed acknowledgments and replies appear to be growing much more common in the business world, quite a number have come my way, and while I cannot say that I like them, their usefulness is appreciated and they are treated accordingly with respect. It is thought that this represents the attitude of most business people.

To show the length to which business concerns here are going in this direction, it may be mentioned that a very well-known firm in response to a communication sent a printed letter containing ten separate replies and referred the enquirer to paragraph number eight "which answers the subject of your enquiry." The recipient accepted the reply without question. It is of course not recommended that the Department should go quite so far as this.

Looking facts fairly in the face, there seems little doubt that unless some special point in a letter has not been dealt with in the reply, the majority of subscribers will be satisfied, not perfectly perhaps, but satisfied.

No doubt the wording of some of the letters now in use might be strengthened here and there, and the size, to facilitate filing, and class of paper used improved upon. It can be confidently stated that if anyone has any suggestions to make in the direction of improvements, they will receive that careful attention which is always given to suggestions by the Secretary's office.

Mr. Brown and I were brought up in the same hard school of contract work during the strenuous time caused by the starting of the Corporation system in Glasgow, and I can therefore more deeply sympathise with him in his acute pain at the threatened loss of a station or circuit.

In those days to lose a station except through death or some other insuperable reason was a disgrace only to be wiped out by obtaining two to take its place. The chances were that the subscriber who left us went to the opposition and we were not satisfied until we had obtained our revenge.

Alas, th se happy days are far behind us, but it is hard to part nevertheless with these feelings, as I know well, but other times other manners, things of necessity have altered. There is no longer any opposition, and if a man wishes telephone service he must come to us. It follows that if a subscriber has given notice and finds he must retain the service after all, he will withdraw that notice whether we call upon him once or 50 times or send him sympathetic letters by the score, meanwhile shedding crocodile's tears at his financial misfortunes. On the other hand it must be admitted that there are a certain number of people who sit on the hedge not knowing what to do, who, if written to nicely or seen by a judicious officer may be pushed gently down on the right side. The difficulty is to find which is which. I have always recommended that an immediate acknowledgment, printed or otherwise, of the notice should be sent giving all particulars as to earliest date the service can be given up, &c., and that within three days a contract officer should call to find out the cause of the notice having been given, and that the future policy should be based upon the result of that interview. In the majority of cases it will be found that no forther call is required, but that a letter sent a month before the due date will do all that is necessary. Some people think even this small amount of attention too much, but I am still of the opinion that it is the *minimum* amount which should be given to a ceasement case unless it is seen to be hopeless from the beginning, *i.e.*, if the subscriber has died or gone abroad or some equally obvious reason, even here, of course, the possibility of the new tenant becoming a subscriber cannot be ignored, but this may be considered more as a new business than as a ceasement matter.

Now, as to the other problem raised by Mr. Brown—viz., that of making each contract officer responsible for all classes of work in his district, and not having one class of contract officer to deal with ceasements, another with new business, and another with large users— a little explanation will throw much light upon the reasons leading up to the change.

When Contract Departments were inaugurated by the late Company they superseded a system of canvassing by officers on a small salary and commission. Many of these officers had a wide experience of contract work and knew their telephone public thoroughly. As it was the Company's desire to extend its business largely, especially where opposition existed, a large force of new men with no contract or telephone experience had to be engaged. Ceasements and transfers were considered to be, rightly I think, the most difficult part of the work, and for this reason the experienced men were formed into ceasement sections and the new men into new business sections. There were other sections in Glasgow I know, but there was a special reason for that at the time which does not affect the case in point. As time went on the new men became as expert in their work as the original canvassers, and it was considered that they were perfectly capable as a whole of dealing with all classes of business in their areas.

The experiment was tried in London and found to answer admirably in every respect. This in itself is a powerful argument in favour of its adoption generally.

It is understood that each contract officer to be efficient is supposed to be capable of carrying out the highest duties of his class. How then is it possible to certify this if he cannot deal with all classes of cases ? If he cannot deal with a transfer or ceasement of P.B.E. case then he is a more or less inefficient contract officer.

If a contract officer is "timid and pessimistic" he has missed his vocation, he was not built for a contract officer.

It has been definitely proved in London that what for want of a better word may be termed a "backward" contract officer, through no fault of his own in many cases, be it said, can be trained gradually to take on the most difficult cases. Before a man is certified as being capable of carrying out the highest duties of his class, if there is the slightest doubt, he is transferred temporarily from, say, his country territory to the City or West End in order that his capabilities may be judged. Few, if any, men have failed to pass the test, although some have taken longer than others to adjust themselves to the changed conditions. When that officer is transferred back to his original area, he is better equipped for his work because he has greater confidence in himself as he knows that he can satisfactorily deal with whatever may turn up.

While it is admitted that there are men among the contract staff who are more capable than their fellows of dealing with one class of work than with another, it is nevertheless necessary to look at the position from an imperial rather than a parochial standpoint.

By making each man in his area responsible for every class of case, considerable economies in time and travelling expenses can be effected.

Under the old system the ceasement men journeyed from one new business area to another, and, to state an extreme case, might actually call at the same time as a new business contract officer upon the same subscriber. From the business man's point of view that spells inefficiency. Even if he called on a subscriber in the same street or neighbourhood on the same day, the argument is the same.

Then again, if a contract officer were asked to call upon a subscriber regarding a new order and through dealing with a ceasement case for the same subscriber was aware of the facts, it is obvious that he was in a better position to discuss the matter, which might turn out to be a removal, more intelligently than a man without the knowledge he possessed.

Is there not an advantage from the subscriber's point of view in always seeing the same man, who presumably knows his telephone system and requirements and is able to give satisfactory advice thereon, whether the case under consideration refers to new business or a ceasement ?

Further, who is to say that what appears to be a simple new business case may not turn out to be a complicated P.B.E. or transfer case. Is the new business contract officer to retire and allow another man to get at the facts afresh from the would-be subscriber ? How would the public look upon such a state of affairs ? If the new business man is to see such a case through, then surely it follows that he can complete other similar cases.

Again, what are the feelings of a contract officer who finds the P.B.E. plums pulled out of his pie by another man ?

Finally, what are the first-class contract officers for if not to help those under them in special cases. If any contract officer finds himself in difficulties he should always be able to call upon the first-class contract officer or the Contract Manager to help him out. Such things are not unknown, and I cannot recall a case where a subscriber has objected to two officers calling in this way, indeed it is all to his advantage to get the best possible advice, and two heads are often better than one.

Arguments could be produced in favour of the new system almost indefinitely, but enough has been said perhaps to show something of the other side of the medal.

It is agreed that every possible encouragement should be given to good men, and it is hoped that some scheme may be adopted to make this possible ; the present method of promotion is slow, if more or less sure. In this connexion it is trusted that the recommendations of the Contract Committee on the question of establishment and pay of contract officers are being favourably considered.

One cannot help agreeing with the appeal by Mr. Brown for more latitude in dealing with the public. It is a thing much to be desired in order that the public may not think that the Department is "honeycombed with red tape," *as one subscriber put it once to me. If a subscriber calls to see a responsible* officer, in which category District Managers and Contract Managers may possibly be included, and desires some small concession, it is poor comfort to be told that the matter will be considered or referred or whatever the stock phrase is, and that he will be communicated with later, and after he has forgotten all about the case to be informed that he can or cannot have what he desired. The difficulty of delegating authority in such an enormous concern as the Post Office is appreciated, but the officers mentioned are after all responsible officials and are not likely to abuse any privileges given them. If by any chance they do, well, the remedy is simple.

WM. F. TAYLOR,
Superintendent of Contracts, L.T.S.

MORSE AND FIVE-UNIT ALPHABETS.

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

IN the course of the very interesting articles wherewith he has lately enriched your literary pages, my genial and learned friend, Mr. Donald Murray, has kindly gone out of his way to rescue me from oblivion, and incidentally to administer to me and all my works some very shrewd, but, I hope, not unfriendly knocks. Certain of my more warlike friends expect me to rush out of my cave and smite him hip and thigh. Not so ! I know too well the power of his pen to dare to tackle him, with his own weapons, in the field of journalism—his native heath !

I am not yet among the prophets, and I cannot even don the armour of Saul, so I must just go on inventing, and trust to my five smooth stones—speed, accuracy, flexibility, economy and reliability—to slay my giants for me.

If I ever shine in the public print it will be with the reflected glory of literary exploits of my advertising manager, whose ample field of battle is the front page of the cover of your JOURNAL.

I shall still venture, nevertheless, to cherish my peculiar ideas about the respective merits of the Morse and the five-unit alphabets ; and I even believe

that, for the edification of a very sympathetic audience, I could advance a sound argument in favour of the former. But I really fail to see any good reason why I should labour to convince the trade rivals of my firm that they have put their money on the wrong horse.

F. G. CREED.

Croydon, Jan. 23, 1915.

CABLE ROOM MEMS.

THIS number is to be pre-eminently a Telegraph number, and therefore with a sense of the fitness and due proportion of things the Cable Room must squeeze itself into an odd, out of the way corner or be reduced to the unostentatious "nonpareil" or "ruby," so much repined by the writer of the London Telephone Service Notes.

In all the pride of our Telegraph number, however, and risking the inevitable nemesis of a *Telephone* number, which will surely follow one of these days, the reminiscent mood broods over us, and a small band of Cable Room members recall with pardonable satisfaction that the nucleus of the Government Trunk Telephone Service had its origin in the Central Telegraph Office under the immediate aegis of the then Assistant-Controller of T.S.F., not to be confused with the later T.S.X.

To our friend of the Telephone Service Notes, who but indifferently hides his genial nature behind anonymity, these same members of the present Cable Room staff would respectfully submit that the pioneer work of the Government "trunks" was no mean service to render the State in addition, be it remembered, to the ordinary telegraph duties of an international telegraph centre. The maintenance of the trunk telephone lines in those early days by the Telegraph staff was by no means an easy task, a task which has never yet received a word of recognition, and, to speak with knowledge, a task which has never been better done. It is remembered how, from a portion of what, strange to say, is now the Deputy Chief Censor's sanctum, the first telephone circuit to Paris ran out its A and B to the French capital, to which was added Brighton, followed by trunks to a number of other important centres, until a huge portion of the western corridor of G.P.O. West, second floor, was portioned off, "board" after "board" being added as the wonderful invention began to make itself felt in British business life. Memory reconstructs the uniquely curious arrangement for testing the Paris circuits to a pole-box on the roof of Cannon Street Railway Station by means of controlling switches fixed at the Cable Room test box, the troublesome condition of Brighton and the magnificent audition of the "Glasgows," the old "visuals" blinking their dirty white shutters behind their narrow grille, the frequency of "partials" in the Chelsfield tunnel section, and the pathetic appeals from "Spillers" and other renters on breakdown days. Crowning all reminders of those early days was the satisfaction expressed by certain of the younger technical aspirants, who reading in certain text books that no telephone circuit over 50 miles could be successfully superposed, were able to smile with a superior smile at the paragraph and point to the daily practical working of the London-Bristol plus!

If any other memory silhouette stands out very clearly it is the very pronounced inferior maintenance of certain trunk circuits NOT constructed by Government engineers.

The citation of this actual practical telephone experience of members of the senior Service is so cited in no spirit of unkindliness but simply as a slight substantiation of something more than mere seniority. It is submitted as proof of the claim that the training of the telegraph operator produces a versatility and adaptability not yet proven on behalf of the telephonist, and entitles the former to pride of place on grounds more stable than mere seniority, although even age has its due.

Now to return from the controversial to the less debateable. Not one of the least useful effects of this war period, so far as the C.T.O. is concerned, is the manner in which events have thrown the Inland and Foreign sections together. Undoubtedly each has learnt from the other, and in a common cause has apparently realised something of that "unity through diversity" which it is absolutely essential should form an outstanding feature of the *largest telegraph office in the world.*

It must also have been gratifying to the powers that be to notice how, despite the depletion of the Cable Room staff particularly, quite a number of the remnant who remain, despite lack of practice, have nevertheless lost little of their cunning with the *punching sticks or their equivalent.*

J. J. T.

LONDON TELEPHONE SERVICE NOTES.

MONDAY, Jan. 25, proved a red letter day for the Telephone and Telegraph Society of London. Mr. D. H. Kennedy, whose fame as a lecturer is well known, delivered an address on "Special Services in the Metropolis," illustrated by lantern slides and various practical demonstrations of the services reviewed. It was one of fate's unkind tricks that the instrument specially provided for the chairman's use in connexion with Selfridge's "telephone order service" should have betrayed its trust. The unkindness was the more pronounced when considered in relation to the lecturer's particular official responsibilities. In the Cable Room, no doubt, they would regard the untoward incident as a warning against the iniquity of putting one's trust in the Telephone instead of in the *senior* Service. Mr. Dunford, of the Central Telegraph Office, is to lecture before the society on the occasion of its next meeting, and ere these notes appear we shall perhaps have learned more of the reliability of this same senior Service.

The February meeting of the London Telephonists' Society was devoted to further competition papers. Miss Ward, of Kingston Exchange, provoked a continuous ripple of laughter by her picturesque description of that exchange as it used to be in the days of not very long ago. Miss Baldwin, of the Trunk Exchange, gave an interesting comparison of the telephonist's work at trunk and local exchanges. Miss Aylott, a "Central" telephonist, read an excellent paper on "The Wrong Number Trouble."

The paper showed that she had given the subject a great deal of thought and had formed definite opinions as to various ways in which, some at least, of the wrong numbers might be avoided. The papers provided a lively discussion, and the whole evening proved most enjoyable. It was particularly gratifying to all present to have Colonel Ogilvie of the number. He has always taken a keen interest in the society, but the calls on his time have been so continuous this year that it was almost more than we could have hoped to see him at our meetings.

At the next official meeting (on March 9) Mr. Stuart Jones, of the Secretary's Office, who has studied telephone problems in various countries, is going to tell the members something of his experiences. This ought to prove one of the most attractive evenings of the whole session, and we anticipate a crowded house. The election of officers for the ensuing year will also take place, and the awards will be presented to successful competitors whose papers were read in January and February.

The London Telephonists' social meeting took place at Chelsea Town Hall on Saturday, Feb. 6, and left not a dull moment. Everybody concerned worked *so enthusiastically and to such single purpose that the gathering was* an assured success even before it took place. The members of the society, by collection amongst themselves, raised a sum which defrayed the whole cost of the refreshments and left a handsome balance. The "City" Exchange are to be congratulated on their splendid efforts in this respect. They collected the largest amount—being closely followed by Hampstead (a smaller exchange) and by Central. Singularly enough two other very large exchanges tied at the other end, the total for the two exchanges being no greater than the total at either any of the three exchanges mentioned. The refreshment arrangements were undertaken by Miss Twyford, of the General Post Office South Dining Club, and most excellently was the task performed. The Telephonists' Society owes and acknowledges its great debt to Miss Twyford and to the girls who gave their services to wait on the assembled company. They worked ceaselessly, and must have been absolutely tired out by the end of the evening. Their share in the success of the gathering was a very real one. It is impossible in the limited space of these notes to do justice to their efforts, or to those of the various artistes who in one way and another contributed to the enjoyment of the company. It is very gratifying to think that after paying all expenses it is hoped with the aid of a grant from the general funds of the Telephonists' Society to forward a cheque for £60 to the Post Office Relief Fund, whose president, Mrs. Hobhouse, *joined the party during the evening.* The secretary and treasurer of the fund, Mr. Arthur G. Ferard, was also present with Miss Ferard.

They are enthusiasts at the Western Exchange and have had another concert, forwarding a cheque for £6 10s. (part proceeds) in aid of the Relief Fund. Space does not allow us to give details, but suffice it to say that the concert was as successful as the earlier one, and that all who were able to go had a feast of good things in the musical line.

The Putney, Kingston and Wimbledon Exchanges organised a dance in aid of the fund. It took place at Wimbledon on Jan. 23, and proved so delightful that already arrangements have been made to repeat it. Financially prosperous, it added a sum of over £9 to the fund.

The Croydon Telephonists' Society had a crowded meeting on Thursday, Feb. 11, when a debate was held on the vexed question of "Authorised

Expressions." The lady who was to have presented the case in favour of authorised expressions in exchanges had, between the time the arrangements were made and Feb. 11, given voice to various "authorised expressions" in another place—as the result of which she figured no longer as Miss Longford, but became the wife of Lieutenant Pitman. The meeting on the motion of the Chairman, Mr. Berlyn, passed a resolution of congratulation to Lieutenant and Mrs. Pitman. That lady's place as a debater was taken by Miss Chandler, of Sutton, who showed a truly able devotion to the authorised expression. The other side of the case was presented by Mr. Horace Dive, but the Chairman, no doubt to save the latter's susceptibilities, did not put the matter to the vote. During an interval in hostilities refreshments were served, and it may have been the strength of the coffee which caused the speeches thereafter to partake of so marked a similarity. The meeting seemed to be enjoyed by all present. At the society's next meeting, Mr. McCleish, of the Controller's Office, will lecture on the "Transmission of Messages under War Conditions."

Speaking of war reminds one that for some time past there have been marked indications of a growing martial spirit in the Controller's Office. The outward and visible signs are particularly to the fore on Saturdays, when garments of strange cut and boots of heavy tread are to be met with in unexpected places. For a time, too, the ring of more or less military commands are to be heard in certain temporarily vacant rooms on the first floor of the Carter Lane building. For half an hour after 4.40 p.m. squads were to be observed earnestly endeavouring to carry out weird and wonderful evolutions. The writer is informed that the efforts of a highly placed official to form fours, would make the subject for a successful *vaudeville* sketch. An attempt to reform "two deep" had to be abandoned as any sort of reform was too deep to be undertaken.

TELEPHONE AND TELEGRAPH SOCIETIES.

Brighton.—A meeting took place on Dec. 14 under the presidency of the District Manager, Mr. C. F. Moorhouse. Six papers were submitted by lady members in competition for prizes, the winners being:—First, Miss Puttick; second, Miss Simmons; and third, Miss Mackintosh. Other papers were submitted by Miss Beach, Miss Parris, and Miss Webb. The attendance left a good deal to be desired but this is not to be wondered at considering the atrocious weather.

On Nov. 14, in consonance with the decision already arrived at to start a social side to the society, a whist drive and concert was held at the Pavilion Creamery when there were 100 present. The affair was a huge success and the concert which was arranged by Miss Parris proved to be of a very enjoyable character. The next concert of this kind will probably be held in January when prizes have been promised in order that the profits may be applied to the Belgian Relief Fund.

Another meeting of the society was held on Jan. 4 when Mr. J. Stuart Jones, Traffic Manager, Secretary's Office, gave a most illuminating paper relating to the London and Brighton new trunk line cable. The District Manager presided over a fair audience which was well representative of all branches of the Service. Mr. Stuart Jones was heartily thanked for his interesting paper which was illustrated with lantern slides.

At the meeting held on Feb. 1 a most interesting lecture was given by Mr. C. W. Stone, of the Brighton Post Office, the subject being "Telegraphy." The lecturer included in his address both ancient and modern means of communication and illustrated his remarks with blackboard drawings and exhibition of present-day telegraphic apparatus. Mr. A Lumsden, Traffic Superintendent, presided, and at the close a hearty vote of thanks was accorded to the lecturer.

Isle of Man.—The third meeting was held on Jan. 7 when Councillor Gillmore gave a paper, the subject of which was "Forty-five Years' Experience in Telephony, Telegraphy and Electric Lighting," which, on account of the lecturer's large and varied undertakings, was exceptionally good and was greatly appreciated. A discussion followed in which a number of points raised were ably explained by the lecturer.

The fourth meeting was held on Feb. 4. Mr. W. Anson, Superintendent, read a paper on the "Telephone Call Offices at Post Offices," which proved to be very interesting and instructive. A discussion followed in which some of the suggestions put forward in the paper were spoken upon by the members, and a number of points raised were ably explained by the lecturer.

Glasgow.—The third ordinary meeting was held on Jan. 11 when the subject of the evening was "The Probable Developments of Trunk Working." Mr. N. L. Smith, the chairman of the society, gave a historical *resumé* of the trunk system and explained in detail the present procedure in dealing with trunk calls. He afterwards outlined the method which it was proposed to adopt in the near future, when a proportion of the trunk traffic would be transferred from the control of the trunk operator to the control of the local operator, with the consequent preparation of tickets and timing of calls involved. It was then explained to the operators and others present, in non-technical language, the principle whereby it was now possible to speak over comparatively long distances by means of underground wires, and how, consequently, it was possible to run a larger number of wires between the centres of telephone areas at a capital cost and maintenance expenditure which, combined, made the individual circuits much cheaper than by the overhead method, where poles got overloaded and alternative routes were difficult and expensive to obtain. The question of the desirability of the local operating and supervising classes becoming acquainted with the recognised code letters of the principal towns was also touched upon.

PERSONALIA.

NEWS OF THE TRAFFIC STAFF.

LONDON TRAFFIC STAFF.

Promotions—

Miss MARGARET M. WORTH has been promoted to be Assistant Supervisor, Class II, at Gerrard Exchange.

Miss FLORENCE CARTER to be Assistant Supervisor, Class II, at Hampstead Exchange.

Miss EDITH F. RICE to be Assistant Supervisor, Class II, at Museum Exchange.

Miss AMY TROTTER to be Assistant Supervisor, Class II, at Mayfair Exchange.

Transfers—

Miss ALICE BRAND, Assistant Supervisor, from the North Exchange to Museum Exchange.

Miss EVA W. BURNETT from London Wall Exchange to Romford.

Miss ELIZABETH A. MANNING from Sutton Exchange to Central.

Miss MARY L. THOMAS, Mayfair to Victoria.

Resignations—

Miss CLARA E. CLARKE has resigned in view of her approaching marriage, and has been presented by her colleagues at Croydon Exchange with a cut-glass salad bowl, a case of silver tea-spoons, and several other useful presents.

Miss E. M. TANEY has resigned to be married and was presented by her colleagues at London Wall with a tea and dinner service.

Miss MAY D. PAYNE, of Wimbledon Exchange, who has resigned, has been presented with a silver-plated cake basket, and a case of tea knives in view of her approaching marriage.

Miss GERTRUDE L. VARNEY has resigned to be married and has been presented by her colleagues of the City Exchange with a case of fish knives and forks, servers, a breakfast service, a bronze fern pot, a Doulton art pot, toast rack, salad bowl and servers, silver butter, biscuit and cheese stand, butter dish and other useful things.

Miss JESSIE H. HOLLOW, of Kensington Exchange, has resigned in view of her approaching marriage and has been presented by her colleagues with a tea service.

Miss FLORENCE M. SCRUTTON, of Hammersmith Exchange, who is leaving to be married, hopes to sail for New Zealand shortly. Her colleagues presented her with a travelling bag.

Miss ANNIE E. MOORE, of the Trunk Exchange, has resigned to be married. Her colleagues presented her with cutlery, tea-spoons and fish-knives, tea service, cruet, silver cakestand, jam-spoon, tea-pot stand, and pot-pourri jar.

Miss MABEL HARWOOD, of the Trunk Exchange, who has resigned, has received the following wedding gifts:—A silver tea set, a butter dish, celery glass, china plaque, biscuit barrel, brass candlesticks, spirit kettle, cake basket and numerous other gifts.

Miss ALICE L. DENNIS, of London Wall, has resigned on account of approaching marriage, and was presented by the staff with a tea service.

Miss LILIAN M. ROBERTS, of the Hop Exchange, also resigning to be married, was presented by her colleagues with a pair of bronze ornaments.

Miss CHARLOTTE JORDAN, of East, has resigned and was presented with a silver and cut-glass centre piece as wedding gifts.

Miss GLADYS COOPER, of North, has resigned.

Miss BEATRICE E. APPLEBY has resigned in view of her approaching marriage. Her colleagues at Hampstead presented her with fish knives and forks and carvers.

PROVINCIAL STAFF.

Mr. H. J. E. STILL, Supervising S.C. & T., Margate, has been promoted to be Assistant Traffic Superintendent at St. Albans.

Mr. ARTHUR E. MARRIOTT, a popular member of the Wall Set Department Factory, Birmingham, was the recipient of a beautiful piece of workmanship in the shape of a 400-day clock, as a mark of good feeling and good wishes for his future as a married man. Mr. Garner very kindly made the presentation.

Miss M. C. COUSINS, Observation Clerk, Swansea, was the recipient of cutlery from the staff on leaving the Service to be married.

Miss A. ELLERY, Assistant Supervisor, Class I, Swansea Central Exchange, was the recipient of a case of cutlery from the staff on leaving the Service to be married.

THE annual tea for poor children was given by the staff of Paddington Exchange on Saturday, Feb. 13, when some 325 guests assembled to partake of the delicacies—both physical and intellectual—provided for them.

The catering and entertainment were both undertaken by the staff instead of employing professionals as in former years, and the results were of the most satisfactory nature, there being no hitch whatever, though owing to the failure within three days of the entertainment of two out of the four gentlemen who formed the original cast of the Pierrot troupe, the fortitude and perseverance of the remaining members were very severely taxed.

Three other gentlemen, however, very kindly stepped into the breach at the last moment, and the determination of the "Entertainment Committee" resulted in a most successful and greatly appreciated performance.

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CONTENTS.

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SOME TRAFFIC EXPERIENCES WITH THE DARLINGTON AUTOMATIC EXCHANGE.

BY ALAN ROBERTS (*District Manager, Middlesborough*).

THE Western Electric Company's full automatic exchange system as described in the *Engineer's Journal* of July 1914, and in the further article appearing in the TELEGRAPH AND TELEPHONE JOURNAL for November 1914, was brought into operation on Saturday, Oct. 10, 1914, at 2 p.m. In order to facilitate this transfer, the lines at the Trunk Exchange connected with the usual "F" pattern sections were transferred to the new C.B. manual switchboard in advance of the main transfer. At 1 p.m. on Aug. 29, 1914, as many trunks as could be spared were transferred to the manual board and tested out prior to two o'clock, when the new method of working was brought into operation, the remaining trunks being transferred subsequently. This procedure not only provided against any possible interruption to the trunk working, which was of vital importance as the military authorities were making considerable use of the circuits, but also enabled the operators to become familiar with the new methods of working before the general transfer of subscribers' circuits to the automatic exchange.

The incoming trunks terminating at the Local Exchange were left undisturbed until the day of the automatic transfer. The trunk traffic, fortunately, was light, and was disposed of without undue delay. The opportunity was taken to introduce the docket system of recording faults.

There is no subscribers' multiple on the manual section, all calls being completed through the automatic equipment by means of junctions. The outgoing junctions to the automatic section are multipled on every fourth panel, as are also the trunk and local junction circuits. Where the trunk fee is 6*d.* or more, this is signified by a white filling in the groove under the jack. The incoming junctions from automatic, known as number 12 trunks, are equally divided between the three outgoing positions, while those to "enquiry" and "complaint," known as number 14, are terminated on special "enquiry" positions. All these circuits are provided with lamp signalling Subscribers requiring to book a trunk or junction call or to make a complaint dial 12 and 14 respectively, and the automatic apparatus selects an idle junction in the required group.

A large number of trunk calls are dealt with on the "no-delay" basis, the operating expression used in such cases when the subscriber books his call being: "You may have them now." The speed with which some trunk calls have been effected has given a pleasant surprise to the public.

The space in the multiple panels on the "enquiry" and "complaint" positions contains docket distributors and book racks for directories, &c. On these positions also are fitted the dead number key-ended circuits with lamp calling. The dead number circuits are provided so that in the event of a subscriber dialling a number which is either "spare," "ceased," "changed," or "temporarily out of service," he will gain the attention of the "enquiry" operator, who will give him any necessary information. At the time of the transfer, only the spare and ceased numbers still in the directory and the "temporarily out of service" numbers were joined up on these circuits, and some difficulty arose because the busy-back was given when a subscriber dialled to any other spares in the exchange.

Instead of the ordinary "engaged" test on the trunk and junction multiple, visual lamp "engaged" signals are provided. Green opals are used and their varying degrees of brilliancy, due to early deterioration of the lamps gives a peculiar effect. What the effect on the operators would be with a large illuminated multiple before them I leave to your imagination. Renewals of these lamps are very frequent and considering the small fraction of time occupied in ordinary engaged testing methods, I question whether this apparently costly innovation is warranted, or, in other words, if the game is worth the incandescent electric candle.

On the left-hand side on the key shelf of each operator's position is fitted a dial for automatic working. The right-hand side would seem to be the most natural position for it, as it can be rotated with greater ease and accuracy with the right hand; but the transfer of the dial to that position would impede the working of the special ringing key which is provided for ringing magneto exchanges and party lines. Some of the distant trunk exchanges are signalled by generator and some automatically on the insertion of the calling plug, the lines to the former being identified by a green line on the designation plate.

The arrangement for challenging "engaged" subscribers for trunks is somewhat cumbersome, and it has now been decided to abandon the practice of giving priority to trunk calls in the Darlington area. The operation for effecting a trunk connexion with an engaged subscriber was as follows:—

(1) The operator dialled the number required on any disengaged outgoing junction to the automatic apparatus, and, if the busy-back was received,

(2) She then plugged into a disengaged "trunk-offering"

circuit, dialled the subscriber's number again, and was put in circuit on both subscribers' lines.

(3) She used the standard expression, "Trunk call for . . . . ., &c." If the subscriber agreed to accept the call, she then said: "Please hang up your receiver and I will call you."

(4) She then dialled again as in case (1). Should the subscriber fail to "hang up" on request, the telephonist had to repeat the whole of the above operation. To guard against this, however, the telephonists were instructed to keep in circuit until a decided click was heard, indicating that the connexion had been severed. If in doubt, she would challenge before withdrawing the plug from the trunk-offering circuit. There was no means provided for identifying whether the subscriber was already engaged on a trunk or a local call.

Double lamp supervisory signals are provided in the cord circuits, but neither signals are operative unless the calling plug is in a jack.

In effecting a call to the automatic, the operator inserts the calling plug into a disengaged junction jack; the supervisory lamp will glow until there is a "free" register (explained later). The lamp usually glows only momentarily, say, for .8 seconds, and the dialling tone, indicating that a register is waiting to receive the number required, should come on simultaneously with the dimming of the supervisory lamp, but as this does not always happen, the operators have to throw the key in the listening position in order to hear the tone before throwing it in the opposite position for dialling.

Calls to Nos. 12 and 14 are not metered, and local fees on trunk calls are charged from the trunk account, tickets being made out for any chargeable enquiry.

Subscribers requiring Postal Service dial 2600 and are connected with an instrument in the phonogram stalls, which are situated in a separate room. All such calls are metered. Coin-box circuits are terminated with lamp calling on the manual switchboard in order that the operator may collect the fees. No dialling apparatus therefore is provided at the subscriber's end The circuits, however, are wired through the automatic apparatus so that they may be called automatically. Party lines are also provided for on the manual board, but these are not wired through the automatic apparatus. Subscribers who are denied trunk facilities are listed on the manual section, since there are no other means of identification. Reference charts are also fixed on the multiple panels showing the old and new numbers, and little difficulty is experienced in completing an incoming call when the old number is quoted. The callers are advised of the new number.

To obviate the necessity for keeping an inspector on duty at night time to replace fuses, &c., arrangements have been made for the alarm circuits to be extended to the manual room, and, in the event of any failure, the inspector would be called by the operator by means of service message.

Prior to the transfer, two letters were sent to the subscribers, one notifying them of the introduction of automatic working and pointing out the inadvisibility of printing exchange numbers on new supplies of stationery, and another notifying the date and time of the transfer and the subscriber's new number, and giving supplementary instructions to those on the instruction cards. With this letter was also enclosed a special directory giving the new numbers.

The system being a four-figure one necessitated changing the whole of the subscribers' numbers. The few complaints from subscribers were on the ground of expense to be incurred in renumbering stationery, but further explanation satisfied them in each case.

Traffic distribution.—There are fourteen groups of line-finders, thirteen of which are fully equipped and provide for 60 subscribers' circuits each, the remaining one is partly equipped. The 600 subscribers were distributed over the whole of the equipment in order to bring all the automatic equipment into use, and also to provide for any possible overload during the week after the transfer.

Originating Calls (in which the Line-Finders are concerned).—Records were taken to ascertain the number of calls originated during the busy hour on each subscriber's circuit, and from the information thus obtained, cross-connexion lists were prepared for the engineers. The distribution on the thirteen fully equipped units of line-finders provided that each unit should be given an approximately equal load. The partly equipped unit was proportionately loaded.

Inward Calls (which concern the Final Switch).—It was assumed that, with a few exceptions, the number of inward calls in the busy hour was approximately equal to the number of originating calls. No special record, therefore, of inward traffic was taken.

The final switches were divided into four groups each capable of accommodating 200 subscribers' circuits and each group was proportionately loaded, that is to say, each group had approximately an equal number of incoming calls during the busy hour. From this final switch distribution the subscribers' new numbers were allotted.

One of the four groups of final switches is arranged for private branch exchange working, the circuits being so wired that they can be "grouped" as on a multiple; in this case, when a private branch exchange number is dialled and the first line is engaged, the brushes of the final switch move on to the succeeding lines. In this connexion it is to be noted that on the Western Electric system the numbers are arranged in sequence downwards and that "0" takes a higher value than "9," thus, the actual numbers of a private branch exchange having a published number 2600 (four lines) would be 2600, 2609, 2608, and 2607.

The service inspectors visited the subscribers before the change over, and a card was therefore prepared for each street or locality showing the subscribers in that street, the house number being given where known, together with old and new telephone numbers. The cards were arranged in groups and approximately in walking order, one group being taken by each service inspector. The primary object of the visit was to explain the automatic working and to see that the instruction cards were properly fixed and understood. Where the instruction card was missing, a note was made on the card referring to the street concerned and the engineers were advised. The abandonment of the existing system of instruction cards should be considered as they are subject to considerable abuse. The essential instruction should be actually fixed to the instrument either by insets on the dials or by means of cards in small metal frames fixed to some part of the apparatus, and this, of course, applies also to switchboards. The non-observance of the instructions at the time of the transfer led to considerable trouble, as might be expected, for, although the inspectors visited the subscribers' premises, the people who were instructed by them could only form a small percentage of the telephone users. It is human to err, and the subscribers at Darlington are not exempt from this weakness.

The service inspectors were retained for a few days after the transfer to follow up the subscribers' complaints and to test the service.

With the full automatic we bid adieu to the telephonist only so far as ordinary local connexions are concerned. This system is comparable to the C.B. system, except that mechanism is provided to perform the work of the operator at a manual board with the subscriber assisting by dialling the number required. Analogously the line-finder compares with the answering equipment. The eight line-finders for each 60 subscribers correspond to eight answering cord circuits, which are more than ample for the busy hour load. The registers do the work performed by the operator and control the various switches and junctions. The final switch represents the subscriber's multiple. The line-finder, therefore, is only concerned in subscribers' originating calls and is not affected by incoming calls, just as the answering lamp is not affected when the operator plugs in the multiple to call a subscriber on a manual section.

If you overload an operator's position, you are going to slow down the service; similarly, if you have not sufficient auto-registers you will experience the same result. When a subscriber removes the receiver from the rest, if there is an available register to receive the impulses, a tone comes on the line which is analogous to "Number, please." Failure to conform to instructions, viz., to remove the receiver from the rest, or to dial the number required on hearing dialling tone, results either in getting the wrong number or no number at all. Trouble was experienced at the transfer from

this cause and from faulty lines, and, of course, the subscribers naturally attributed the cause to the failure of the system. The underground plant was in course of reconstruction and should have been completed by the contractors before the transfer, but owing to shortage of men, due to the war, this could not be done; and as the tenancy of the Local Exchange premises was fast approaching termination and could not be extended, there was no alternative but to make the transfer and pray for fine weather.

Allowance, however, should always be made for equipment of a new type, for, notwithstanding all experiments and exhaustive satisfactory tests on the new installation, initial trouble is liable to be experienced.

The register becomes engaged when a subscriber calls, or on the occurrence of a short circuit or an earth on the B line. This is evident upon the test clerk's desk, as the lamps installed there in connexion with the registers show the progress of the subscriber's dialling. The test clerk can therefore observe any irregularity and plug in on the circuit in question. When a faulty line is the cause, the subscriber's circuit can be transferred to another position on the test clerk's desk for attention, and calls can then be completed for the subscriber if it should happen that he cannot do so himself. The docket system of faults, therefore, does not represent all the subscriber's faults, for many faults can be remedied without the subscribers knowing that they existed. This arrangement is undeniably an improvement on the C.B. system as a fault finder, since the troubles demand the prompt attention of the test clerk and maintenance staff.

The instruments supplied to the subscribers are of the C.B. pattern with dials, and the switchboards at private branch exchanges are principally of the cordless type.

The arrangements made for the operator's test at the change over were for them to (1) dial each subscriber and, having got him, ask him to (2) dial the operator, special temporary circuits being provided at the manual board on ordinary subscribers' numbers. It was ascertained by the service inspector which subscribers could be obtained after 2 p.m. on Saturday and lists were handed to the operators for testing.

With regard to the test (2), many subscribers had already made satisfactory calls, and therefore this test was not proceeded with in their case. It would seem advisable in future transfers to abandon this test, or at all events defer it until some days after the transfer, as considerable time is taken up. Only the first test should be made at the outset. Dockets were prepared for unsatisfactory tests, but as many of these were "right when tested," the general testing at the start was deferred.

Owing to the number of test calls made, the subscribers' meter readings were not taken until 9 a.m. on Monday, Oct. 12, credit tickets being made out for all subscribers' test calls from that time.

The best test of a system's efficiency is its practical use. The service inspector's tests made three weeks after the transfer result as follows:—

Number of calls made	290
	Average time. Seconds.
Dialling tone observed	4.8

Dialling tone percentages.

1 second or less.	2 seconds or less.	3 seconds or less.	4 seconds or less.	5 seconds or less.	Over 5 seconds.
41 %	80 %	90 %	92 %	92 %	8 %

	Average time. Seconds.
Commencement of call to :—	
Completion of dialling	10.7
Starting of ring	13.8
Called subscribers' answer	28.1

Subscribers' Reports :—	No.	Per cent.
Satisfied	131	73.6
Fairly satisfied	39	21.9
Dissatisfied	5	2.8
Indefinite	3	1.7
	178	100.0

Subsequent tests were made on the 10th December at the Darlington Exchange, and the following results show an improvement on the above:—

	Seconds.
Average time for dial to rotate and recover from "0"	1
Average time for dialling tone to come on ...	.85
Minimum time for dialling tone to come on in 20 tests	.8
Maximum time for dialling tone to come on	1.3
Subscribers' average dialling time for four figure number	6
Operators' average dialling time for four figure number	4.5
Time from finish of dialling to commencement of ringing	2
Time for line to clear from an engagement ...	2
Average time for subscriber to answer after commencement of ringing	19.75

So that .85 + 6 + 2 + 19.75 = 28.6 seconds the average time for total operation.

The average time for total operation in other exchanges in this district (extracted from all the local calls made on 21 exchanges during the service inspector's recent visit up to date) is 38.3 seconds, which shows by comparison with Darlington figures a difference of 9.9 seconds.

In the combined Trunk and Local Exchange a saving of 40 per cent. in the operating staff has resulted.

Some favourable opinions of the subscribers on the automatic system are that it is an improvement on the old magneto system. It is quicker, and moreover it is a pleasure to be able to speak without being interrupted by the operator; further, it makes the subscriber answer his telephone more promptly, for, in case of a caller restoring the receiver to its rest, the called subscriber does not know who was calling him.

The system is a marvel of ingenuity, and although descriptive matter is helpful to follow its intricateness, it needs a careful inspection of its working in order fully to grasp and appreciate the wonderful triumph of telephone engineering in the latest system of automatic telephony.

"FOR ENGLAND'S SAKE."

The various funds in connexion with the war must find it increasingly difficult, as time goes on and income taxes and the cost of living rise, to obtain support. There are so many almost equally meritorious funds that people are apt to object very justly that they cannot subscribe to all of them. The British Red Cross Society and the St. John Ambulance Association are, however, bodies whose appeals we cannot ignore, and anything promoted with the object of furthering their ends must commend our support. For this purpose, Mr. Sherwin Engall, who is a well-known member of the Telegraph branch of the Secretary's Office, and who has long been a contributor to *St. Martin's le Grand*, has written and set to music a stirring song entitled "For England's Sake." It is published by Stainer & Bell and is obtainable from Mr. Francis E. Blake, High Street, Acton, London, W., at 1*s.* 6*d.* a copy. The entire proceeds of the sale, after deducting the bare expenses, will be devoted to the two societies named. We can confidently recommend this work to our readers, and when, in addition, we mention that a sale of 2,000 copies will mean at least £105 for the funds, we are certain that a large demand for the song will arise.

OBITUARY.

Mr. A. L. E. Drummond, one of the best known and among the oldest—in point of length of telephone service—District Managers, passed away at Newcastle on March 4 in his 55th year.

Mr. Drummond's connexion with telephone service began at Sheffield in 1881, and he subsequently served in the Potteries, Manchester, Leeds, Oldham, Plymouth, and since 1902 at Newcastle.

He was much esteemed at Newcastle and the sympathy of the telephone staff extends to his widow and family.

THE COLLECTION AND DISTRIBUTION OF TELEGRAM FORMS IN THE INSTRUMENT ROOM.

THE BIRMINGHAM CARRIER DESCRIBED.

By H. L. PEARCE and S. BODEN.

THE rapid growth of the British Postal Telegraph Service during the last quarter of a century has resulted in the straining of every nerve by present-day administrators to effect economy in wires and labour and to increase the individual output. Full advantage is being taken of the adaptation of machinery to the work of telegraphy, and the introduction of mechanical appliances is being extended everywhere. Although not seeking to oppose this invasion of the mechanical engineer, the telegraphist of early days views the change with some misgiving for the reputation of his craft, fearing that the old watchwords of accuracy and efficiency are in jeopardy of being sacrificed to speed and economy. He notices that experiments are being made and new methods tried daily in connexion with nearly every phase of his work, a marked partiality being shown towards proposals for displacing the human element and eliminating manual labour. Typewriters, Gell perforators, continuous Wheatstone working, Creed re-perforators, slip-printing machines and the like now form part of the recognised equipment of every large transmitting office, with the inevitable result that the atmosphere of the instrument room, where quietude was once regarded as indispensable, has to-day given place to something more closely resembling the clatter of a busy weaving mill or the machinery shop of a factory.

Up to the present, however, nothing has contributed more to this changed aspect than the Lamson pick-up carrier with its overhead tracks of mechanical messengers. Backwards and forwards these lifeless bodies scurry along the aerial lines, each grasping a load of traffic and depositing it with almost human intelligence at either the central check platform or the desired telegraph instrument; indeed, to the uninitiated, the work performed by this ingenious apparatus appears to be almost uncanny in its certitude and perfection.

For many years the time occupied in the collection and distribution of telegrams has been recognised as responsible for much of the delay so common to the traffic passing through large offices, and various suggestions have been made and apparatus installed with the object of securing a more rapid means of transit than that provided by human agency. For instance, check tables were established in the several divisions and connected with each other by means of pneumatic tubes. Later on tubes gave way to the endless cord-carrier, which was a decided improvement since it gave a continuous as against an intermittent service. But the inherent difficulty still remained. A large proportion of the traffic had yet to be transferred from one check to the other, involving at least a double handling by messenger and circulator alike; in fact in cases where two or more of these tubes or carriers were connected with one check table many messages passed through five or six pairs of hands from their point of receipt to their point of despatch by the operator—a fruitful source of delay. Obviously then, the *desideratum* was to provide some means whereby the whole of the traffic could be rapidly transferred direct from the receiving instrument to a central distributing point, and be re-transferred to the despatching instrument with the minimum of handling and delay. The Lamson pick-up carrier, *per se*, has at last solved this problem, and a short description of the apparatus recently installed on an extensive scale at Birmingham may perhaps be of more than passing interest to our readers.

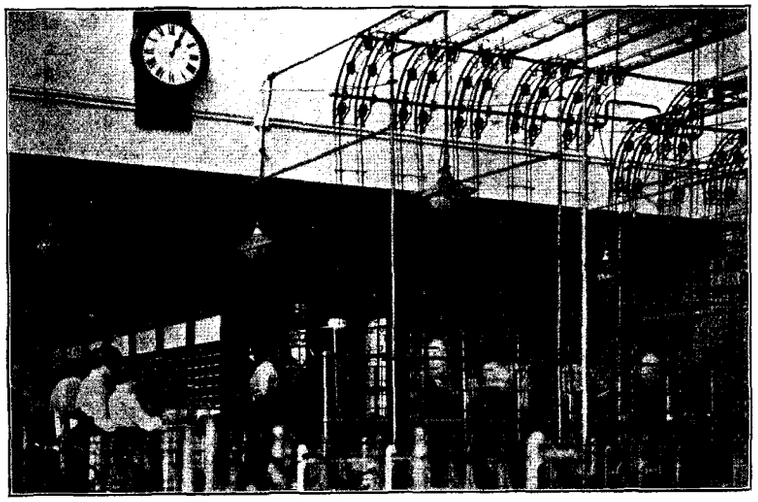


FIG. 2.—BIRMINGHAM INSTRUMENT ROOM.
View of Carrier Platform.

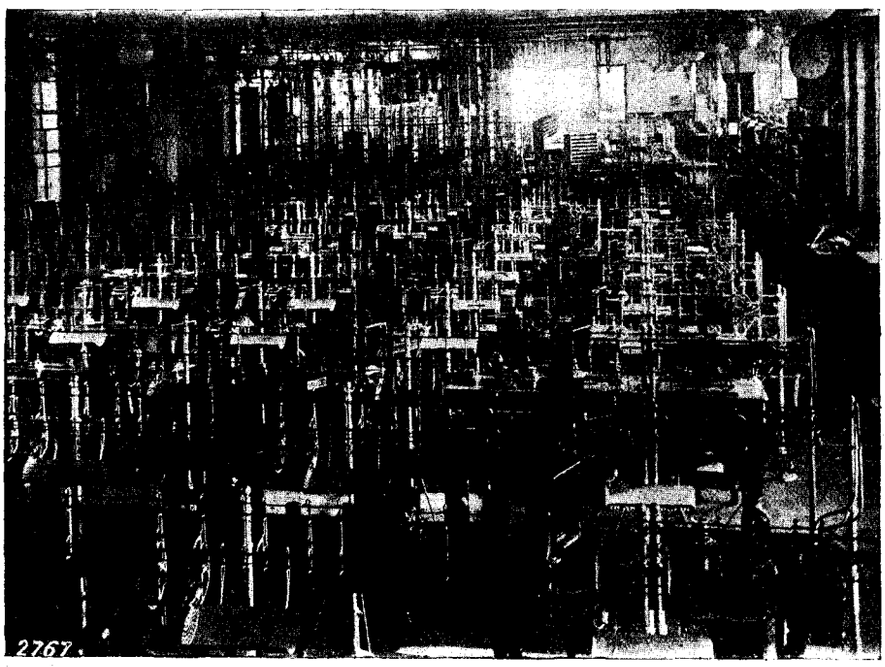


FIG. 1.—The BIRMINGHAM INSTRUMENT ROOM.
A Perspective View of the Pick-Up Carrier.

Briefly stated the contrivance consists of an endless moving cord having grapplers attached which carry telegram forms from the check to any selected instrument, and also pick up forms from any desired instrument and convey them to the check table.

The main instrument gallery at Birmingham is roughly 70 yards long by 15 yards broad, and the controlling part of the pick-up carrier, together with the check table, is placed in the centre of the room. The pick-up apparatus at this central point is established on a raised platform and arranged to form three sides of a square, the fourth side being occupied by the check table as shown in the illustration.

From the central platform there run 27 lines of double track each traversing one of the instrument tables and having an aggregate length of about 1,500 yards, that is to say, 750 yards out and 750 yards return. The shortest line is approximately 28 yards and the longest 106 yards. The tracks between the central platform and each instrument table are carried overhead and are made of hard drawn steel rods supported on light metal pillars or standards of one-inch barrel fixed to the floor. Passing along each track is a continuously moving endless cord of special make, and attached

to this cord are a number of pick-up "fingers" similar to that shown below. Grooved pulley wheels are provided where corners have to be negotiated.

On approaching the selected instrument the fingers open and deposit their load of telegrams into the metal tray suspended from the track. Still open, they pass (one above and one below) along the *adjoining despatching shelf where, automatically closing,* they grasp the messages waiting collection and convey them to the check for circulation. The opening and closing of the "fingers" are controlled by "cams" or "ramps" affixed to the steel track running alongside the instrument table. These cams vary in their angles of projection, and as each is differently graded from that of any other on the same table, only that finger which is adjusted to engage a particular cam is operated thereby. By this means each finger is made selective in its operation.

It will be seen from the previous figure that the "pick-up" itself consists of two portions fixed on a base or car, the lower portion being movable and normally held against the upper portion by a spring. It also has a curved projection which, on making connexion with the ramp, is forced downward carrying the lower portion of the finger with it. The "pick-up" thus remains open as long as the curved projection continues to traverse the ramp, the lower portion of the "finger" passing *under* the despatching shelf at

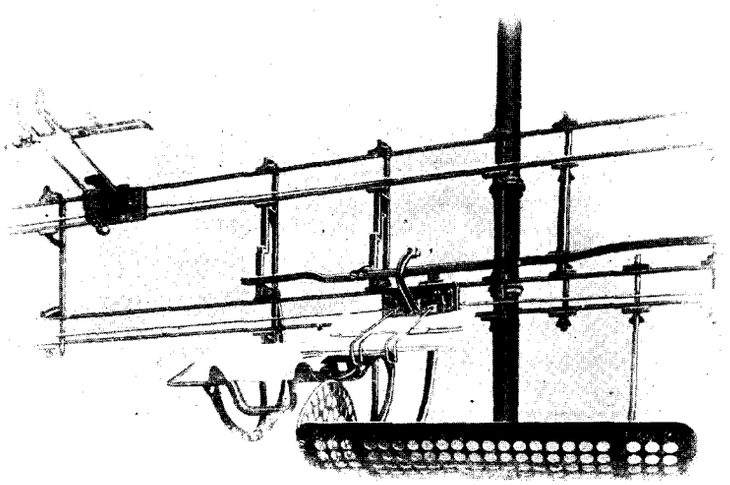


Fig. 3.

Details of Horizontal Track showing Fingers, Receiving Tray and Despatching Shelf at the Instrument.

the near end, whilst the upper portion passes *over* it. The middle of the despatching shelf is, however, cut away sufficiently to allow the lower portion of the finger when closing to pass through the aperture. At this point the ramp terminates, and as a consequence *the pressure on the spring is released. The lower half of the finger* then rises through the aperture in the shelf meeting the upper portion with a snap, and away goes the telegram form held firmly between the two. This is a very ingenious arrangement, and so perfectly are the fingers adjusted that very rarely do any pair of them come into contact with the shelves in their action and passage.

Figs. 4 and 5 show two of the fingers in actual operation on the "A" side of the Birmingham-Southampton quadruplex circuit.

A Typical Table.

We shall perhaps be better understood if we describe the action at a specific point. On table 15, for instance, are placed three quadruplex circuits working to Sheffield, Derby and Nottingham; there are thus six points, three "A" sides and three "B" sides, each provided with a despatching shelf and receiving tray. At the central platform is a tier of six despatching tablets labelled "Table 15." As, however, the message forms are sent to the "A" sides only it follows that only three tablets are in use—that is every alternate one—and these are labelled "SF," "DY," "NG." If, therefore, a telegram is placed on the tablet labelled SF, the pick-up fingers which are graded to open at the NG and DY circuits respectively pass it by; but when the finger comes along which is graded to open at the SF instrument, it grasps the form and carries it to table 15, passing the NG and DY circuits without opening because the cams there do not lie in the path of the finger. The

Fig. 4.

The Fingers in the act of Depositing a Message in the Receiving Tray at the Circuit.

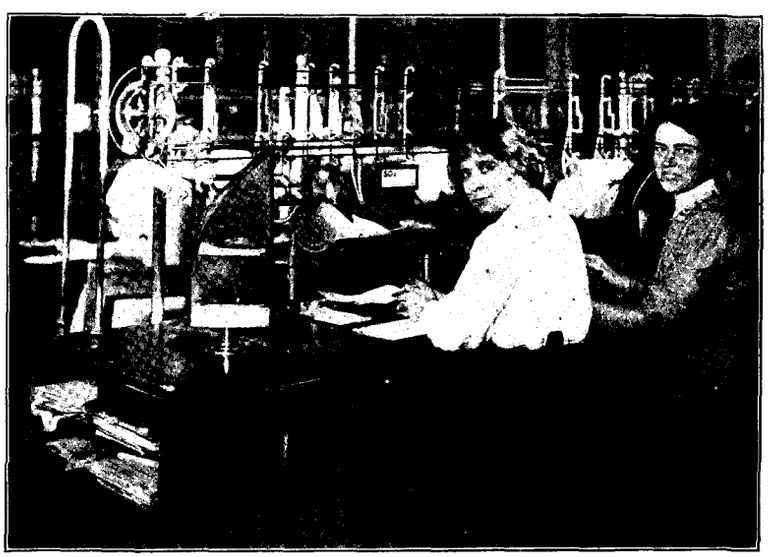


Fig. 5.

Here the Fingers have just picked up a form from the Despatching Shelf at the Instrument and are on their way back to the Check Platform.

form is thus carried on to the SF instrument where the finger comes in contact with a cam which forces it open causing the message to be dropped. A similar procedure takes place in connexion with the other two circuits on the table. It should be stated that fingers are also provided for the remaining three "B" points, but in this particular instance they are only used for the purpose of collection, all the forwarded traffic for each office being deposited in the tray attached to the "A" side of the instrument.

THE DISTRIBUTING STATION AND CHECK.

The check platform or the point at which all tracks converge is the most important part of the arrangement. It is a structure raised some three or four feet from the floor. On three sides are placed vertical tiers of despatching tablets or shelves. These tablets are receptacles for messages waiting transit to certain specified circuits, and attached to each is a "cam" correspondingly graded to that of its respective instrument The action at the platform and the circuit is, therefore, precisely the same; the fingers open, deposit their load of inward traffic and then closing again grasp a batch of outward messages and convey them to the desired position.

Immediately underneath the vertical tiers of tablets, and below the level of the platform, are receiving channels in which run endless flat rubber band conveyors about 10 inches wide. The incoming telegrams on being released at the platform tiers drop into one of these channels whence they are conveyed to a main band carrier placed centrally and running underneath the platform to a central position at the check table. This main conveyor is larger than its tributaries, being 15 inches wide. Here the messages are collected by girl probationers and distributed amongst the check officers for circulation.

Running along one side of the check table, which is 20 feet long, are fixed eight nests of boxes each divided into 30 pigeon-holes or compartments. These compartments are open back and front, each corresponding with a given instrument table and labelled with the code names of the offices connected to that table. After being endorsed by the check officers, who are seated at the off side of the boxes, the telegrams are put in their appropriate compartments whence they are collected by girl probationers from the near or platform side and placed on the carrier for conveyance to their respective circuits. Fig. 6 represents an inside corner of the distributing station.

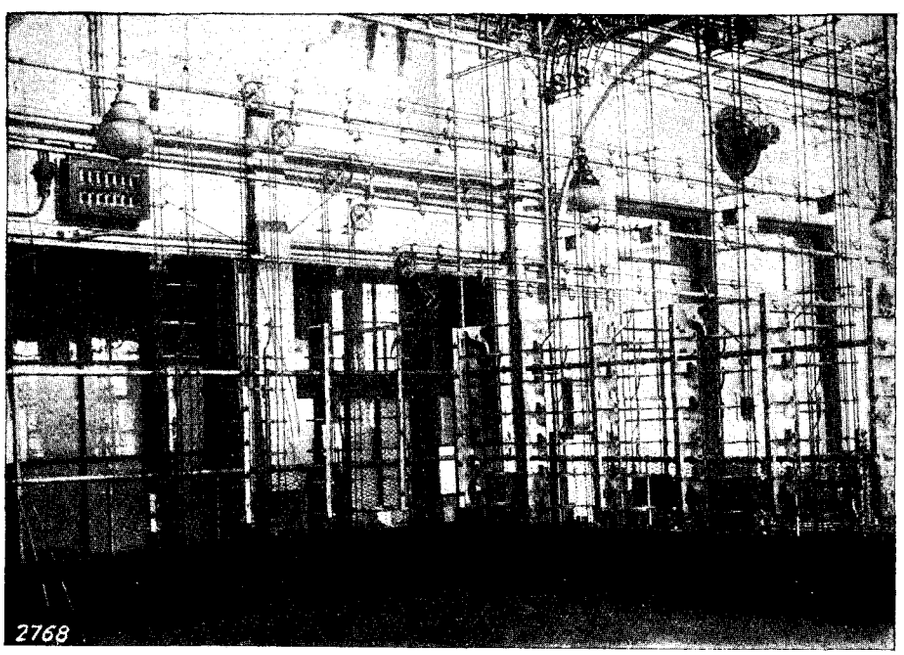


FIG. 6.
The Central Platform. An inside view of one corner.

DETAILS.

The force required to drive the Lamson pick-up carrier is roughly ¼ horse-power per 100 feet run, although this varies in proportion to the character of the line the number of fingers, and the twists and corners traversed. At Birmingham 8 horse-power is used, this being obtained from three electric motors placed underneath the central platform, whilst a fourth motor is engaged in driving the band conveyors. The total number of fingers in use is 153, the number on each track varying according to its length; and their travelling speed is at the rate of 200 feet per minute. The time taken to complete the longest journey out and home is 90 seconds, but as two fingers are employed for each instrument on the long tracks this gives a maximum clearance time of 45 seconds at the most distant circuit. Although the plant is not altogether silent in its working, there is less noise than might be expected from the motion of so much machinery—a matter for congratulation to its inventors and erectors. The installation, which occupied a period of seven months, was carried out by the Lamson Pneumatic Tube Co., Ltd., of 20, Cheapside, London, E.C., without any interruption to the work of the Post Office. The running hours are from 8 a.m. to 8.15 p.m. daily.

ADVANTAGES OF THE CARRIER.

The advantages possessed by the mechanical carrier as compared with the human system consist principally in its regulation of the flow of messages from and to the circuit, and its power to collect and distribute a large volume of traffic with the minimum of delay. Telegrams do not lie in the message baskets waiting collection for indefinite periods as under the manual system; on the contrary forms are invariably collected singly and almost immediately they are placed on the despatching shelf at the instrument, and with equal facility they are distributed to their forwarding point from the central check. Divisional or sectional checks are obviated, thus reducing the number of handlings. The carrier attendants are able to deal with more traffic individually than was possible under the old arrangement, consequently a saving of messenger force is effected. But how far this saving is counterbalanced by the cost of installation and maintenance cannot at present be determined. Supervision is also more effective inasmuch as the staff of attendants and check officers are located in one central area, consequently loitering and the congregation of messengers at various parts of the instrument room is prevented. In addition, the responsibility of sectional officers and telegraphists in connexion with the clearance of message cages is lessened; the former is thus able to devote himself more closely to the control of his division and the latter suffers less disturbance in his work.

The time occupied in circulation from one point to another depends of course mainly on the celerity with which the traffic is dealt with at the check. This varies according to the experience of the staff employed, to the references necessary in cases of unknown places and to the pressure of work. Cutting out these slowing-down factors, messages can and often do reach the forwarding circuit within 90 seconds of their receipt. Under normal working conditions, however, the transmitted traffic at Birmingham, which is seldom or never less than 17,000 telegrams a day, is circulated from point to point by means of the Lamson pick-up carrier with not more than an average delay of five minutes. In addition to the transmitted work, the received traffic, averaging over 2,500 telegrams a day, is conveyed by the carrier to the check table, where it is separated from other work and transferred by hand to the adjoining addressing table, and about 1,500 forwarded telegrams are conveyed from the check to the instruments.

ITS DISADVANTAGES.

Beyond the fact that an installation of this description renders visual supervision less effective and prevents free access to the apparatus for adjustment and changing purposes, the disadvantages of the pick-up carrier itself are few. The only one of serious import is the liability of messages to become mutilated during transit round corners. Such cases, however, form an exceedingly small percentage of the telegrams carried, and are mainly due to the manner in which the forms are placed on the despatching shelves or to the spring operating the fingers becoming weakened and allowing the message to drag.

THE CLOSED CIRCUIT TROUBLE.

A difficulty which presented itself when the system was inaugurated was the problem of closed circuits. Commencing at 2 p.m., and continuing throughout the afternoon, circuits are concentrated hourly, the corresponding sets being closed and disconnected and the staff withdrawn. It is just at this point that the disadvantage of a purely mechanical contrivance manifests itself; it lacks intelligence and continues to deposit messages unobtrusively at a deserted point should the fact that the circuit is closed be overlooked at the check, which is very likely to happen at a time when these changes are constantly taking place. Consequently cases of individual delay arise with resulting annoyance to sectional officers. The difficulty has, however, been largely overcome by the provision of a small brass clip bearing the word "closed" on its face. When the clip is hooked on to the despatching tablet at the central platform messages cannot be placed thereon. A list is provided showing the closing and opening hours of all circuits, and the distributing staff themselves place these "closed" labels on the various stations at the proper times, the circulating officer being responsible for seeing that this is done. Where possible it is also arranged that the whole of the circuits on a table shall close at, or nearly at, the same time, and the running of the carrier for that particular table is then stopped. Several tracks are thus closed at 5 p.m. This also effects an economy in motor power and wear and tear, as the wasteful method of keeping half a dozen lines running with perhaps only one instrument served by each is avoided.

BAND CONVEYOR AND CHECK DEFECTS.

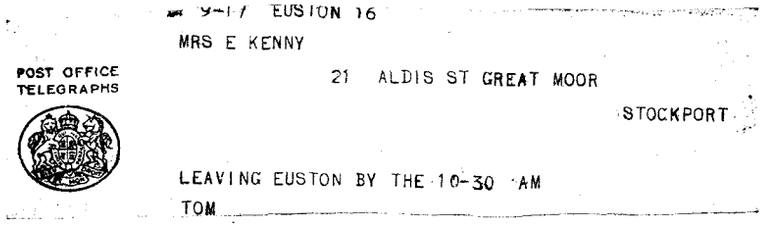
A notable disadvantage and one that gave real cause for concern to the Birmingham authorities at the commencement, was the trouble experienced in connexion with the band conveyors. Messages were often defaced, arrested for lengthy periods, and in some instances lost altogether during transit along the bands from the vertical tiers to the check table. This was undoubtedly a most serious defect whilst it existed, but fortunately the Post Office Engineering Branch, by whom the whole of the platform and conveyors were installed, have since largely overcome the difficulty, and losses from these causes are now of comparatively rare occurrence.

Experience has also proved the unwisdom of allowing the whole of the traffic to be delivered at one point on the check table, since this produces congestion and prevents a quick distribution of the work. Moreover, in the original lay-out of the platform, possibly through lack of space, no provision seems to have been made for expansion of the check table, with the result that in times of pressure there is not sufficient room to employ extra staff to cope adequately with the work.

These faults are, however, largely of local origin, having been brought to light during actual working of the apparatus, and need not obtain in the case of similar installations at other offices.

THE CARRIER A SUCCESS.

In conclusion we venture to state that the Lamson pick-up carrier is the most successful mechanical appliance yet introduced into the Post Office Service for the collection and distribution of


9-17 EUSTON 16
MRS E KENNY
POST OFFICE TELEGRAPHS
21 ALDIS ST GREAT MOOR
STOCKPORT
LEAVING EUSTON BY THE 10-30 AM
TOM

The first message delivered in Manchester printed by the Western Electric machine.

telegram forms, and its advantages over the human system are very manifest. In our opinion its installation at other large telegraph offices is merely a matter of time and adaptation, for the trial on an extensive scale at Birmingham has not only demonstrated its utility as a time-saver and eliminator of manual labour, but has also revealed its potentialities in the direction of order and system.

WITH THE EXPEDITIONARY FORCE.

BY LIEUT. A. A. JAYNE, R.E.

No. V.

I SHOULD imagine that one of the most nerve-racking posts in the Army serving here is that of the Brigade Section Officer and his men. Imagine areas immediately behind our trenches swept by rifle fire, "Jack Johnsons" and shrapnel and the feelings of the officer and his linemen whose duty it is at any hour of the day or night to go through and repair lines passing to the trenches. To be a passive target in an open field and at the same time make a good joint in a wire is surely a good test of courage. Naturally in such circumstances a break in a wire is not an infrequent occurrence.

From the Brigade Headquarters to the trenches, or wherever the battalion headquarters may be, cables are at first laid out on the ground. This where possible is done at night, cable D5 gauge being used. Afterwards they are lifted on to "sticks."

It is not at all an easy matter to lay cable during the night, as may be supposed. There are small woods, undulations in the land, ditches and dykes to negotiate; men being relieved from the trenches and others passing along to effect the reliefs, ration parties, and other difficulties have to be contended with. During this first stage of communicating with the trenches the cable is pegged down to the ground. Obviously it must lie evenly on the ground everywhere or someone may trip up and break it. When roads are crossed the cable must be raised at least 15 feet—soldiers going to their posts in the dark often use the cable as a guide or they inadvertently walk into a pole at a crossing—in both cases some derangement of the line frequently takes place. After a time troops learn to avoid the cable, and similarly, when it is known what tracks are being used, the cable is raised on poles and moved out of the way. Often during the night the linemen have to grope along to trace and repair a fault caused by shell fire.

The part played by the Telegraph and Telephone Departments of the Post Office in this war will I suppose never be fully known. In almost every infantry battalion there are some men serving and fighting who during peace times and whilst on the reserve follow the vocation of Post Office linemen, mechanics, &c. These men are invaluable, and their experience in maintaining and working lines is readily utilised. Then there are the Divisional Companies, known as the Signal Companies, consisting in the main of Royal Engineers proper. In these units are the reservists and specially enlisted men who come to the Army from the Post Office with expert knowledge and practical experience. The work of the regular Royal Engineers is splendid, and their skill and enthusiasm coupled with that of the Post Office men, with whom they work in the closest friendship and co-operation, is beyond all praise.

The cable used in the foregoing circumstances is for telephone purposes, and the sets used are Telephones Portable D, mark III. In practice, however, it is found necessary to use the buzzer, and seeing that lines run out from the Brigade Headquarters to each Battalion Headquarters, a good deal of skill is required to read your own buzzer, owing to a certain amount of electrical induction.

Along the trenches telephonic communication is usual. Here the telephone operators often find themselves in tight corners owing to the ups and downs of the fighting, and if a trench has to be vacated the telephone man is not by any means the first out, as the last thing he thinks of is to leave his speaking set behind.

A Divisional Signal Company consists of headquarters and four sections. No. 1 Section consists of three cable detachments and these connect from divisions to each of the three brigades. The remaining three sections called Brigade Sections communicate with the battalions in each brigade. The work of the last mentioned sections is to communicate with the trenches or wherever the battalions may be. Each Brigade Section has two telephone detachments and eight Despatch Rider Cyclists. The telephone detachments have a pack mule or pony which carries about three miles of cable. The work of communicating with the trenches has been briefly described above.

No. 1 Section of the Divisional Signal Company marches with

the brigade when they are on the move, and communication with the division is kept up by means of the cable which is continually run out, often on to the side of the road. There is no occasion to point out the difficulties this section has to contend with, as most readers will have gained some idea of the conditions prevailing. When, however, the various headquarters remain stationary, any permanent lines that may be running along the route are utilised. This is easily accomplished because it is known that only the enemy is in front, and therefore no inconvenience will be occasioned to people that matter by cutting and terminating the wires. Of course it frequently happens that there are no permanent wires along the road and then cables on poles are used. The number of poles carried by a section is limited, and hop poles and props are borrowed or bought from farmers and others. Suitable sticks are also cut from hedges, &c., and the art of wood cutting comes into its own. From Divisional Headquarters to Brigades buzzers are worked, but on the lines to Corps Headquarters single current sounder sets are now being used.

The Corps Headquarter Signal Company is responsible for communications to Divisional Headquarters. At present there are some permanent lines that can be utilised, at any rate for a part of the way, but I may say that the wires available are very often in a great tangle. For instance, along some roads leading from Corps Headquarters the wires are fairly straightforward, being erected on house standards. On leaving the houses one often finds some of the wires cut and hanging down in a confused mass. Then from a pole before the break there will be a wire running off sharp at right angles and evidently left by a brigade or division. Then what with several bridgings and bunches it will be seen that much patience and care is required to find the wires wanted. The only thing to do is to test, sort and label very carefully and distinctly. Pole diagrams at each end and at any other point should be kept punctiliously, or sooner or later you will be "let down." The lineman must be a good climber—he usually is—for in small villages ladders are not to be obtained at any price. On one occasion the lineman wanted to get at a house bracket to remove an earth fault. Permission had to be obtained from the residents for him to get out of a small bedroom window. He then had to put his foot on a rain pipe from which he had to stretch to the bracket and hang on. If the permanent lines do not run close up to the required headquarters, a cable extension must be made.

The easiest course to pursue for Divisional Signals, when they know where they are going, is to get in touch with their Corps Signals. Find out as much as possible about existing communications and what others there are available, and lay plans accordingly. A good knowledge of French is very useful for negotiations between the French and Belgian telegraph authorities.

By the way, from the Army Headquarters to the Corps, where there is frequently very heavy traffic, we have converted the Second Class Office baseboard set to duplex. The capacity on such lines is negligible, and the insertion of a rheostat for the compensation circuit acts splendidly. This is a great improvement on the cumbersome and somewhat complicated First Class Office set. All that is necessary is to move the sounder from the baseboard for the convenience of the receiving telegraphist and in its place put the rheostat. This plan is very useful in the event of an alternative wire not being available.

Either the work of keeping up communication is so engrossing or the Signal Service get used to shot and shell; the fact remains that there is a profound coolness in all it does. On one occasion it was the duty of one section to proceed up a road across an open field and down another road, thence to connect with its headquarters. The cable wagon laid the cable down the first road and turned into the field and immediately became the centre of shell fire. The only thing to do was to clap on speed and pay out the cable. Away jolted the wagon and got across when the officer discovered that his small stock of poles had slipped off. "About turn and pick up poles." Again the area shelled was successfully done and they started down the next road. "Don't you go down that road," shouted a despatch rider, "Jack Johnsons are coming straight up the road like hailstones." "All right," said the officer," we will pay out under this ridge."

(To be continued.)

PSYCHOLOGY AND TELEGRAPHY—A NEW PSYCHOLOGICAL EXPLANATION OF "OPERATOR'S PARALYSIS."

BY REX D. MILES, *Tacoma.*

[This article which we reprint, abridged, from the *Telegraph and Telephone Age*, of New York, is interesting as indicating the difference between the American and British Morse practice. It refers, of course, to Morse sending with a local sounder.—EDITOR, "T & T. J."]

ONE of the most interesting phases of practical psychology is a study of its laws in connexion with the art of telegraphy. Telegraphy, though possibly a science from the viewpoint of the electrician, is an art from the viewpoint of the operator and from the viewpoint of the psychologist. Skilled telegraphy develops intricate connexions and associations between the visual, auditory and motor regions of the brain which no other profession develops to such a great extent. An understanding of these connexions and associations, and a study of the course of the nervous impulses called forth in telegraphing, both sending and receiving, is not only fascinating but invaluable, and operators taking up this study will find their work made easier for them by coming into a better understanding of the motor impulses and how best to direct them.

Probably the most important question in the relation of psychology to telegraphy is that of the cause of "operator's paralysis." Some time ago German psychologists announced that the cause of "writer's cramp" and "operator's paralysis" was due to a worn-out condition of the brain cells controlling the use of the muscles of the hand and wrist. Up to the time of this announcement it was believed that the trouble was purely a local cramped condition of the muscles, resulting from long-continued use. No one has ever, until now, advanced any hope to any one suffering from this condition, and the usual method pursued has been to give up hand sending and use an automatic dot sending machine.

The writer, himself an operator, has for the past year been engaged in a study of psychology, especially in relation to telegraphy, and has reached a new conclusion as to the cause of operator's paralysis. The conclusion being correct, relief from that condition can quickly and certainly be obtained by an observance of psychological laws.

The conclusion, briefly summed up, is this: the cramped and strained condition of the muscles is caused by confliction between conscious and sub-conscious motor impulses. Conscious impulses call for a slower rate of sending than sub-conscious, consequently if there is a conflict the muscles are unable to obey either impulse satisfactorily, and a strained condition results which, if persisted in, leads to cramps and pains in the arm and hand, which eventually become permanent. How the confliction arises will be shown later.

By conscious impulse is meant the directing of each separate move of the hand with the thinking, conscious mind, and by sub-conscious is meant the free and easy, steady impulse, having its seat in the visual and auditory regions of the brain, which directs the hand automatically, so to speak, while the conscious mind thinks only of the matter to be sent and pays no attention to the hand. The path of the sub-conscious impulse is from the visual region to the auditory region through associatory cells, thence to the motor region, thence to the muscles of the hand and wrist. The path of the conscious impulse is from the visual region to the conscious mind, thence to the motor region, thence to the muscles, without the guidance of the auditory cells.

In skilled sub-conscious sending it is possible for the mind to be thinking of some extraneous matter and at the same time pay close attention to the work in hand, as the eye and the ear guide the hand automatically through permanent connexions between brain cells which have been established in training. There must always be present, however, a conscious desire or will to transmit the matter being read or thought of to be sent, which desire or will constitutes the motive force of the sub-conscious impulse, and which controls the speed at which the matter is transmitted.

In sub-conscious sending, therefore, we have a steady, unbroken impulse, while in conscious sending we have broken impulses, each move of the hand calling for a new impulse from the thinking mind. In learning to send, conscious impulses are used entirely until such a time as training has developed a path for the sub-conscious impulse, when a marked degree of improvement is noted.

The psychological law explaining this is that in learning to send it is the auditory cells which are trained (by hearing on the sounder the result of the movement made by the hand) and not the motor cells, except that the motor cells are trained to obey the guidance of the auditory cells in directing the movements of the hand. Thus, if the letter " A " is thought of to be sent, the impulse goes to the auditory cells as the letter " A," and reaches the motor cells in terms of the movements necessary for the hand to make on the key to reproduce on the sounder the sound image of the letter " A." It matters little whether or not the hand is actually on the key. The movement made will be registered in the conscious mind as having the sound of the letter " A " whether or not the sound is actually heard.

But if the letter " A " is thought of in the conscious mind and translated into one dot and one dash, two distinct impulses are sent from the conscious mind to the motor cells, the first requiring the movement necessary to form a dot, the second requiring the movement necessary to form a dash, and the movements made are registered as movements and not as having the sound of " A."

It follows that if a word, or several words, are read to be sent, or thought of to be sent, one sub-conscious impulse is all that is required to transmit them, and the secret of easy sending is to keep one sub-conscious impulse going as long as possible, and keep it supplied with words to form into sound images.

To illustrate how the conflict between the conscious and the sub-conscious impulses arises after an operator has reached a high degree of efficiency, let us take a first-class sender and assign him to eight hours' sending per day on a poor circuit. Say a single wire, 500 miles in length with a bad escape, through one set of repeaters with a " cranky " receiver at the other end.

To begin with " the stuff drops out." The receiver complains and the repeater chief is called in. The repeaters are adjusted, but still the matter drops out and comes badly. The sender starts again to do the best he can under the circumstances. He begins to send heavier and more firmly, and every time the receiver breaks he puts forth more effort to make his sending carry through. After two or three hours of this sort of thing his arm becomes tired and it requires more of an effort to send. The greater the effort to send the greater the attention paid to the hand, and by the end of the day the sender has lapsed into conscious sending and is directing each move of the hand separately, and chances are he notices a slight pain in his wrist. The next day he starts in again sending sub-consciously, but if the performance of the first day is repeated, greater effort is called forth and more and more attention is paid to the movements of the hand. It would be all right if the sender could entirely do away with the sub-conscious impulses for the time being and send at a slower rate, using conscious impulses, but this is impossible. He may send one, or two, or three words consciously, then his mind will be momentarily taken from his hand and he will send several words sub-consciously. And even when he is directing the hand consciously the sub-conscious impulse is present, conflicting with the conscious impulse.

It is self-evident that if he experiences the same sort of thing day after day for any length of time, the cramps and pains will become worse each day and finally result in a permanent cramp which cannot be relieved by a night's rest.

It is possible for the same condition to result from merely sending eight or ten hours a day on a first-class circuit. After about six or seven hours sending, the hand itself and the brain cells controlling it become fatigued, and it requires greater effort to send against this handicap. This also results in paying too much attention to the hand, which eventually causes a lapse to conscious sending and the attendant confliction between impulses.

Sending operators who are troubled with the cramp occasionally, as well as those suffering from a cramp of long standing, should observe the following rules when sending becomes difficult and when the cramp makes itself felt.

Concentrate the mind on the sounder, forgetting all about the hand, and think of the letters and words to be sent in terms of sound images, the way they sound on the wire, and not in terms of the movements necessary to send them.

The ear, listening to the sounder, acts as a guide to the sub-conscious impulse in sending Morse, just as the eye, watching the point of the pen, acts as a guide to the sub-conscious impulse in writing.

If it is found impossible to forget all about the hand, the sender should endeavour to think deeply about some extraneous matter at the same time he pays strict attention to the copy. If this does not bring results the sender should resort to the law of suggestion and think strongly to himself: " I am a perfect sender. I listen to the sounder, and the sounder guides my hand. I am a perfect sender." Such auto-suggestion not only helps to concentrate the mind on the guidance of the sounder, but displaces any fear which may be present, and restores self-confidence, which is in itself an important factor in telegraphy.

The presence of fear and the lack of self-confidence reduces the strength of the motive force of the motor impulse, as is evidenced very often by pugilists whose blows lack strength because their opponent has them " scared."

It will be found that as soon as perfect sub-conscious sending has been recovered the cramps and pains will disappear, leaving the arm free and easy, and the only feeling in the arm after a hard day's work will be that of natural fatigue. The probable physiological explanation of this fact is that the confliction of nervous impulses tends to impede the circulation of the blood through the minute blood vessels of the muscles, while the free and easy sub-conscious impulse tends to accelerate it.

A contributing cause to the condition known as " operator's paralysis " is sending for some length of time with the key improperly adjusted. If the spring is too strong the force of the motor impulse is raised to above normal; if the spring is too weak the motor impulse force is lowered to below normal. In either case it requires more effort to send (either to push the key down or to hold the hand up), and if the condition is persisted in for a long period it results in directing conscious attention to the hand, which we have seen causes a lapse to conscious sending and the attendant confliction between impulses.

Every operator knows how to adjust a key and knows how he wants it adjusted, but the following psychological explanation of the proper adjustment of the key will perhaps be of interest to the telegraph profession, especially to those operators who are now struggling with the first symptoms of the cramp.

Two things regulate the force of the motor impulse in telegraph sending, first, the firmness with which the sounder closes, and second, the resistance offered to the muscles by the spring in the key.

The force of the impulse varies inversely with the force with which the sounder closes and conversely with the resistance offered by the spring.

To illustrate this, go to a single wire, adjust the key spring to a medium resistance and pull the relay way up, then send for a few moments. It will be found that the sounder closes imperfectly and a strong motor impulse is sent to the hand. Then turn the relay way down and send for a few moments. It will be found that the sounder closes strongly and firmly and that a weak impulse is sent to the hand. The stronger the impulse to the hand the harder it is to do the work, and *vice versa*, which explains why a single wire " feels " heavy or light according to the strength of current in the main line.

The spring in the key should be used merely as a compensation spring. If the sounder closes so strongly that the resulting motor impulse is too light for comfort, the compensation spring should be adjusted until its resistance to the muscles calls forth a stronger impulse. If the sounder closes imperfectly the resulting motor impulse will be strong, and the compensation spring should be adjusted lightly, otherwise the motor impulse will be stronger than necessary.

To secure the proper adjustment of the key, either on a single wire or on a duplex, the following rule should be observed.

Send for a few moments on the key as it is. If the hand feels heavy the spring is too light; if the hand feels light the spring is too strong. In either case the spring should be adjusted until the resistance offered by the spring is equal to what appears to be the weight of the hand when sending. The resulting motor impulse force may be considered as "normal," and this force should never be increased or decreased with the conscious mind for any length of time. If the signals drop out at the distant end, adopt a slower rate of sending. If this does not avail, adjust the sounder until it closes imperfectly. This will result in a natural increase in the motor impulse force, insuring a firmer contact without the use of effort as defined.

It is now possible to explain psychologically why the operation of the sending machine becomes easier the heavier the signals are transmitted, if it is not already evident to the reader.

When the weights and contact points are readjusted to send heavier, the sounder closes stronger, and a lower motor impulse force is sent to the hand, making the work easier.

When sending heavier with the Morse key, however, the sounder closes strongly, which calls for a weak impulse, but in order to send heavier with the Morse key the motor impulse force must be increased with the conscious mind, and there we have another conflict in impulses between the strong conscious impulse and the weak sub-conscious impulse, which directs conscious attention to the hand, resulting in a lapse to conscious directing of the character of the movements and the attendant conflict between the slow impulse from the conscious mind to the motor cells direct, and the fast sub-conscious impulse from the visual cells to the auditory cells, thence to the motor cells, which last conflict causes poor muscular work and eventually causes "operator's paralysis."

TELEPHONE CANVASSING RESULTS FOR THE SIX MONTHS ENDED JAN. 31, 1915 AND 1914.

TOTAL NEW TELEPHONE STATIONS OBTAINED.

	1915.	1914.		
London	11,809	15,700	Decrease of	3,891
Provinces... ...	19,830	27,815	,,	7,985
United Kingdom...	31,639	43,515	,,	11,876 = 27 %

CESSATIONS (*i.e.*, Recovery Orders issued).

	1915.	1914.		
London	12,305	8,111	Increase of	4,194
Provinces... ...	14,459	13,242	,,	1,217
United Kingdom...	26,764	21,353	,,	5,411 = 25 %

NET ADDITIONS TO TELEPHONE STATIONS.

	1915.	1914.		
London	*496* (*dec.*)	7,589	Decrease of	8,085
Provinces... ...	5,371	14,573	,,	9,202
United Kingdom...	4,875	22,162	,,	17,287 = 78 %

Note.—For purposes of comparison it has been necessary to add to the 1914 figure one week's results to make the two periods represent an equal number of weeks (*i.e.*, 27 weeks).

It will be seen from the above that despite the large number of cessations there has been a net gain of 4,875 stations during the period under review, without taking into account some 4,000 new stations provided for naval and military requirements

IMAGINATION.

BY MABEL B. PYNE (*Purley Exchange*).

I THINK it will be admitted readily that imagination in business is one of the strongest aids to success, and, like everything else, it can be divided into two parts—the true and the false. True imagination sees the whole of things exactly as they are, no better, no worse, in exact proportion and precise detail; whilst the false kind is that which enables its unhappy possessors to see things just as they themselves wish them to be seen, and frequently with additions which do not exist at *all*; such a quality is usually described as a "vivid imagination," whereas in reality it is a weak one. Or again, to describe it in everyday language, this is called seeing things in the minds' eye—a good practice, so long as the eye is not allowed to squint. I wonder how much imagination the dear old lady possessed who recently made a shirt of nainsook for the troops at the front, with a 13-inch collar and a frill down the front.

The outcome of imagination is that it enables one to grasp the whole in an instant, and having this mental picture it is easy to see whether it is in correct proportion, for most decidedly things must be in proportion to be in harmony and so complete a perfect picture. Reason will determine the proportions of the picture.

And it will be recognised that constantly to keep one's mind in harmony with the true scheme of things shows the great artist—decidedly greater than one who is seized with a few beautiful thoughts and immediately puts them on paper for all the world to admire—for a person of imagination must always preserve the whole in harmony at whatever cost to himself. I think I am right in saying this applies always and to everything; for having in mind the whole as it should be, it would positively hurt to spoil it.

Perhaps my meaning would be more clear if I gave an illustration. Suppose one of us went to a shop to buy a hat; we should not choose a hat just because it looked charming in the front, or stylish from the back or side view. No! we should take the hat *in our hand, hold it out in front and try to imagine the effect of* the whole when worn. Then we should try it on.

This seems to me the correct attitude to take in everything—to get outside and then imagine the effect of the whole when in use. We all know how easy it is to fall into the habit of judging events or incidents according to the appeal they make to our particular nature; and to avoid this we must get quite out of ourselves.

Imagination is greatly needed in the everyday routine of a telephonist, for there is something wonderful in the thought that on every position each pair of cords may represent commerce, comedy, tragedy or a transaction decidedly "of the earth earthy," and the actors are, as it were, suspended on the end of each cord—the operator pulls the strings—and so the world wags on.

Then think for a moment of the poor results of the telephonist who can only see as far as the seventeen pairs of cords in front of her, and compare her work with that of another who tries to realise things from the subscriber's point of view as well. In this respect I think some supervisors are to blame for not enlarging the operator's outlook. Many must be able to speak from experience and remember that when they were operators and did not fully understand some instruction, they have asked for information and have only been partly convinced, because the answer only gave things from an operator's standpoint. They will surely have made it a practice since to answer any queries first from the subscriber's or the Controller's Office point of view and then according to the way in which it should be treated by the telephonist. This widens the operator's interest in her work, and helps to prevent her from becoming "groovy"; although, sad to say, there are some people who seem quite satisfied and do not wish to be shifted out of their one particular little groove, and if such people should read—surely by mistake—some very imaginative book such as are written by Jules Verne, or the best of Rider Haggard's works, it is quite safe to foretell they will lay it down in disgust and say it is too "far-fetched." They cannot see that it is good exercise for their mentality, provided their reason is sufficiently strong to stand the strain.

Another point I should like to mention is the difference between theory and practice; this surely is nowhere more noticeable than in telephony. Can anyone explain the difference? The only explanation I can think of lies in the example of the old-fashioned sums that used to vex us in our schooldays—if 6 men could reap a field in 4 days, how long would 12 men take to do the same work? But does the answer seem really practical? Could it be imagined of the British workman?

This difference between real practical experience and the proof of figures can be carried largely into the life of a telephone exchange, where statistics play such an important part.

It has been said that there are three kinds of lies—black lies, white lies and statistics. I leave this statement to you. I do not uphold it, for it has also been said that a lie has no legs; it has nothing to stand upon, it has to be propped up. But statistics can manage to support themselves and are useful as an indication of the law of average that runs through all things; but as an average their use ends, and imagination developed by experience should supply the rest.

It is not good always to see through the spectacles of statistics; the vision is not clear enough. Take, for instance, the figures shown in the summary of observations or service inspectors' tests as the case may be. It is impossible for these figures to represent a true criterion of the service, on account of the small proportion taken.

First, I will meet the figures on their own ground. In Purley an average of 40,000 calls per month are dealt with, and the service figures are based on about 50 calls; this means that the whole service is judged on .001 calls! Poor feeble little figure! Cover him up quickly.

No! imagination tells us, that apart from all the proofs in the world in the way of figures, in her inmost heart each operator and supervisor knows unmistakably whether the small portion of the service for which she is responsible is good.

But to return to the statistical point of view, I think the nearest approach to the real service given in each district would be a summary of the month composed of the observations or service inspectors' tests, the total number of written and verbal complaints shown in detail, together with the number of subscribers' lines. These figures published on the same sheet of paper would be interesting, I venture to think, for the reason that it would include public opinion on the matter.

In saying this I quite realise that the Department aim at giving a standard service, and the public have still to be educated in matters telephonic, but the disadvantage under which we labour, compared with model America, is the fact that the American public want to be educated, but the British public does not.

Here I should like to mention that it seems to me curious that one important feature in operating has never to my knowledge been mentioned. I allude to the actual sequence in which an operator deals with the various classes of calls; she cannot pick and choose which call she may take first, she cannot even arrange the calls as she would like. Take, for instance, the case of an operator who is unfortunate enough to have three money-box calls in succession. They may be the only calls on her position, but she will be hung up for quite 30 seconds; whereas an operator who take three local calls in succession is immediately free to take the fourth call. It also makes the greatest difference in her overlapping operations. This, perhaps, applies more to outer London exchanges where the working is slower and there is more ticketing to be done.

Of course at the end of the day there will be the average number of the various classes of calls, but that does not alter the fact that the succession in which the calls crop up makes a great difference to the quantity of work an operator performs during the day.

I am quite sure every telephonist remembers mornings when she has slogged into the work and practically every demand has been either ineffective or it has been obstinate and absolutely refused to go through without the additional urging to "ring on" or "change junctions"; and an operator who comes out smiling at the end of such a morning deserves, in my opinion at least, the D.S.O.

Then, again, I am sure each operator will also recollect other mornings when the cords seem scarcely to have been touched, and yet the calls have gone through like a dream. Of course, I shall be told this is the same in every duty, and I quite agree, but according to statistics an operator's work should never vary; she should always take the same load.

The word "load" is odious to my mind. Whenever I hear it or "team" mentioned, a little shiver runs all over me, and I immediately conjure a vision of a yoke of oxen. Can anyone tell me why terms synonymous of cattle are used? Imagination was surely wanting when telephone terminology was decided, else, again, why such an ugly clumsy word as "order-wire?" The original "call-wire" was easier to say and sounded more brisk and businesslike; and "order-wire key" is worse still, for the simple reason the key is not a key as we know it, but a small round knob.

We have all heard it said, and it is generally understood, that women make better telephonists than men, I believe because they are more conscientious in details; I venture to add it is simply because a woman may have a mind above it.

A well-known writer—E. F. Benson—in one of his books has given the idea of a telephonist's duty rather well. The heroine of the book is an energetic and vivacious society woman, and she has three telephones fitted to her house so that she could talk to all her friends at the same time, but she forgot she had only two ears. She goes on to say she ought to have been one of the young women at the exchange; how they must feel in "the swim," they are the centre of everyone who wants to talk to everyone else.

THE TELEPHONE IN AUSTRIA.

Electrical Industries publishes an interesting article on "Twenty-five Years of State Telephones in Austria." The Government monopoly dates from 1893 (Vienna 1895). In 1895 there were 8,723 telephones in provincial towns and 8,196 in Vienna, or 16,919 in all; at the end of 1913 there were 142,625 telephones. In the same period the length of subscribers' lines increased from 40,400 miles to 269,000, and the number of exchanges from 118 to 1,576. The development as regards exchanges, stations, trunk lines and number of conversations has more than doubled in the last five years, but Austria is still far from advanced in this direction, the proportion of telephones to inhabitants, for instance, being only 5 per 1,000. The figures exhibited of th development of the large towns do not agree with the official figures; but telephone statistics, we know by sad experience, are both elusive and illusive, the omission or inclusion of official lines, &c., and the adoption of different boundaries, often making a considerable difference in the total:—

	Official figures (January, 1914).	Figures quoted in the article.
Vienna	64,438	62,320
Prague	10,310	31,243
Triest	5,324	—
Brünn	4,063	—
Lemberg	3,880	11,478
Graz	3,144	3,660

The enormous disparity between the two sets of figures for Prague may possibly be explained by the inclusion (very properly) of Smichov, Ziskov and other large suburbs with that city in the second column. Whether the same explanation would apply to Lemberg we do not know. Lemberg, at least, has little interest for Austrians at the present moment.

GUERNSEY STATES TELEPHONE DEPARTMENT.

The balance sheet for the year ended Dec. 31, 1914, shows that the total number of stations has increased from 2,100 to 2,162. The revenue amounted to £7,530, and the expenses (including £2,065 in respect of the depreciation and sinking fund accounts) to £6,761, thus leaving a net profit for the year of £769.

The
Telegraph and Telephone Journal.

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

Editing and Organising Committee - - { MR. JOHN LEE. MR. J. W. WISSENDEN.

Managing Editor - - MR. W. H. GUNSTON.

NOTICES.

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

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THE EFFECT OF THE WAR ON TELEPHONE DEVELOPMENT.

IN our February issue we quoted a newspaper report to the effect that there had been a very heavy falling off in the number of telephone subscribers in Germany—10,000 cessations are said to have taken effect in Berlin in October alone—and promised some figures showing the incidence of the war on our own telephone development. We give in another column a comparative statement of the canvassing results for the last six months of 1914 and 1915, which properly considered is highly satisfactory. The watchword "Business as Usual," of which we have heard much, can hardly be considered as a counsel of perfection from the national point of view, for obviously two or three million men cannot serve with the colours and pursue their ordinary avocations at the same time; nor must we omit to take into account the other millions engaged in work ancillary to the great military and naval preparations which have been and are still going on. Such work must necessarily involve some dislocation of ordinary business life and show its effect on the development of a business accessory such as the telephone. Even America, a non-belligerent and probably the most remote from the direct influence of the war of any of the great telephone using countries, has felt its effects. We see from *Telephony* that the Bell system in 1914 showed the smallest gain for several years, viz., 467,000 stations or an increase of 5.7 per cent., as against 676,000 in 1914, an increase of 9 per cent. on the preceding year.

The more reasonable ideal of maintaining business at the highest level, compatible with the crisis through which Europe is passing, has been well achieved in this country, and the figures to which we draw attention show that the Telephone Administration has satisfactorily borne its part in this achievement. Not only has the number of telephones in the country not decreased, but it has been added to by some 5,000 during these stormy six months. The increase in new stations is 31,639, or 27 per cent. less than that for the corresponding period ended January, 1914, the decrease through stations ceased is 26,764, or 25 per cent. more than last year; and the net difference between the two periods is 17,287 stations, that is to say that the net increase for the six months is 78 per cent. less than the increase in the corresponding period last year. The actual net total of new stations, after deducting "ceasements," is therefore 4,875, to which should be added some 4,000 military telephones not included in the table. It will be seen that the number of stations in London has gone back by 496, but this is counterbalanced by the net increase in the provinces of 5,371. Blackburn and Cork showed an actual net gain in new stations of 7 and 11 respectively as compared with the latter half of 1914, and in every provincial centre with the exception of Southampton the number of new stations has exceeded that of the stations ceased. These figures, which include the disconnected lines of alien enemies, are on the whole rather remarkable when it is considered the disturbing effect which the war must have had on many trades and professions, an effect which has reacted on the incomes of private persons. We shall look forward with especial interest to the figures for the six months ending on June 30 next.

DOCTORS AND THE TELEPHONE.

A RECENT number of *The Hospital* refers to a case in which a medical practitioner ordered by telephone the preparation of a solution of eserine sulphate, and the dispenser, mistaking the figures, made the solution too strong, with tragic results. Apparently assuming that no blame attaches to the druggist for want of knowledge of the quantities of the drug which might safely be administered, *The Hospital* thinks that the moral is an obvious one, and hopes that the medical profession will adopt a rule against the practice of prescribing and ordering medicines by telephone. In view of the known difficulty of distinguishing the sounds of certain numerals by telephone—to obviate which careful rules have to be laid down in the operating instructions of telephone administrations all over the world—and of the important part which quantities necessarily play in the compounding of medicaments, we think the advice of *The Hospital*, at least in the case of poisons or deleterious drugs, is sound. That journal, however, goes on to deal with the larger and much vexed question of telephone etiquette. Now, although the telephone has been with us for nearly 40 years, the laws of telephone etiquette are still imperfectly understood, and people desire and expect a promptitude of attention on the part of their telephone correspondents which they do not demand or receive in other modes of communication. The case of the doctor is no whit different from that of any other citizen; his remedy is also the same as theirs—except in this, that a business man is not on his premises after business hours, while a doctor is generally at home when he is not paying his round of visits. A doctor should not be rung up out of consulting hours except in cases of emergency. If when he is rung up during those hours he should happen to be engaged, it is not reasonable to expect him to leave a patient to whom he may be attending in order to reply to the telephone.

We often read complaints in the Press that the man possessing a telephone is called up by a correspondent who expects that he shall neglect the business before him, the client perhaps to whom he is talking, to give immediate attention to some unimportant matter. The remedy is, we think, that most busy men have some clerk or other assistant who can answer the telephone and put off the enquirer with the reply that the principal is engaged. The telephone public must be taught that the etiquette of the telephone is the same as that of any other method of correspondence, that is to say: first come, first served—with some relaxation of the rule in favour of cases of special importance. They must learn not to expect preferential treatment by telephone, especially in trivial matters. The remedy is certainly not in the rule that no communication should be made by telephone which can possibly be made by letter. We think our Contract Departments would be prepared to argue in favour of a contrary course. The value of telephonic communication is not yet fully appreciated in this country, and doctors should be, and in general are, the first to encourage its use. The abuse of the telephone lies not in the frequency of its use but in the neglect of an etiquette which ordinary good sense will dictate. We are in full sympathy with our contemporary's strictures on the use of the telephone for prolonged conversations. This is one of the minor evils which a universal adoption of measured rates may tend to remedy.

A QUESTION OF LIKING.

THE sub-postmaster was a philosopher who wrote, when it was suggested that his sounder circuit should be substituted by a telephone, that he had grown to love the sounder and perhaps he would grow to like the telephone. Years ago he had a single needle, he said, and the tappings of the needle on the bones had become music to him. Then came the change to the Morse sounder. He hated the idea, but in time it grew to be quite tolerable and in the end the sounder came to be loved. In truth he hit upon a fundamental problem. Why is it that some forms of telegraph instrument are so attractive? Many of us have delighted in the Hughes. We have enjoyed the thrill of including bold combinations. We have enjoyed the opportunities which came for rattling off a sentence—an unofficial sentence—by the substitution of "K" for "C" and of "Q" for "O," if thereby we could squeeze in one combination the more. It may be that the days of Hughes are over, but none of us who spent our years at the piano keyboard can look back on them with anything but sorrowful longing. But it is questionable if any method of telegraphy has excelled the Morse sounder in its allurement. We could almost conjecture the temperament of the distant sender. We knew the eager young gentleman who rushed his dots; we knew the hardened experienced one who seemed to send so slowly but who pegged away and covered the ground, as one may say, even more rapidly; we knew the solid and heavy dots which, oddly enough, looked so much better on the slip than we expected, and we were led to conjecture the sterling character of the sender which was apt, just as his sending, to be misjudged.

A human business, indeed, is the telegraphy which depends upon manual skill in the formation of symbols. It has its mysteries, its affinities. We find this person a congenial co-worker; we like the sending—but we cannot explain why. Another sender comes and what a difference. The cold slip may show the dots and dashes to be perfect, but in spite of the evidence of the senses the spirit of the thing is worlds away. It is unsympathetic sending. It lacks some deep, temperamental bond. No mere science can elucidate the question, for it lies in the psychic realm. Some of our seniors, who take us back to the old "Magnetic" code, tell us of wondrous affinities in those days. The signals had a weird musical rhythm, and press messages could be telegraphed quite correctly with the suggestion of popular melodies running through the cadences of the rhythmic sounds. Perhaps the popular melodies of to-day would be less suited to telegraphic suggestion. At any rate there is little opportunity for the twin arts. But we can well believe that there are many "Magnetic" operators still among us who can close their eyes and hear the swinging antiphonals of the two bells, with some old melody running through. So, like our friend the sub-postmaster, we have grown to love these inanimate things, the telegraph instruments which have been our intimate companions for many years.

Perhaps, after all, our dread of change is only unreasoning in the sense that reason has little to do with it and the passing of old friends is necessarily sorrowful. The book-lover fondles his Kelmscott, with its hand-set type bold and clear; he reads but does not fondle the machine-made shilling edition. All the economics in the world will not touch his affections. So we can quite believe that there is a dread, a sentimental dread, in most of our hearts when changes come which substitute the large intricate machine for the smaller, individual, intimate device with which we have become so familiar that it has grown into our very being. Nor must these deep feelings be mentioned without infinite respect. They are the spirit of the craft. They belong to the inner realm of which, it is said, Englishmen are slow to speak. But because they are unseen and generally unrecognised their potency is none the less to be taken into account. "I have grown to love the sounder," said our friend, "perhaps I shall grow to like the telephone." Perhaps, too, many of us will substitute our love of that which is familiar for a liking—no one would ask more—of that which, as yet, is unfamiliar.

HIC ET UBIQUE.

The Electrician of March 19 does us the honour to say that the contents of our March issue are both varied and interesting, and proceeds to congratulate—not us, but the British Government on its production! The Editor is evidently not aware that our JOURNAL is not an official publication and is not the property of the Government. He seems rather cross because the artist who was responsible for our cover has inserted—quite unsuggested by us—a G.R. in the design, to which, however, in a journal written by and for Post Office men, we saw no sort of objection. *The Electrician* is quite correct in its assumption that no pressure is allowed to be put on advertisers. It is however hopelessly incorrect in its suggestion that we charge subscribers a sum of 1½*d.* for postage which we do not incur. On all copies of the JOURNAL sent to outside subscribers full postage is paid, as it is also on the monthly packets sent to our agents in the various post offices throughout the country. What apparently has led our contemporary into error is the fact that complimentary copies

are sent monthly by the Secretary of the Post Office to Foreign and Colonial Governments and to the leading newspapers (amongst which is included *The Electrician*). These copies being ordered and sent officially and not by the Editors of the JOURNAL are, of course, dispatched post free.

THE following report of a line out of order is one of the strangest ever received by the London Telephone Service. It is from a doctor and is written on an ordinary form of medical certificate :—

This is to certify that *S*—— 297, residing at *L*—— *House, D*——, is suffering from *Frost Bite* and is at present unable to follow *his* occupation.

Robert A. E. C——, *M.R.C.S., L.S.A.*

Nota Bene.—It is trusted that he will speedily recover.

WE print the following mare's nest from the *Daily Citizen* of Feb. 19 without further comment than to say that its probability is sufficiently condemned on internal evidence :—

To my story, told yesterday, of the manner in which the red tape of officialdom has survived the war I can now add another. An important official in the State Telephone Service had occasion to write a letter on behalf of his superior to the telephone authorities of a Scottish town, asking for particulars regarding certain work which was waiting to be put in hand. No reply, beyond the "I-am-commanded-to-acknowledge-receipt-of-your-letter-which-is-under-consideration" type, arrived for three weeks.

At the end of that time the official, who had practically forgotten the matter, happened to be in the Scottish town, and the telephone people there showed him the unanswered letter and explained that there was no one of sufficient standing in that office to reply to it without breaking at least seven departmental regulations. In that predicament, the visitor's advice, as a high officer, was asked. The latter thereupon sat down and, having secured the necessary information, answered the letter himself and addressed it to himself.

The result was that the projected work was completed in a week from that date. Had the official not chanced to be in Scotland and had he not answered his own letter, the work, if all the rules had been observed, would have been started some time in 1917, when a local officer would have acquired a certain seniority !

WE like the above picture—which we reproduce with due acknowledgments from *Telephony*—considerably. The operator of the humorist who reads novels, eats sweets and knits at the switchboard is a dear old friend whom we would not willingly part with. The irate lady at the telephone is probably a member of the American colony in London, for we doubt whether any Londoner either uses or understands the meaning of "Land sakes." So likewise is the policeman who refers to the supposed German as a "guy," which in America means not an effigy of Guy Fawkes as here, but simply a "chap" or "fellow."

WE all know persons who consider that a telephone service ought to be given to them at minimum rates although their premises are situated many miles from a telephone exchange. A gentleman of that class living in a delightful rural district of Kent recently wrote that, if he could not be given a line at minimum rates, then "it is no wonder that the Germans look with contempt upon us as a worn-out obsolete nation," and "if some better management than this cannot be arranged" he suggests "turning the whole Department over to a kindergarten."

Passing over the desire to get the best of both worlds a "*rus in urbe*" and an "*urbs in rure*," we have endeavoured to follow the mental gymnastics of the writer. We follow, and even agree, that a kindergarten might give him what the Post Office will not, because after all it would be child's play to do so, and not a business proposition ; but we confess with some misgivings that we cannot reconcile his statements. Apparently he agrees that we are a worn out and obsolete nation, a nation in its second childhood. His remedy is to revert to the first childhood, and the result he expects will be better management ! Moreover, recent events have shown that the "worn out and obsolete nation" is not yet prepared to resign in favour of the newer blood.

Apropos of our article on the Lamson carrier in the Birmingham telegraph office, we are informed that the Western Union Telegraph Company have "gone one better" in their New York office by adopting girls on roller skates for the distribution of telegrams from point to point. A film is travelling this country showing the ladies gliding gracefully about with a few telegrams in their hands. We imagine that these young ladies' official training must include instruction in the art of avoiding contact between their centre of gravity and the floor.

THE PROBLEM OF CRAMP.

IN an article in the American *Telegraph and Telephone Age*, which is reprinted in these columns, the occurrence of "operator's paralysis" was discussed from the point of view of psychology, and an explanation offered differing in some respects from that published in the report of the Departmental Committee in 1911. In the opinion of the contributor the muscular condition associated with telegraphists' cramp is due to a mental conflict arising between conscious and sub-conscious impulses. The circumstances which produce this disturbance are fatigue or repeated difficulty in securing reception. The automatism acquired by a competent telegraphist breaks down under the strain, and he falls back into the earlier stage of operating, when the movements of his fingers result from deliberate attention. If this experience has been repeated frequently the feeling of pain and cramp ensues, ending in confirmed disability.

As a remedy for the disease the victim is recommended to concentrate his mind on the sounder, forgetting all about the hand, with its appropriate movements, and to think of the letters and words to be sent in terms of sound images. A curious difference of opinion on this point is to be seen in the Committee's report, for the learner is expressly warned to avoid constant reference to his slip in the effort to gain accuracy of formation, as confidence will probably be hindered thereby.

Whether or not the Committee intended the learner to devote his whole attention to his manual exercise, there is no denying that unless he reach a stage when manipulation is carried on with the minimum of consciousness, he will not attain speed or style.

On the other hand, it may be doubted whether the remedy for cramp is to be found in the process of auto-suggestion described in the article referred to. In case the signalling operator is unable to divert his mind from his all-too-present hand, he is advised to think strongly to himself "I am a perfect sender. I listen to the sounder and the sounder guides my hand. I am a perfect sender." Plenty of evidence is forthcoming in other directions, however, that such auto-suggestion can be used beneficially in all cases where mental anxiety forms an element to be reckoned with. The English report, with what must be regarded as traditional distrust of the reality of non-physical phenomena, says: "A neurasthenic telegraphist might believe difficulties to be real which exist only in his imagination." Yet, if this imagined difficulty has the effect of paralysing his manipulative powers, its reality might at least be admitted by enquirers into such causes.

Let us make a further quotation from our American expert: "The presence of fear and the lack of self-confidence reduces the strength of the motive force of the motor impulse. . . . It will be found that as soon as perfect sub-conscious sending has been recovered, the cramps and pains will disappear." It is somewhat characteristic that the Transatlantic treatment of the problem is largely in terms of consciousness, while on this side the disease is traced to the dual effect of nervous instability and repeated fatigue. In at least one clause, however, psychical difficulties are referred to in the report; the inexperienced operator is stated to suffer anxiety and nervous strain when his responsibility affects him, or the impatience of his colleague at the distant office may impair his confidence. Some support was given to this view by the men's representatives, who connected muscular failure with mental strain.

It is, perhaps, a little disappointing that after prolonged expert enquiry the problem of cramp cannot be regarded as solved. The statistics gathered have considerable value, and several noteworthy facts were revealed which should assist further progress. Of these it will suffice to mention that in one division of the Central Telegraph Office over 50 per cent. complained of difficulty in keying. In the same division 78 per cent. chose a special kind of key in the trial. These figures seem to justify the conclusion that the weakness has shown a tendency to increase and that, in the minds of the staff, relief is to be sought in the kind of key adopted. The American view attaches, perhaps, too much importance to the mental factor; the English view underrates it. Probably want of confidence begins in some cases from apparatus or electrical difficulties; in others from anxieties not necessarily professional. The physical reacts on the mental and a reciprocal cumulative effect results.

LARA.

SUPERVISION—AND SOME OTHER MATTERS.

OF all the papers which have been read before the various societies of the Post Office during the current winter session, probably none have been so widely discussed as that of Mr. Renshaw on "The Ethics of Supervision." It has formed the subject of more than one article and has been referred to by several readers of other papers at the meetings of kindred societies.

The reason for this widespread interest, apart from the merits of the paper itself, is not far to seek. The author has hit upon a subject and opened a discussion which, from time to time, has more or less crudely presented itself to the minds of hundreds of thousands of officers of the Post Office.

Probably nowhere has this subject presented itself with more persistence than to the thinking supervision of the manipulative sections of the Telegraph and Telephone Services.

Of necessity these two depend for their efficiency upon TIME. One may apply extra energy to catch a train, a 'bus, a tram, but no amount of energy or extra assistance can give back to a telegram or a call the minutes once lost upon them. Telegraph and telephone work cannot be laid aside for a few minutes and taken up again without the essential utility of the work being detrimentally affected; there must be a continual carrying-on or efficiency suffers. The carpenter, the joiner, the engineer may lay down the half-finished labour of their hands, even secretarial papers may "stand over till the morning," without affecting the value of the finished article, but the telegraph and the telephone belong to the never-resting species of State service, symbols of untiring energy and the perpetual motion of Nature's own forces.

Such being the principle upon which the very life and breath of telegraphy and telephony depend, conscientious supervision is bound to look upon waste of time as the peak of the telegraphic or telephonic criminal curve. Carried to its logical conclusion the utilisation of the operator's every spare second would thus appear to be one's duty to the State.

There is, however, another point of view, and that is the supervisor's duty to the supervised, as to living human frailties rather than as to anonymous numbers on a pay-sheet.

The juxtaposition of these two apparently equally clamant duties presents one of the problems not infrequently set before the supervisor, and bluntly presented may be stated thus:—

"How far is the individual to suffer for the work?"

"How far is it permissible to allow the work to suffer for the individual?"

These are real questions, not to be settled by a mere wave of the hand, by wordy logic-chopping, or by dismissal as "foolish," "frivolous," &c., &c. They cannot be solved by any rule or regulation framed by the pen of man, but they are nevertheless very real, and prove more interesting than the somewhat forbidding title of Mr. Renshaw's paper would appear to promise. While voting whole-heartedly in favour of a generous observance of the humanities, one cannot but acknowledge the pull which sometimes comes between the *work* on the one hand and the *man* on the other. "Supervision" is evidently a bigger term than would at first appear. It needs no quibbling, hair-splitting *babu* as its exponent, but a man or woman with a soul.

One item of the Deputy Controller's paper on "Some Outstanding Features of the C.T.O." was the very earnest appeal which he made regarding the formation of Study and Literary Classes, and the possibility of constituting the latter one of the future features of G.P.O. West. This matter, it is understood, may probably receive attention when the program of the P.O. T. and T. Society is drawn up for the 1915-16 session. Short essays by members of the staff upon questions such as those raised above could be read, followed by open discussion. It can be stated with perfect confidence that any suggestion made by the membership will receive most sympathetic consideration from the committee of the society. Many of the local societies have set apart evenings for short papers, and with signal success.

The number and length of British and other Government telegrams dealt with in the Cable Room, appears to increase, and may be accepted as a token of the silent activities of this campaign of silence. Slowly during the last few months have the Anglo-Continental communications settled down, not to their normal condition but to an abnormal distribution of wires and cable conductors, bringing the Metropolis into direct touch with—at present—unmentionable places "somewhere in Europe," and we live and hope and work—for more!

There is much that of necessity must remain hidden until the war is over, but while one hears of Dreadnoughts, cruisers, destroyers, submarines and mine-sweepers, there can be no harm in giving one grateful thought to those linemen of the deep, who go down to the sea in ships and repair the various telegraph cables that bind us to islands and continents. There are many pleasanter and safer occupations than splicing a cable at sea during the naval and meteorological conditions of the last few months!

"Machine telegraphy" has loomed large of late, filliped by the war, as the present is obviously the inventor's opportunity for showing staff and other economies. Machine telegraphy has of course come to stay, but it is no absolutely new feature of telegraphy, and need cause no qualms to the willing and the efficient. Whether the vision of the super-telegraphist be realised or not, certainly the telegraphist with a penchant for mechanics should come into his own with one or other of the various systems now competing for first place.

J. J. T.

SPECIAL SERVICES IN THE METROPOLIS.*

BY D. H. KENNEDY (*Assistant Superintending Engineer*).

A MARKED feature of legislation in recent years has been the extent to which the Post Office has been called upon to enter into more and more intimate contact with the lives of the people. In addition to carrying their letters, parcels, and telegrams, it has of late years taken care of the keys of their Home Savings Banks, paid their Old Age Pensions, and it now takes a large part in looking after their health through the medium of the National Insurance Society. Even in the Telephone Service, which in its early days was regarded as very largely reserved for the wealthy, the same process can be seen at work. In various ways the Telephone Service, like its elder brethren, is caring for the needs of the population.

I propose to give a rapid sketch of some of the special services in the Metropolis under four main headings :—

(*a*) Special services in connexion with public business.
(*b*) Special services in connexion with public information.
(*c*) Special services in connexion with public safety.
(*d*) Special services in connexion with public pleasure.

(*a*) SPECIAL SERVICES IN CONNEXION WITH PUBLIC BUSINESS.

Practically every business house in the Metropolis is now provided with its own private branch exchange. When I had the privilege of reading a paper on the subject of private branch exchanges before the Institution of Post Office Electrical Engineers last April, in collaboration with Mr. J. W. Turner, I pointed out that there were in the London telephone area some 12,000 of these private branch exchanges, and that, as there were only some 2,500 working positions at the main exchanges, the number of private branch exchange operators greatly exceeded the number of main exchange operators. It might be argued from that that the private branch exchange is part of the ordinary service, and is not a special service ; but it is a fact that many of the large stores have developed special features in connexion with their private branch exchanges, and it is with them that I propose to commence my survey. Nevertheless, I cannot resist the opportunity of emphasising the statement I made nine months ago, that the efficiency of the London Telephone Service as a whole is very largely a question of the efficient working of these private branch exchanges. More efficient working than exists at present can be secured in two ways :—

(1) By an improvement in the engineering conditions.

There are at present too many different types of switchboard in use and too much variation in the circuit conditions. A greater degree of standardisation is necessary even if much scrapping is involved in obtaining it.

I am strongly of the opinion that the cordless type of switchboard should be standard for small installations, and that the obsolescent types of cord switchboards should be scrapped.

(2) By training the private branch exchange operators.

In this last connexion I wish to pay the most generous tribute of appreciation to the work which has been done by Mr. Preston's Traffic and Service staffs in improving the conditions in the London main exchanges. No one who has examined the traffic instructions issued during the last few years, and watched closely their application, can fail to realise that a great advance has been made in standardising the working methods of the operating staff. This reform, however, only reaches the private branch exchange in the relatively few cases where the Department supplies the operators. I would welcome very warmly an extension of the system of supplying operators to private branch exchanges. This system produces the very best working conditions. On the other hand there has been a sporadic tendency to permit certain corporations, such as railway companies, to provide not only their own operators, but also their own plant. From the point of view of the efficiency of the London service I regard this development with the gravest misgivings, and I think it highly inconsistent that, while in the provinces we are congratulating ourselves on the perfection of the service between Liverpool and Manchester, achieved by the elimination of dual control, we should at the same time see the thin end of another dual control wedge introduced in the Metropolis.

Fig. 1 gives a list of 29 of the largest private branch exchanges in the London area. It will be seen that in March 1914 Messrs. Harrods Limited had the honour of possessing the largest installation with its 10 operators' positions, 85 exchange lines, and 313 extensions. Since then Messrs. Selfridge's installation has been increased and consists of 9 positions, 60 lines, and 265 extensions, so that it now runs Harrods very closely. It will be observed from the totals that these 29 private branch installations had in March 1914 112 operators' positions, 637 exchange lines, and nearly 7,000 stations, the average number of stations per installation being no less than 234. In Messrs. Harrods' switchroom on their best traffic day the operators dealt with over 10,000 calls.

LONDON ENGINEERING DISTRICT.

LIST OF PRIVATE BRANCH EXCHANGES WITH THREE OR MORE POSITIONS. March, 1914.

Name.	No of Positions.	No of Exchange Lines.	No of Extensions Working.	Operators supplied by Department or Subscriber.
Harrods Ltd.	10	85	313	Subscriber
General Electric Co. ...	8	30	129	,,
Army & Navy Stores ...	7	26	342	3 Dept. ; 5 Sub.
Selfridge & Co. ...	6	40	184	Subscriber
Whiteleys Ltd.	5	40	167	,,
Admiralty	4	14	440	Department
Waring & Gillow ...	4	19	106	Subscriber
War Office	4	20	391	Department
London County Council	4	15	219	,,
Associated Newspapers	3	15	148	Subscriber
London City & Mid. Bank	3	13	148	,,
Buckingham Palace ...	3	9	100	Department
Metn. District Railway	3	12	114	Subscriber
Queen Annes Mansions...	3	14	412	Department
Treasury	3	20	184	,,
Colonial & India Offices	3	10	262	,,
House of Commons ...	3	23	140	,,
Savoy Hotel	3	29	394	Subscriber
Waldorf Hotel	3	18	479	,,
Hotel Cecil	3	26	546	,,
Maple & Co.	3	20	59	Department
Bedford & Imperial Hotels	3	10	570	Subscriber
Thos. Cook & Son ...	3	13	114	,,
Telephone House ...	3	13	90	Department
Daily Mail	3	20	137	Subscriber
Spiers & Pond Ltd. ...	3	21	85	,,
Somerset House ...	3	12	303	Department
Debenham & Co. ...	3	20	104	Subscriber
John Barker Ltd. ...	3	30	106	,,
Totals ... 29 ...	112	637	6,786	
Averages ...	3.8	22	234	

FIG. 1.

FIG. 2.—THE SELFRIDGE PRIVATE BRANCH EXCHANGE

The switchboard at Messrs. Selfridge's has recently been enlarged to 9 positions. As typical of the methods adopted in dealing with telephone orders, we may describe what takes place in the case of a call for the Selfridge store. The subscriber, who has asked for "Gerrard 1," is connected and the Selfridge operator replies, not by saying "Hullo" or "Who are you ?" but by using the word "Selfridge." The caller then usually asks for the department required. The operator replies, "Do you wish to give an order ?" If so, the connexion is made with a telephone order line. The telephone order clerk is provided with two lines, an incoming line over which the customer's demands are received, and an outgoing line which enables the order clerk to communicate with any department in order to settle any matter of doubt. The customer's orders are written down on appropriate forms and passed to the departments for execution. A customer inquiring about an article purchased on a visit to the Stores is connected direct to the department concerned, and calls for the hairdressing, manicuring, and drug departments are put through direct. The Selfridge exchange operators each handle about 900 calls per day. In their new department on the south side of Oxford Street, Messrs. Selfridge have introduced a new feature, which they have widely advertised. Ladies wishing to give orders which refer to a number of departments are provided with comfortable chairs and tables, and the services of assistants, and at their elbows are placed pedestal telephones. The assistants take particulars of the articles required, samples are brought

* Paper read before the Telephone and Telegraph Society of London on Jan. 25, 1915.

immediately for the inspection of the customer, and if madam desires to consult her housekeeper or cook on any question of domestic economy which she may be dealing with, the telephone enables her to make free calls for this purpose.

Government Private Branch Exchanges.

This title at once calls up visions of the Treasury, the Board of Education the Home Office, the War Office, and the Admiralty, all of which have large private branch exchange switchboards. It is well known that the service on these switchboards at present is special in every sense of the word, and much appreciation has been expressed by those who have the right to do so

FIG. 3.—SELFRIDGE'S TELEPHONE ORDER ROOM. CUSTOMERS GIVING ORDERS BY TELEPHONE.

of the good work done both by the Engineering and Traffic officers in connexion with these services since the outbreak of war made the need acute. The grouping of these exchanges under one general title, and the fact that the distance between the switchboards at present is small, has caused the thought to occur to me that there might be considerable economy in providing at some future time a single large Government switchboard to take the place of the several small switchboards at present existing. Some of this economy is obtained at present by grouping the services at night, but I think it might be possible to proceed further in this direction.

Stock Exchange Service.

The triangular area bounded by Throgmorton Street, Threadneedle Street, and Bartholomew Place which includes the Stock Exchange, is without doubt the most densely telephoned area in the British Isles. The centre of this area is taken up by the main hall of the Stock Exchange, and one might almost say that it is bounded by telephones. Around its circumference there are no less than nine large telephone rooms, containing altogether 112 telephone cabinets. Five rooms contain Post Office instruments for communicating with London subscribers, and one room is reserved for international trunk service. The remaining three are maintained by the Post Office for the Exchange Telegraph Co.

Dealing with those rooms in the order mentioned, Post Office call office attendants regulate the service to and from the silence cabinets by means of cordless switchboards, and members of the house may either run accounts or pay for their calls as obtained. The international services between London and Paris and London and Brussels are, of course, at present suspended, pending the consideration of Germany's claim to control Europe, but members who are required to speak to Paris or Brussels, as the case may be, are called from the main hall in the following manner. On receiving a call, say from Paris, for Smith, Jones & Co., the attendant presses down the key bearing the name of that firm, and this lights a small lamp above the key and at the same time illuminates a number on a large luminous signal board in the centre of the hall. The members keep a close watch on these indicators, and a very short time suffices to bring to the telephone a member of the firm indicated. The remaining feature of the Stock Exchange service which calls for attention is that provided under the auspices of the Exchange Telegraph Co. It includes the three call office rooms already referred to, together with the Bartholomew House Exchange, and here I am able to quote from an excellent description of the exchange written by Mr. P. J. Mantle, Exchange Manager at London Wall, for the November 1912 number of *The National Telephone Journal*. He says the Bartholomew House Exchange is probably the least known of any of the exchanges in London, and this is due to the fact that it does not intercommunicate, all its calls being local. It is primarily intended for the use of stockbrokers in communicating between their offices and the Stock Exchange, but it includes some subscribers who are not members, these being bankers, financial newspapers, outside brokers, and others to whom prompt information of Stock Exchange movements is essential.

The Bartholomew House telephones took the place of the old 'Call System' of the Company, which was similar to the 'Call System' in America, and was worked by means of automatic instruments having four 'buttons' on them. The call box enabled members to call their representatives back to their offices, and also to call a messenger from the Company's office, as well as providing a button for calling the inspector in case his services were required to attend to the tape machine. This 'Call System' was supplanted by the Telephone Service which, as time went on, became more and more appreciated, particularly when brought up to date by means of electric light calls. It is now possible to have a Bartholomew House telephone line without a tape machine.

There are three classes of subscribers to this system :—

Class A : £50 4*s*. per annum, comprises a tape instrument and a Bartholomew House telephone with the use of the call office in the Stock Exchange.

Class B : £25 per annum, comprises a Bartholomew House telephone, with the use of the call office in the Stock Exchange.

Class C : £12 10*s*., provides for the use of the call office in the house only.

The calls to and from the House are dealt with in a special manner, which elicited from Sir William H. Preece the statement that the call office system adopted at the London Stock Exchange stands unrivalled for smartness of switching. The three rooms, containing altogether 48 cabinets, are each in charge of attendants who are supplied with two order wires, one for inward, and one for outward calls. The rooms are associated with various "markets." No. 1 Room, Miscellaneous Market, 28 cabinets. No. 2 Room, the American Market, 8 cabinets. No. 3 Room, the West African Market, 12 cabinets. In the telephone exchange, the calling lamps of subscribers who use the miscellaneous market have white opals ; the American market calling lamps have green opals ; and the West African market lamps, red opals. When a firm desire to instruct their representative in the exchange to effect a bargain, the procedure is as follows :—

The subscriber calls the A operator at Bartholomew House and says, for example, call "John Jones." After the operator has repeated the name given by the subscriber the latter hangs up the receiver and waits. The operator, noting the white opal, depresses a white order wire key and passes the name "John Jones" to the attendant in No. 1 Room at the Stock Exchange. The A operator has then finished her part of the connexion. The attendant passes the name to a Stock Exchange "waiter," a uniformed official who sits in an adjoining sedan chair. He communicates with a brother waiter in the "market" and the latter sings out once for "John Jones" and at the same time switches on John Jones's indicator lamp. John Jones approaches the waiter, is notified "telephone," and makes tracks for No. 1 Room. As he enters the room he gives his firm's No., say 434, to the attendant, and the attendant says in reply "434—20." John Jones proceeds into cabinet 20, and if we follow him we observe that he commences speaking, usually in animated fashion, without the least loss of time. On a busy morning members file past this attendant in close order, and one hears him articulating thus a continuous series of numbers, while the members proceed without a pause to the cabinets and at once commence their conversations. Moreover, these attendants acquire a close personal knowledge of the members of the Stock Exchange, and seeing them approach they frequently anticipate their requirements and give them the cabinet number without the member making any remark whatever. It looks uncanny but the mystery is cleared up when it is explained that the attendant, in giving the silence cabinet number to the member, is at the same time speaking into a breastplate transmitter to the B operator in Bartholomew House, and that she makes the connexion instantaneously and the subscriber's bell is rung automatically on the connexion to the box being made. Stockbrokers have a high appreciation of the value of seconds, and invariably the office is on the line and waiting when the member reaches the cabinet. The service is fully entitled to the encomium for smartness upon it by the late Sir William H. Preece, and I think this is one of the particular cases where the manual operator as compared with the automatic exchange can hold her own and have a little to spare. In "rush" times the operators deal with a large number of calls, and it will be noted that the B operator has to work at the pace set by the attendant.

The concluding sentence of Mr. Mantle's paper is worth quoting. It is as follows :—"As some indication of the excellence of the service rendered to the Bartholomew House subscribers, I may mention that the last written complaint was received eight years ago."

Shorter's Court.

Shorter's Court is well known to the people who do business in the "street." It is a short, narrow *cul-de-sac*, entered from Throgmorton Street, a tiny outer-world salient on the Stock Exchange frontier, into which the non-member may walk with countenance unabashed and hat likewise. From the telephonic point of view Shorter's Court is interesting because the buildings which surround it are let out in minute sections to cable companies and stockbroking firms for telegraph station and telephone cabinet purposes. It is a sort of telephone honeycomb—the basement alone contains 34 cabinets—and very heavy rentals are paid for a single cabinet. Into this small enclosure which is only about 15 yards long, the Department leads some 300 telephone wires.

Lloyd's Service.

The upper part of the Royal Exchange building is occupied by the ancient Corporation of Lloyd's, and special telephone facilities have been provided by the Post Office for the underwriters who do business there. There are 28 cabinets in use. In the case of incoming calls, the

attention of the individual desired is obtained by the telephone attendant speaking through a tube to a second attendant, and the name of the person required is called out in a loud voice by the crier, who occupies a conspicuous pulpit in the angle of the L-shaped hall. The names are sung out and seem to make little impression on the din, but the members are well accustomed to the process and the system seems to work smoothly. Private wire facilities are provided for some 60 members between their offices and specially equipped tables at Lloyd's. Each position is provided with a telephone, a signal lamp and a ringing key. A member desiring to communicate with his office has only to press the key and the call takes effect at once in the distant office. In the reverse direction, the lifting of the telephone at the distant office lights the call lamp at the table position, and simultaneously a supervisory lamp lights on a lamp signal board in front of the telephone attendant. If the member is present in his position, he lifts down his receiver at once, and both lamps are extinguished. If he is absent from his seat, the fact is observed by the telephone attendant, and the services

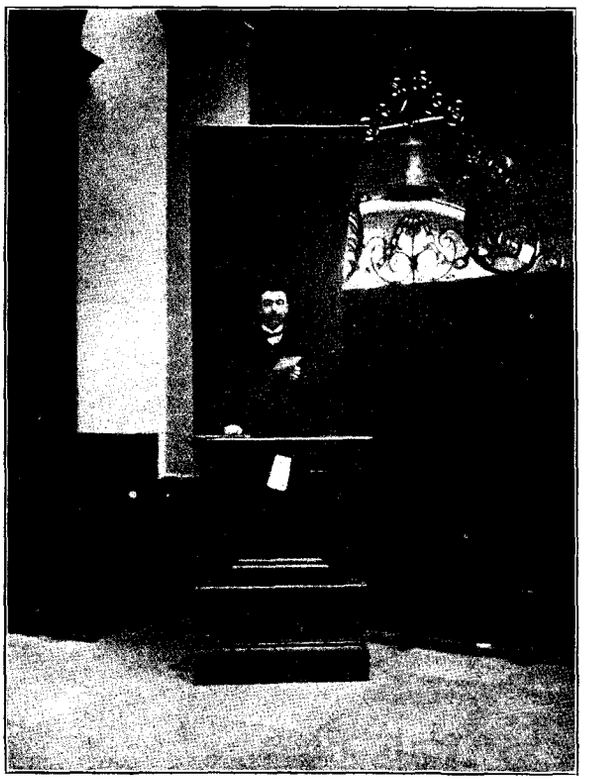


FIG. 4.—LLOYD'S. THE CRIER AND THE BELL "LA LUTINE."

of the crier are requisitioned. The picture of the crier shows also the famous bell which was placed here in 1866, when it was salved from the French ship *La Lutine*, which in 1799 foundered and carried to the bottom an immense cargo of specie. The bell is only used on the occasions when a vessel which has been posted overdue reaches port. Immediately the news is received two strokes on the bell produce silence at Lloyd's. The crier then announces that the S.s. So and So, so many days overdue, has arrived in port, an announcement which is usually received with cheering.

The Baltic Service.

The Baltic Exchange, in a manner similar to Lloyd's, is provided with special telephone facilities, and in the Telephone Directory it shares with Lloyd's the unique privilege of requiring no Telephone No., the instruction being to "call 'Lloyd's' or call 'Baltic' no No. required." The Baltic Mercantile and Shipping Exchange is situated in St. Mary Axe, and as it is the meeting place of merchants and shippers, a large number of trunk calls originate here. Twenty cabinets are allotted for trunk purposes, and there is a corresponding number of lines, together with two order wires and a record line.

The Telewriter Service.

One of the most recent competitors with the telegraph and the telephone is the telewriter, the instrument which transmits handwriting, drawings and dimensioned sketches over an ordinary telephone line, and which can be operated by anyone who can write or draw. It makes in one operation two facsimile records, one for the sender and one for the person addressed. The reception is entirely automatic and the sender can transmit the message in the absence of the addressee, who on his return finds the message written in ink in the handwriting of the sender. Messages can be simultaneously telewritten to several departments. As many as a hundred departments can, if required, simultaneously receive a message from a central station. The telewriter does not supplant the telephone, but it forms a valuable adjunct. So long as two people want to talk to one another, the telephone will always be needed, but there are messages requiring accuracy in transmission which call for no personal conversation, and their value is greatly increased by a written record. Where numbers and prices are involved the telewriter produces a commercial document removing all doubt as to accuracy and responsibility The main principle employed in the telewriter is that of producing two independent motions by the movement of the transmitting pencil, each causing a gradual change of current through a line wire. At the receiver these varying currents produce independent motions which are combined and result in the reproduction by the receiving pen of the transmitted message. The head office and exchange of the company is at No. 20, Bucklersbury, and the 114 subscribers connected with this exchange are provided with intercommunication facilities and also with facilities for transmitting telegrams to the Central Telegraph Office by means of fourteen junction lines. A sub-exchange located in Compton Street provides accommodation for 28 subscribers' lines, with eight lines to the Central Telegraph Office. Under the licence agreement, dated June 1911, the Postmaster-General has power to purchase in 1922. It should be stated that the company maintain all their apparatus including that at the C.T.O., and they only rent lines from the Department. For exchange service the annual subscription is £12, together with a minimum yearly amount payable for message fees (720 calls) £3, and subsequent calls above the minimum number, 1*d*. The exchange rates are applied to a radius of one mile from the exchange.

Standard Time Service.

The part played by the Post Office in supplying standard Greenwich time throughout the country is well known. One of the oldest rented wires in London is that which Messrs. Dent & Co. of Cockspur Street have rented for the last 42 years, connecting them with the "Chronopher," which is the name given to the ingenious machine installed at the Central Telegraph Office for the purpose of distributing standard time throughout the Kingdom. Recently a company called "Greenwich Time Limited" has embarked in this business, and it now maintains synchronised clocks at 154 points within the Metropolis. The company charges an installation fee of £1 and a rental of 39*s*. per annum, and it rents 55 miles of wire from the Department, including a line from the "Chronopher." It is a tribute to the enterprise of our present enemy to have to state that Greenwich Time Limited is a German company, financed by the Normal-Zeit Co. of Berlin. The Normal-Zeit Co. maintains 30,000 synchronised clocks in the German capital. Greenwich Time Limited is carrying out its existing contracts under Government control.

(*b*) SPECIAL SERVICES IN CONNEXION WITH PUBLIC INFORMATION.

The Exchange Telegraph Company has already been referred to in connexion with the Stock Exchange, but it is much better known in connexion with its news collecting, and distributing services. Quoting from a writer in *The Times*: "Every journalist is familiar with the tape machines of the Exchange Telegraph Company, these superlatively ingenious contrivances which seem to do everything but talk. It is not too much to assert that the wonderful organisation of the Exchange Telegraph Company and its still more wonderful transmitting and receiving machines constitute one of the most remarkable features of modern civilisation. The Exchange Telegrapy Company was first in cabling the accounts given by the survivors of the ill-fated *Titanic*, and it occupies a chief position among the news collecting agencies upon whom the Press depends. Its organisation provides correspondents covering the whole world, whilst for reports of Parliamentary and legal proccedings, as well as for Stock Exchange quotations and market prices the company has responsible representatives in both Houses of Parliament, in the Courts, on the floor of the Stock Exchange, and in most of the London markets. Similarly, for obtaining accounts of racing, football, and cricket fixtures, the company possesses a skilled staff. In the case of a great race, say at Epsom, the company has a representative in the grand stand in communication with another representative who has a telephone near the winning post and telephones direct into the London office of the Exchange Telegraph Company at Cornhill. The moment the race is started the fact is communicated by No.1 reporter to No. 2, and within the space of one minute the news that the horses are off is known in all the great centres of population. Similarly, as soon as the winner is declared the announcement is made in the provinces, and it is a standing rule of the company that the time limit for the transmission of such results is one minute. Any failure to achieve this leads to a special Head Office investigation." All this is accomplished by the special training of the Exchange Company's staff and the clever utilisation of the Telephone trunk services. The distribution of news locally in London is carried out by the tape and column printing instruments. The instruments are found in all the principal hotels and clubs. Bankers and stockbrokers utilise them for the financial service, and their employment by the newspaper offices is practically universal. The company has two distributing stations, one at 17, Cornhill, and the other at 64, Haymarket, and over a thousand receiving instruments are connected, some 200 being in newspaper offices between Temple Bar and Ludgate Circus. The services are classified into :—

(1) Parliamentary.
(2) Racing.
(3) Cricket and football.
(4) Special general.
(5) Legal.
(6) Financial, and
(7) Commercial.

The rates for the first six vary from 50 to 150 guineas per annum each. For the seventh the rates vary according to the particular market involved, the minimum being 40 guineas per annum. The news service involves the use of two machines, which between them supply Metropolitan, provincial, and foreign

news to the extent of 11,000 to 16,000 words per diem. The largest morning papers, as well as many of the financial newspapers, rely to a large extent on these extremely valuable services. It may be stated that the number of words transmitted by the news services averages more than two million per day. The instruments used by the company are all worked on the same general electrical principle. The system is a printing system, the receivers printing in bold type on a tape continuously or in column. The transmitter is synchronised with the receivers with which it is connected by alternating pulsatory currents, and the printing is effected by the prolongation of these currents, suitable mechanical appliances being provided to give effect to the change in the direction and duration of the working currents.

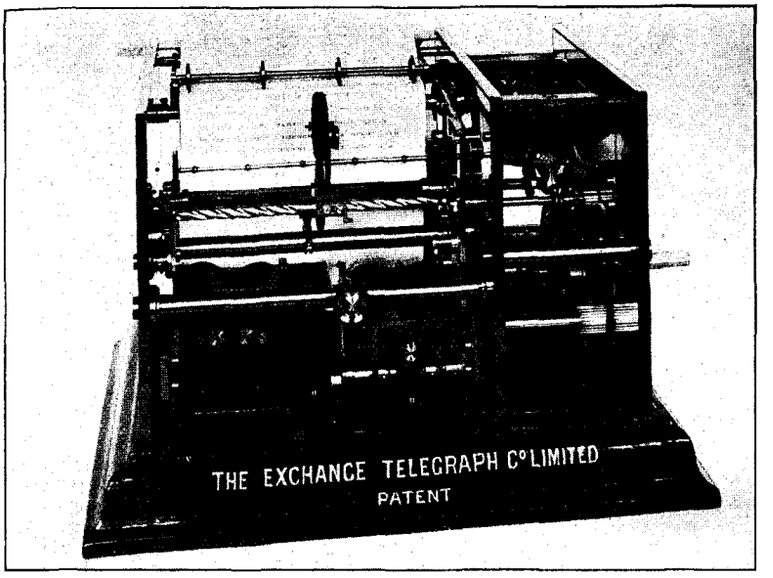


FIG. 5.—EXCHANGE TELEGRAPH COMPANY'S COLUMN PRINTING RECEIVER.

Fig. 5 shows the company's column printing receiver. As many as 500 receiving instruments can be worked from the same transmitter. Special interest attaches to the company's Parliamentary service. During the session a summary of the proceedings of both Houses is delivered by the instrument to subscribers for this service. The report is continous, being despatched over the company's special wire from the reporters' gallery so that the record of the proceedings arrives within a few minutes of their occurrence in the House. A special feature which the company has provided at Westminster is the annunciators in various parts of the building, which exhibit in large type the matter under consideration by the House and the name of the Member who is actually on his feet. A dozen of these machines are distributed in the smoking room, library, dining room and elsewhere, and it is amusing to watch the rush that ensues when the name of a popular speaker suddenly appears on the face of the annunciator.

Houses of Parliament Division Bells.

We may pause for a minute at the House of Commons to look into the division bells system which has been maintained by the Department for many years. In the House of Commons there are 72 bells joined up in series. The bells are rung by a division bell transmitter, the handle of which is fixed beneath the seat of the doorkeeper's chair, immediately outside the door of the House. The circuit controlling these bells is about three-quarters of a mile long and bells are provided in the tea-room, dining-room, reading-room, cloak-room, Ministers' rooms, hairdresser's room, bath-room, writing-room, and in all corridors and courts. They are fixed in all kinds of places from under the roof to the underside of seats, in oak cases on the walls, and on oak panels in recesses. When the Commons assemble, these bells are rung once, immediately the Speaker or Deputy Speaker enters the House. Prayers are then held and at their conclusion the Speaker "takes the Chair," this being signalled by the bells ringing once, and the cry being raised throughout the House "Speaker in the Chair." On a division being declared by the Speaker, the Sergeant-at-arms, who sits in the chamber below the Bar, calls out "Division," the doorkeeper sets the bells ringing and the call to division is thus sounded from the top of the House to the bottom. The bells are rung four times for a division, and a period of six minutes is allowed from the time of the first bell. A similar installation is maintained in the House of Lords.

External Division Bells.

The twentieth century Members of Parliament, at any rate some 25 of them, have stolen a march on their predecessors by introducing external division bells. These are provided in the houses of Members who reside within six minutes' journey of the division lobbies. They are rung by means of special contacts on the transmitters fixed beneath the doorkeeper's chair. Thus, although they are entirely separate circuits, they ring at the same time as the Commons' division bells ring. The introduction of the external division bell has without doubt increased the value of house property within the radius of the House of Commons which can be covered by a motor-car in six minutes, and the fact that it is an advantage for a Member of Parliament to be able to stay at home until his private division bell rings is evidenced by the steady increase in the number of these installations. The rental of a division bell for residences within a quarter of a mile is 30*s.* per annum.

An external annunciator would seem to be a proper accompaniment to the external division bell and if we could only add also a House of Commons electrophone the equipment of the external Member would be nearing the ideal.

"The Times" Service.

The Times at Printinghouse Square, and the *Daily Mail* and the *Evening News* at Fleet Street have recently developed a method of utilising the telephone service which is of considerable interest. At Printinghouse Square a number of telephone stalls is arranged in horseshoe formation round a room, with the supervisor's table in the centre. At each place a staff of young ladies is employed, and their principal duty is to canvass by telephone for advertisement business. Rival morning papers are carefully scrutinised, and where addresses are given advertisers are called up and the services of *The Times* or the *Evening News*' advertising department courteously proferred them. The same staff and telephones are also used for the distribution of war news to those who pay for the war services.

The "Evening News" Service.

In addition to the preceding service, the *Evening News* at Carmelite House has a small special switchboard used solely for the distribution of press intelligence, which has a special interest of its own. Fifteen lines to Holborn Exchange are set apart for this purpose and connected to a sub-editor's room which also contains the Exchange Telegraph Company's instruments and other telephones. Two operators are employed to manipulate these lines, and they are used for the purpose of rapidly distributing to London and the provinces news of special events, more especially big racing events. One operator deals with London and the other with the provinces. To illustrate the process, let us suppose it is one of the big race days. The afternoon edition of the *Evening News* is distributed throughout London in advance of the race, but the *Evening News*' agents have instructions to call up by telephone for the result. Armed with large bundles of newspapers and small rubber stamps the newsboys wait at the different points till the race news is about due. Then they get in touch with Carmelite House, the news is transmitted to them by telephone, and the papers are stamped with the result and immediately distributed. The same process applies to the distribution of news to provincial towns up to a radius of about 150 miles. Users of the trunk service will be interested to know that a racing result can be dispatched by one man to 65 towns in fifteen minutes, utilising the ordinary trunk services and without any special pre-arrangement. I have to own that I could not accept this statement without personal verification. I found, however, that by utilising five lines to Holborn simultaneously, so that while one communication was being sent four other lines were always being held, this feat could be accomplished with ease, and it is in fact a daily event at Carmelite House. I may add that after making this discovery I invited the Carmelite House operator to visit Holborn and the Trunk Exchange and inspect the machinery by which his calls were effected. His visit led to high appreciation on his part of the method of working the trunk service.

The Press Bureau.

There are many special services which have arisen out of the war to which we shall not be permitted to refer, but the Press Bureau is one which will allow of explanation being made. Comment and appreciation has appeared in the press on the subjest of the celerity with which special telephone circuits were provided in the early days of August, and the Press Bureau will serve to illustrate that such was the case. Telephonic instructions were received on Saturday afternoon Aug. 8 that an old building at 40, Charing Cross was to be transformed immediately into a Press Bureau. During the week-end the Office of Works rearranged certain of the rooms, cleaned the premises, laid down linoleum and installed electric light, while the Post Office Engineers installed 20 telephone cabinets in the telephone room, a switchboard and indicators in the press waiting room, and another switchboard and installation of telephones for the Press Censor. A considerable amount of work was involved in providing external wires, as well as the internal work referred to. Telephone cabinets were appropriated to various newspapers and press organisations, and it was stipulated that no one cabinet was to be brought into use until the whole number were available. The work was completed and handed over at 3.20 p.m. on the Monday afternoon. A month later, these premises having been found inadequate, the whole installation was removed to the new home of the Press Bureau at the United Service Institution, Whitehall, where the actual typing of the information circulated is carried out within the walls of the Museum amid the relics and trophies of past wars. Quoting from a description given in the January number of the *P.O. Electrical Engineers' Journal*:—"The Lecture Hall of the Institution has been set apart for the use of the press representatives, and here 22 cabinets of standard call-office type, each equipped with a telephone connected direct with Victoria Exchange and boldly inscribed with the title of the newspaper, group of newspapers, or press agency to which it is allotted, are lined round a structural curve, and strike a dominating note. Within the main body of the hall the pressmen spend many waiting hours, smoking, chatting, reading and card playing. A smaller section has been partitioned to serve as a writing room. This part of the bureau is governed by a joint committee of officials and pressmen.

Four telegraph (sounder) sets and a pneumatic tube to the C.T.O. have been supplied by the Department, which has also equipped and operated a 40-line switchboard to deal with the telephone traffic of the administrative and censorial side of the bureau.

The method of distributing news, as regulated by the joint committee already referred to, is somewhat as follows :—

Well in advance of issue the probable time and the approximate word total is prominently displayed upon a blackboard. One minute prior to the circulation a bell rings, whereupon any cabinet in use is at once vacated, all telephone receivers being first restored to their resting positions. A very occasional offender attempting to steal a few minutes' start from his compeers by retaining telephonic connexion with his office receives physical attention from the committee. As soon as the cabinets are isolated, a bureau official distributes typed copies of the official information and not until every copy is placed is the signal given which precipitates every man to his particular cabinet.

FIG. 6.—PRESS BUREAU.—RECEIVING A BULLETIN.

[Photo by E. L. PHILPOT, Reuters

Connexions to newspaper offices are speedily established, the space held in reserve upon receipt of the blackboard's earlier intimation is filled, and the 'News—Official' is soon on the street."

(c) SPECIAL SERVICES IN CONNEXION WITH PUBLIC SAFETY.

Metropolitan Police Services.

Scotland Yard is well provided with telephones, and a very complete intercommunication system exists between the Police Headquarters and the various divisional offices. In addition, a column printer installation is provided to enable the dissemination of instructions and general police communications to be made simultaneously from Scotland Yard to the 24 Metropolitan Police divisions. Communication takes place only in one direction and the receiving instrument is the same as that which is experimentally demonstrated here this evening by the Exchange Telegraph Company.

From these divisional headquarters the communications are sent on to the outlying smaller stations by telephone, special arrangements being made to permit of simultaneous communication with a number of sub-stations. In this way, one or two minutes suffices to put the whole of the London police on the *qui vive.*

Metropolitan Fire Brigade Service.

The Fire Brigade Service, like the Police Service, makes the fullest possible use of telephones, and every telephone subscriber is familiar with the injunction "In case of Fire call Fire Brigade, no No. required. Speak direct to Fire Station, give address of Fire." It is worth while mentioning here that the last part of this injunction is frequently neglected. In the excitement of the moment the caller shouts through to the Fire Brigade "There is a fire here—come quickly," and fails to realise that the firemen cannot tell where the caller is speaking from. In such cases the defect is made good by the telephone operator who has been carefully tutored as to what is necessary in such cases. In addition to ordinary exchange telephones, the Department maintains for the London Fire Brigade a complete system of fire alarms Interest in the Fire Brigade is so pronounced that it will, I think, be well to quote from the excellent description issued by the London County Council some paragraphs describing the stations and the method of calling them :—

"The staff and appliances of the London Fire Brigade are mainly accommodated in permanent fire stations, 83 in number (excluding river stations) in various parts of the county.

"The general principal determining the distribution of fire stations in London is the necessity of ensuring (1) the speedy arrival, after a call, of life-saving and fire-extinguishing appliances at any spot in the county; and (2) the concentration of 100 men within 15 minutes in any dangerous area for large fires. On receipt of a call the fire appliances at the station are immediately turned out, the life-saving appliance being invariably the first to leave. At the same time a fire-extinguishing appliance from at least one other station is ordered to proceed to the fire. One man or more is left behind to receive the telephonic messages which may be sent from the fire-alarm nearest the scene of the fire, and to keep up communication with the station of the superintendent of the brigade district in which the outbreak occurs. Information of the call is at once transmitted to the superintendent's station, and, if necessary, help is ordered from the neighbouring station or stations. Calls to fires are classed under three heads, as follows :—(*a*) 'Home calls,' (*b*) 'District calls,' and (*c*) 'Brigade calls.' If the fire be one which the officer first to arrive is confident he can deal with by means of his own appliances and those which he knows are on the way from the nearest stations, the call is known as a 'home call,' and is described as such in the message sent from the fire. A 'district call' is one to a fire which can be dealt with by means of the appliances sent on from a number of stations nearest to that at which the original call was received; whilst a 'brigade call' is to a fire which necessitates the attendance under orders from headquarters of men and appliances.

"Connected with every fire-station are fire-alarms fixed in public thoroughfares. The first street fire-alarms were fixed in London in 1880. There are now 1,962 and the number is being steadily increased, with a view to ensuring that no one will need to go more than a quarter of a mile to call the brigade. The person giving the alarm should await the arrival of the first fire-appliance in order to indicate the actual scene of the fire, and directions to this effect appear on all fire-alarm posts. Many posts in the East End are fitted with tablets bearing similar directions in Yiddish. All the street fire-alarms have been adapted for the transmission of telephone messages by firemen.

"All the fire-alarms, telephonic and electric bell apparatus of the brigade is rented from the Post Office.

"In December, 1908, the Council adopted a new type of apparatus and asked the Post Office to substitute it for the apparatus then existing and to use it for all new fire-alarms. This improved type has the advantage that when the alarm is pulled all the bells throughout the station ring instead of only the bell in the watch room.

"Every fire-station is connected by telephone with the station at which the superintendent of the district resides, and each superintendent's station is similarly connected by duplicate lines with the headquarters in Southwark Bridge Road. To provide against the interruption of lines between headquarters and the superintendents' stations, certain stations in adjoining districts are also connected by telephone. Intercommunication is possible throughout the whole of the telephonic system in the brigade. Fire-signalling apparatus has been provided, which, when actuated from the superintendent's station, intimates to the station communicated with that appliances are to be turned out at once. This apparatus automatically actuates, through a timing relay, the electric bells in the men's quarters, &c., and turns on lights throughout the station."*

The City Police Ambulance Service.

The silent white electric ambulance carriages of the City of London Police with their conspicuous red crosses have become well-known to the denizens of the City. The service was established in 1907. In Cheapside, Holborn, or it may be Fleet Street one hears the distinctive single stroke of their electric bells, and the motor ambulance emerges from a tangle of traffic. The policemen on point duty make way for it and ignoring the rules of the road it proceeds rapidly on its errand of mercy. There are 52 points in the City at which street pillar boxes are installed, and these communicate with the switchboard at the City Police headquarters, Old Jewry. In 1914, 2,389 persons, including 209 wounded soldiers returning from the front were conveyed to hospitals in the two motor cars which provide the City service. One ambulance car is stationed at St. Bartholomew's Hospital serving the western portion of the City, and the other at Bishopsgate for the eastern portion, and cases are conveyed to the London, Guy's, or St. Bartholomew's Hospitals, whichever is most convenient. The motor ambulances are summoned by means of the signalling system provided by the G.P.O. at the cost of the police. The boxes are opened by a special key, one of which is carried by every police constable. When someone has been injured the policeman proceeds to the call point, opens it with his key, lifts the telephone receiver off the hook, and pulls forward the handle which is visible in the illustration. The call takes effect on the eyeball indicator at Old Jewry, the attendant there plugs into the jack to reply, and at the same time presses the appropriate bell push on the right of the switch. If the release of the push button is followed by the noise of a buzzer, the attendant knows that the ambulance is required. He obtains from the calling policeman particulars of the location of the injured person and calls out by telephone the nearest ambulance car. The buzzer is provided for the purpose of eliminating the possibility of false calls due to electrical troubles and it does so perfectly, no false calls ever being received. As the public have no access to the call boxes, malicious calls are also entirely absent. The average time after the occurrence of an accident for the ambulance to arrive on the scene is under four

* Commander Sampson Sladen, Chief of the London Fire Brigade, and some of his principal officers were present at the lecture, and he was good enough to allow a practical test to be made of the efficiency of the fire alarm system and of the celerity with which the brigade could reply to a call. At the conclusion of the discussion a call was made at 8.25 p.m. from the fire alarm post which had been installed in the Lecture Hall, and which communicated with the fire brigade station at Scotland Yard. The firemen arrived in Savoy Place simultaneously from the two stations (Scotland Yard and Whitefriars) at 8h. 27m. 20s., and spoke to Scotland Yard from the lecture room call pillar at 8h 27m. 33s. p.m.

minutes, and the average time taken before the patient is placed in the accident receiving ward of the hospital is only nine and a half minutes, including the time taken in rendering first aid on the spot. More than half the time previously taken in conveying an injured person to the hospital has thus been saved, and it is needless to say what benefits have thus accrued.

Another ambulance system, even larger than the City system, is maintained for the Port of London Authority. There are five stations distributed among the London Docks and 76 call points.

It is pleasing to be able to state that the benefits of the ambulance system, hitherto restricted to the City and Docks, are now to be made available throughout the London area. The nucleus of a new system has been provided by the London County Council. A central switchboard for receiving calls has just been installed at the headquarters of the Fire Brigade. Subscribers' lines will be used to obtain the services of the L.C.C. ambulance, and plates indicating that subscribers' telephones may be used for ambulance purposes will be fixed in prominent positions. This is an admirable co-operative arrangement which enables the heavy expense of call pillars to be avoided.

(*d*) SPECIAL SERVICES IN CONNEXION WITH PUBLIC PLEASURE.

Theatre Booking Service.

The telephone is very largely employed in connexion with the booking of seats at theatres and several firms in London, notably Messrs. Keith, Prowse & Co., Ashton, Mitchell & Co., Cecil Roy, and others, who are usually collectively referred to by theatre people as the "libraries," have built up considerable businesses as middlemen between the theatres and the public. While it is true that seats can be booked direct by communicating with the theatre booking office, it is equally true, as these "libraries" announce, that "if you want best seats we have them." The business heads of these firms exercise their judgment as to the future of a new play, and in cases where they purchase large blocks of seats for dates considerably ahead, it can be seen that the transaction eases the financial position of the theatre manager and may prove not unremunerative to the other party. The vending of these seats to the public is the part of the transaction in which we are interested. Messrs. Keith, Prowse rent from the Department a very extensive system of private wires. From their central switch at Poland Street no less than 121 wires radiate, connected with 147 stations. These stations are, in some cases, Messrs. Keith, Prowse & Co.'s own premises, where applications from customers are received and dealt with. In other cases they are hotels and stores, while the remainder are stations at the theatres. At Poland Street, in addition to the 6-position switchboard referred to, there are 30 positions equipped with telephones, switching keys, and incoming and outgoing lines for the booking clerks. The working of the system can best be explained by describing a transaction. A customer calls in at 162, New Bond Street, and desires to purchase two stalls for Covent Garden Opera. The counter clerk immediately lifts the telephone and speaking to the switch operator at Poland Street, says, "Opera—Book." The switch operator connects Bond Street with the book clerk who deals with opera stalls, the book clerk appropriates two stalls to the Bond Street establishment, gives the numbers over the telephone, and the Bond Street clerk makes out the tickets and delivers them to the customer in return for cash. But the customer may open an account at Bond Street, and next time he wishes tickets he may apply for them by telephone. From his home he will ask for Regent 6000, and he will be connected with the private branch exchange operator at 162, New Bond Street. The switch operator, immediately theatre tickets are mentioned, connects with a telephone clerk in an adjoining room. He takes down the customer's requirements, and by means of a switch transfers his telephone from the Bond Street extension to a Poland Street line. Then, as in the previous transaction, he communicates with the book clerk, obtains the numbers of the seats allotted, and then switching himself back to the exchange line, which meanwhile has been held by a holding key, he completes the transaction with the customer by giving the customer the numbers of the seats. The tickets themselves are delivered at the address of the caller by cyclist messenger.

Electrophone Service.

In fine contrast to the business of Messrs. Keith, Prowse Limited, which provides the public with facilities to go to the opera, the Electrophone Co. provides telephone subscribers with facilities for bringing the opera to them. The Electrophone Co., under the management of Mr. H. S. J. Booth, provides facilities for connecting telephone subscribers with Covent Garden, Drury Lane, and practically all the London theatres and halls at which musical performances are given. The apparatus is provided and maintained by the department, and the Department's junction lines which are not required in the evening are utilised for electrophone connexions. On Sundays the connexions are made with the Sunday concerts and also with the services at a number of churches, such as All Souls, St. Anne's, Soho, St. James's, Piccadilly, St. Martin's in the Fields, &c., &c. For £5 per annum two double headgear receivers are provided, thus allowing two persons to listen together to a performance. For £10 per annum an electrophone table with double receivers for four persons is provided. The company have about two thousand subscribers in the London district, and it will be seen that the cost per listener is less than 2*d.* per day. The Electrophone Exchange is in Gerrard Street, and a special system of coloured connecting cords is employed to secure that the transmission shall be maintained at a high standard. The transmission is usually exceedingly clear and the pleasure of listening to a musical performance, especially if one has already seen it or is acquainted with the music, is great. From some individual performers the transmission is especially clear, and when Harry Lauder is at the Palace the lines to that theatre are always fully employed. The transmission from the churches is also exceedingly clear, and one can listen, for instance, to the service and sermon at St. James's, Piccadilly, without losing a single word.

I have now completed my programme and I take this opportunity of offering my sincere thanks to the numerous colleagues and friends who have helped me. If the lecture has any merit it is very largely due to their kind and willing assistance.

There is a considerable number of other special services in the London district to which it has not been possible to refer. I have tried to choose those which are most representative and which have some special interest of their own, and I think I have established the point to which I referred in opening, that the Telephone Service, in addition to its normal function of providing rapid communication between London's 250,000 telephone stations, contributes by means of the special services to which I have referred very largely to the general well-being, the information, the safety, and the pleasure of the inhabitants of the premier capital of the world.

LONDON TELEPHONE SERVICE NOTES.

THE Croydon telephonists greatly enjoyed Mr. Pink's* perfectly prepared paper and duly elected that gentleman to the post of president of their society for the ensuing year. If the new president carries out (as he is sure to) the duties of that office as thoroughly and efficiently as he does his military duties, the Croydon Society's next session will prove a record one.

The London Telephone Service has recently been very much engaged with the consideration of the balance sheets of the various dining clubs in its midst, and it would seem that all is not well with the affairs of the "Head Office" Club. Notwithstanding various increases in the tariff, the year's trading appears to have been conducted at a loss, and for the remedy of this state of affairs various were the expedients suggested at the annual meeting. It does not seem to have occurred to anyone (why it is impossible to guess) that the safest way would be to follow the official lead in the matter and appoint a committee of investigation, including, say, an officer from the A.G.D. or perhaps two experts from an even more exclusive office where the staff, freed from the trammels of day to day official routine, see with eyes of unsullied vision. One can imagine the report given to the world after due and proper delay. A manageress, we should read, cannot be justified for so small a club and should be regarded as redundant. A Superintendent of Diners should be appointed and the Manageress will for the present do duty as an additional Superintendent, with the title of Superintendent of Diners' Teas and Lunches. Both to be responsible to an Assistant Purveyor, Class I. Saucers should be used on many occasions instead of plates, thus effecting a very large saving in plates and in washing. Plates should be used on many occasions instead of saucers, thus securing a great reduction in the saucers used and a corresponding saving in washing. Much of the waitresses' work could be done by Girl Probationers or by the Diners themselves. Quite a considerable saving could thus be secured—and so on and so on—in strict accordance with the recognised formulae. At a later stage a new Committee could be appointed and the old order restored under sanction which should give it the vigour and freshness of youth.

The Telephone and Telegraph Society, at their February meeting, had the pleasure of hearing Mr. Dunford's paper on the activities of the C.T.O. It appeared in full in our last issue together with a host of other essays dealing with the glories (mostly past glories) of that centre of industry—the reading of which provoked the following lines :—

Oh
At G.P.O.
The C.T.O., the C.T.O.
How rapidly it once did grow
It seemed its traffic must o'erflow
All climes and countries, and 'twould show
Profits in millions !
Billions ! !
With pride in such a glow
What wonder if some then did crow—
But that, worse luck, was long ago
Before an overwhelming blow
The advent of the Telepho—
Ne.** Now we know
Why profits go
At C.T.O.
Below
O.

The London Telephonists' Society held their last meeting of the session on Tuesday, March 9, when a large number of members assembled to hear Mr. Stuart Jones's address on "Operating Conditions in Other Countries." The lecture was illustrated by some excellent lantern slides, which showed our telephone sisters in various parts of the world. As Mr. Stuart Jones pointed out, the Paris fashions were to be seen in each case, although in some instances the fashions were not perhaps those of the spring 1915. There was also remarkable uniformity in the type of switchboard in use. After the lecture Miss Heap, in expressing the obligation of the members to Mr. Stuart Jones for his lecture, had some amusing comments to make on the contrast

* We regret that by a printer's error Mr. M. C. Pink was described in London Notes last month as Mr. McCleish, and Mrs. Twyford as Miss Twyford.

** These letters are pronounced by closing the lips and letting the breath escape through the nose.

between the points in a foreign telephone exchange which strike the imagination of observers of the sterner sex and those which appeal to the gentler sex. Mrs. Stuart Jones had very kindly consented to distribute the prizes awarded to those who had proved successful in the annual competitions and whose names have already appeared in these Notes. The task was not a light one as the prizewinners, who were allowed to select their own volumes, had in some instances purchased miniature libraries, and how they managed to convey their possessions home is a mystery. The election of officers for the following year resulted in the return of Mr. T. Beck (Museum Exchange Manager) as president, Mr. Townsend remains as secretary and treasurer, with a strong representative committee. The society should certainly flourish next session.

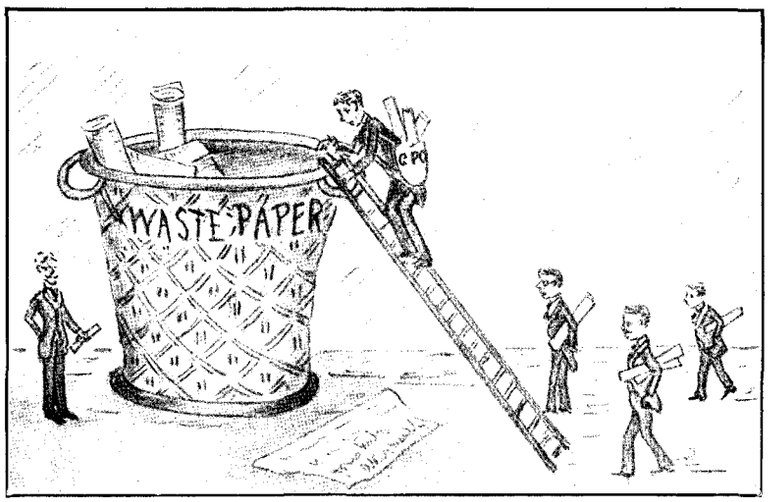
There have been further entertainments in aid of the P.O. Relief Fund. The Gerrard staff organised a concert which took place on Feb. 19 at the Cripplegate Institute, and it proved most successful.

By reason of one part of the entertainment, "Mrs. Jarley's Waxworks," being technically "dramatic," the choice of halls was limited, and, unfortunately, owing to this it was necessary to refuse many applications for tickets, the accommodation at the Cripplegate Institute being quite inadequate to meet the demands. Notwithstanding this, however, it is gratifying to those ladies who so ably undertook the arrangements to be in the position of handing to the Relief Fund the sum of £18 2*s*. 6*d*. Space will not permit of a detailed account of the various items presented for the amusement and instruction of the audience, but the ladies and gentlemen who undertook to represent wax figures must be congratulated on the wonderfully lifelike (or should it be lifeless) manner in which they portrayed such amazing personalities as a Cannibal, the Ancient Mariner, &c., &c.

Mr. Horace Dive peeped out occasionally through the disguise of Mrs. Jarley, in which lady's exhausting duties he was supported by "Peter" and "John" (Messrs. Harvey and Geddes of the Gerrard Engineering staff), Mr. P. Keatley of the same staff provided suitable music.

Waxwork exhibitions appear to be popular with the Telephone staff, for another such was provided by the "Avenue" staff on Saturday, Feb. 20, when they gave their annual tea and entertainment to a party of London's poorest tiny mites—another party being feted the same day by the staff of the London Wall Exchange.

These notes cannot be closed without a reference to those members of the London Telephone Service who have recently gone to swell the ranks of the Royal Engineers. When a special appeal was made to the P.O. Engineers Volunteer Training Corps for recruits for the Regular Forces, 14 men from the Controller's Office expressed their willingness to undertake the duties, and having successfully passed the medical test, they have now left for Chatham. They carry with them the heartiest good wishes of their fellow-members of the Training Corps and of their *confreres* in the L.T.S. We look forward to their return covered with glory.



THE G.P.O. WASTE-PAPER BASKET.

LONDON WALL EXCHANGE: TEA TO 500 CHILDREN.

The annual tea given by the Staff of the London Wall Telephone Exchange to 500 children of Canning Town was again a great success. Perhaps the most successful feature of the evening was the entertainment after the tea, when certain supervisors of the exchange showed on the stage a clever scenic revue, to the great pleasure of the admiring audience. A couple of marionettes kept the hall in roars of laughter for another happy hour, and each child was consoled for the end of the delights by the present of an orange and a new penny on departure. We cannot say who enjoyed the evening most, but certainly there was no one, either of the helpers or of the children, who did not consider the time well spent.—*Mansfield House Magazine.*

PERSONALIA.

NEWS OF THE TRAFFIC STAFF.

LONDON TRAFFIC STAFF.

Transfers—

Miss ALICE M. CARTER, Assistant Supervisor, Class II, from Mayfair to Greenwich Exchange.

Miss DAISY O. VINING, Assistant Supervisor, Class II, from Hampstead Exchange to War Office.

Miss STELLA I. POND, from Mayfair to Park Exchange.

Miss ISABELLA SPALDING, from Central to Mayfair Exchange.

Resignations—

Miss ELIZABETH M. E. GOLDSPINK, Assistant Supervisor, Class II, has resigned in view of her marriage, and was presented by the staff of the Hampstead Exchange with a silver Queen Anne tea-service, a silver cake-basket, a pair of silver vases, a china tea-service and a set of carvers.

Miss CHARLOTTE H. SAYERS, Assistant Supervisor, Class II, of Putney Exchange, has resigned to be married, and was presented by her colleagues with a dinner service and many other useful gifts.

Miss JANE LONGFORD, Assistant Supervisor, Class II, has resigned to be married, and was presented by the staff of the Croydon Exchange with fish servers, half-dozen fish knives and forks, an oak biscuit barrel and a silver cake-stand.

Miss ADA M. FIELD has resigned in view of her approaching marriage, and her colleagues at Reigate Exchange have presented her with a silver cake-basket, a hand-painted picture, a hand-worked afternoon tea-cloth, a pair of hair-tidies and an embroidered black satin cushion.

Miss JENNIE BROWN, of London Wall Exchange, has resigned, and was presented by her colleagues with several useful gifts, including a case of cutlery, a biscuit barrel, a table centre and a pair of pictures.

Miss GLADYS E. PEGG, of Hop Exchange, has resigned in view of her approaching marriage, and was presented by her colleagues with a cruet.

Miss EDITH M. PEARCE has resigned to be married, and has been presented by her colleagues at Paddington Exchange with a brass clock, an oak tea-tray, a bed-spread, teapot and stand, marmalade jar, table centre and other gifts.

Miss WINIFRED K. SPENCER has resigned in view of her approaching marriage, and her colleagues at the Victoria Exchange have presented her with cutlery and pictures.

Miss ELSIE H. TWYMAN, of the Victoria Exchange, has resigned to be married, and was presented by her colleagues with cutlery.

Miss CONSTANCE M. GREGORY, of Victoria Exchange, has resigned to be married, and was presented by the staff with a dinner service, and by the supervisors with a cruet, also several other gifts from individual colleagues.

Miss EMILY OBERHEIM has resigned to be married, and her colleagues at Hampstead Exchange have presented her with a clock and a set of carvers.

Presentations—

Mr. C. STEWART SEMARK of the Traffic branch was married on Feb. 1, the ceremony taking place very quietly on account of the serious illness of his mother. His many friends and colleagues in the Traffic branch and other branches of the London Telephone Service presented him with a handsome clock in celebration of the occasion.

The report of the presentation made to Miss G. S. LYNCH, Chief Supervisor, C.T.O., on her retirement, is unavoidably held over until next month.

Death—

Miss IDA E. PERTHEN, Mayfair Exchange.

PROVINCIAL.

Promotions—

Mr. S. J. SWINNERTON, Assistant Traffic Superintendent, Class II, Liverpool, has been promoted to be Assistant Traffic Superintendent, Class I, Liverpool.

Mr. G. JOHNSON, Male Clerical Assistant (Traffic), Liverpool, has been promoted to Assistant Traffic Superintendent, Class II, Guildford.

BRIGHTON TELEPHONE AND TELEGRAPH SOCIETY.

On March 1 Mr. Hare, of the Secretary's Office, gave a most interesting lecture on "Cost and Value," the lecture itself proving far more interesting than its title. There were a good number present, and the chair was taken by Mr. J. F. Horn, Postmaster, Brighton. The discussion following the paper was sustained by Mr. R. A. Dalzell, Provincial Superintendent, Mr. Moorhouse, District Manager, and Messrs. Stretton and E. J. Woods. Hearty thanks were tendered to Mr. Hare for his attendance and lecture.

On Feb. 26 the third and last whist drive and concert in connexion with this society was held at the Pavilion Creamery, Brighton, when well over 100 persons took part in the competition. The prizes were given by various members of the staff so that the whole of the proceeds were devoted to the Belgian Relief Fund, the sum amounting to about £2 10*s*. The whist drive was followed by a concert, kindly arranged by Miss A. Parris, who also accompanied. At the end of the proceedings a large box of chocolates was handed to Miss Parris by the District Manager as a small token of appreciation of her services in arranging these concerts and acting as accompanist. Mr. Moorhouse also distributed the whist drive prizes.

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THE

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CONTENTS.

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TYPEWRITERS AND MENTAL SCIENCE.

NOW that typewriting has become a prominent feature in large telegraph offices, the problems connected with the art deserve consideration by those brought into relation with it, whether as manipulators or as controlling officers. An excellent short statement on the subject from the pen of Richard Herbertz, of Bonn University, was published a few years ago in the *Journal of Applied Psychology*, and as the points discussed are not familiar in this country, a brief summary will, no doubt, interest the readers of this periodical.

The method adopted was to circulate a ***questionnaire*** of seven items to the leading makers of typewriters, and to examine their replies in the light of accepted psychological results. Information was sought as to the reasons affecting the order of the symbols on the keyboard; the merits or disadvantages of visible machines; the relative strain on the memory and mind generally; the provision of a shift-key or, in its absence, of an extended keyboard; the circumstances affecting speed, and choice of type.

Of these questions the most important were those dealing with the shift-key and visibility of the script; the inquiries into speed and strain did not call for treatment apart from their connexion with the two main topics. As might have been expected, the arrangement of letters corresponds generally with that found suitable in ordinary printing; frequently used keys, however, are placed far asunder and struck, as far as possible, by different hands. On this plan, speed is facilitated, especially with combinations often used in common speech. Attempts have been made to improve upon the universal keyboard by the introduction of an ideal key arrangement which places those most often used near to the shift-key, with the object of reducing the number of letters under observation.

The arguments in favour of a small series of keys with a device for changing the symbol were that an extended range would be too big to master; that it would be difficult to learn, and errors would easily arise; that as capitals occur only once in twenty letters, the duplication was not sound economy, especially as the possibility of repairs would be doubled; a further objection was, that an extended keyboard could not be adapted for visible writing. Such a series of keys, it was held, would embarrass the learner and would reduce speed; whilst the loss of time in using the shift-key was so small, its occurrence being usually at the end and not in the middle of words, that it was in practice negligible.

From the psychological point of view there are admitted advantages in the provision of a shift-key, for there is an undoubted diminution of the strain upon the powers of perception and memory. The reduction in the extent of the keyboard tends to facilitate the instinctive touching of the required key and to develop the habitual reflex movement; in this way both accuracy and speed are encouraged.

The opponents of the shift-key were by no means without a formidable case; the touching of a shift-key was asserted to cause a loss of 20 per cent. of effective working time. An experiment of a decisive kind was quoted; if the capital and small letters are touched alternately, first on a machine with a shift-key, and then on a machine with an extended range, the latter requires only about one-fourth the period for the operation. It was computed that a letter requiring the use of the shift-key occupied five times as long as a small letter, or at least 400 per cent. Taking the average of capital letters in the German language which, of course, is high, at one in twenty, we have a loss of 20 per cent. Another interesting calculation takes the six hours' daily work of a moderate typist making four touches a second, a total of 86,400 touches; if 5 per cent. be lost by the use of the shift-key, we have 4,320 touches ineffective, equivalent to 61 lines of copy. On psychological grounds the shift-key is opposed because it fails to associate a uniform image of the symbol with each key; in this way nervousness and embarrassment are introduced. In addition, it is urged that the even flow of the writing is broken by the use of the shift-key and a jolting effect ensues; compared with a shift-key machine the extended keyboard acts like an electric train as against a street omnibus. From the scientific point of view it is not easy to decide the claims of the contending parties. At first glance one is inclined to refer the advantages to the growth of habit; this solution, however, does not answer the question as to which habit it is expedient to acquire. Leaving aside the circumstances of a technical nature peculiar to each special kind of activity, the kind of machine recommended will depend upon the mental endowment of the individual who will operate the machine. Taken broadly, the human race can be divided into three or four classes as regards its capacities for recollecting words: those who remember words with a visual accompaniment of its image; those who recollect the spoken sound; those whose minds retain a clear image of the movements of the muscles in speaking or writing; and those who are a blend of all three modes. A person equipped with the optical gift and weak in motor innervation will probably not find an extended keyboard burdensome, but the shift-key will be a hindrance to him. If one is weak optically but has a strong motor memory he will not do so well on an extended range as on a shift-key machine. The problem resolves itself into a study of individual aptitudes

and any attempt to arrive at universal results, to be applied regardless of personal variations, is not justified.

Coming to the apparently simple question of the relative advantages of visible or invisible writing, we find amongst the uninitiated general agreement as to its value. This view was supported by many of the replies on the grounds that memory is eased thereby; corrections are quickly made; punctuation can be readily attended to; no time is lost in raising the carriage; the learner is helped; and there is greater certainty in typing, especially in tabulated work. On psychological grounds it was claimed that the sight of the script provided the stimulus for automatic activity as in ordinary handwriting, and by association facilitated rapid motor innervation. The supporters of invisible writing denied that the comparison with ordinary handwriting was legitimate. In ordinary penmanship, control is exercised through the eyes on the forms made from their origination to completion; every movement is guided and every stroke and curve directed. It is not so in typing, where a single tap produces a complete symbol, and the hand is separated from the paper by some distance. A false analogy has led people to suppose that the necessity for keeping the paper straight and letters of a uniform size, which is essential in penmanship, also exists in typewriting. The only rational end of visibility is in guiding the formation of the letters, and this is precisely what visible machines cannot provide for. Not only is visibility superfluous, but actually injurious, since it diverts the typist's attention from where it ought to be and occupies it with what has passed. Observation of what is on the paper so far from preventing, actually causes errors. A typist used to a visible will be found to refer so seldom to his script that changes can be made in infrequently used letters on his machine without his discovering them, even when urged to stop at each error. This is put forward as proof that it is beyond the powers of a typist to write and immediately to see what has been written.

Finally, psychological analysis requires a distinction to be made between typing from dictation, from copy, or from one's own thoughts. In the sub-consciousness of most typists are images of the feeling movements connected with certain rhythmic sequences of words. The muscular movement of the hand awaits the stimulus of its appropriate cue; if the after-glance on the paper retards this, and from a strictly psychological standpoint it probably does, delay and possible embarrassment result. Those who care not for such fine considerations will yield to the allurement of visibility, and, for their consolation, it must be said that the possible saving of time by avoiding the raising of the carriage has not been estimated. For scholars and those given to transcribing their mental stores, visible script has the advantage of helping apperception and improving style. Even here, also, individual variations must be allowed for. The apparently inexplicable preferences amongst typists for certain makes of machines will, doubtless, be found to have its cause in some difference of mental equipment of which the individual himself is hardly conscious.

LARA.

"FOR ENGLAND'S SAKE."

Although the song "For England's Sake" has only been published about a month, its sale has more than met the cost of publication, &c., and there is a growing balance in hand for the British Red Cross Society and the St. John Ambulance Association. A first instalment will be sent to the societies in a few days. Messrs. Rowland Hill and B. M. Wylie, of the Accountant-General's Department, will audit the accounts.

The song has met with an enthusiastic reception at patriotic concerts in London and the provinces and in France.

The price is 1*s.* 6*d.* net cash, and copies will be sent post free on application to F. E. Blake, 127, High Street, Acton, London, W., or to the composer, J. S. Engall, 62, Goldsmith Avenue, Acton, W.

WE are glad to learn from *Electrical Engineering* that Mr. Douglas Watson and the staff of the Constantinople Telephone Company are safely over the Bulgarian border. (We have since heard that they have reached Boulogne). According to the *Morning Post* that staff has now been replaced by Hungarians under the control of an Austrian councillor, Eugen Redl.

FIELD TELEPHONY.

BY GEO. W. J. PRAAT (*Traffic Superintendent, Bournemouth*).

THE use of telephones in field operations is of course not a new feature in the Army, but never before have telephones played such an important part in warfare as in the present campaign. Thousands of miles of wire have been laid across the fields of France and Belgium and in the trenches, and many miles more will cross the graves of unrecorded heroes as each succeeding trench is taken. But we of the practical side of telephony know full well that it is another story to work these lines efficiently. It is here that the Post Office has rendered good service to the country by placing the experience of eight of its officers at the disposal of the Army authorities. These men have been employed as instructors in field telephony to Royal Field Artillerymen selected from each division of the new army.

The instruction combined theory with practice, because, as a rule, the signaller has to remove any fault which might develop in his instrument or along the line, and he has to keep the instrument in good working order. The exception is when an artificer is attached to a battery. The syllabus of lectures was framed accordingly, yet could be and was modified considerably to meet the wishes of a particular brigade-major or battery commander. Lectures were given, practical demonstrations were held, individual tuition afforded each man, field operations on a small and a large scale were carried out—frequently accompanying the guns—and in some instances the course terminated with a written and oral examination. Every opportunity was taken to obtain from officers who have returned from the war area the latest dodges and wrinkles, such as new methods of cable laying, the best way to join new kinds of wire, and imparting this knowledge to those who have still to face the difficulties.

Briefly, the course of instruction covered

The construction and connexions of the field telephone.
The principle of signalling and how to acquire a good style of Morse sending.
Articulation, and correct pronunciation of numbers.
Practice in sending and reading Morse signals.
Practice in speaking and listening over the telephone.
Practical work in the field, including the removal of instrument and line faults.

A portable field telephone is an exceedingly useful instrument and fulfils its purpose admirably. Its weight, including leather case, is between 6 and 8 lbs., and comprises a push-button or a key for calling the distant station and for sending Morse signals, a telephone transmitter, a telephone receiver, an induction coil with an armature, and a battery of two small dry cells. Morse signals are read by means of the receiver and thus messages can be transmitted by telegraph or by telephone. When, owing to poor insulation or inductive disturbances or to excessive length of the circuit, it is no longer possible to transmit orders by telephone, communication is maintained by sending the messages by key, or as it is more popularly described "by buzzer." It is even practicable to keep open communication after the line wire has been severed by a bullet. Such a contingency is provided for in the Stevens' portable field telephone instrument by two reserve dry cells brought into action by a simple contrivance which shifts the contact point of the key. If the ends of the wire make fairly good contact with the grass or the earth as much as six feet of space can be bridged over in this way.

As a further instance of the adaptability of a portable field telephone, an existing telegraph line can be utilised for field work if a condenser, provided for the purpose, is interposed between the telegraph line and the field telephone. The direct telegraph current does not interfere with the alternating current of the "buzzer" or the telephone.

With soldiers drawn from all parts of the Empire it is not surprising that considerable difficulty is experienced in getting men with no practical experience of telephone work to understand one another. It is true some assistance is obtained by resorting to analogy, but the Army regulations on this subject could probably

be revised with advantage. One does not say "D for Don" but simply "Don." It was a happy inspiration that evolved "Beer" for "B." It is doubtful however whether a Cockney understands a Scotsman better when the latter says "Esses, Tot, Ak, Emma, Pip" for that useful article of exchange the "S-T-A-M-P." One major intends to ensure success by posting a Scotsman at each end of the wire. What is to happen should one of the operators be rendered *hors de combat* is a secret, but perhaps the major intends to store a few "laddies" in reserve in the ammunition wagon. Of course some words or contractions will always be understood, due in no small measure to intelligent anticipation. Such instances are not unknown in our Service. In the Army "C I" is one, and means reel up and "come in."

It is very difficult indeed to get soldiers to speak over the telephone in a low tone. There are always some who will speak quietly while under supervision, but who sink into ways of ineptitude when the restraining force is removed. One method of dealing with these delinquents is to tap the line *en route*, take notice of irregularities and face the man with them later. A separate receiver with connecting clips affords an easy means to this end. It happened on one occasion that one of the men under instruction had to pass the point at which the commanding officer was listening with the separate receiver. The man quickened his steps to the end of the circuit, apprised his colleague, who immediately shouted to the distant operator "Hullo; do you hear me? The —— colonel's tapping the line up farther, so be careful what you say."

THE MILITARY D MARK III COMBINED TELEPHONE AND TELEGRAPH SET.

By R. Baxter (*A.T.S.*).

A description of the wonderful D Mark III set of apparatus may be of interest to telegraphists and telephonists, as many Post Office officials may yet find their way into the Army. As a certain

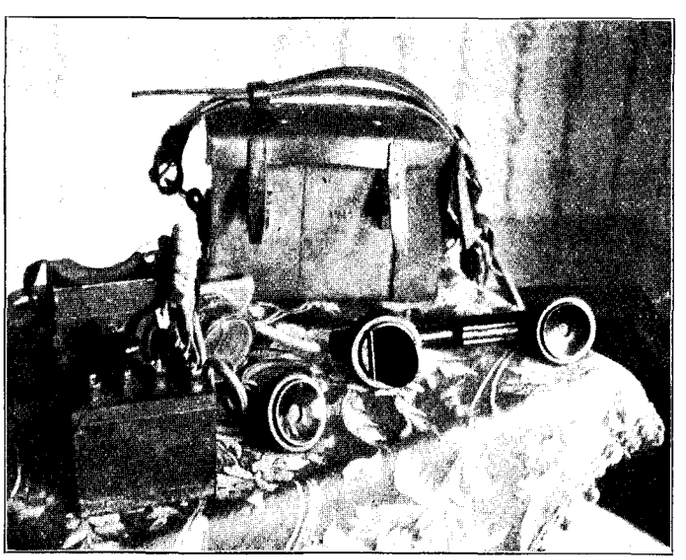


Fig. 1.

commanding officer remarked to the writer: "One can never know too much. This is an 18-pounder gun." He then proceeded to give a description of the weapon, adding "you may yet have to use one." It would probably be well if we could all realise such a contingency, and learn all we can to frustrate a determined and resourceful enemy.

Fig. 1 shows the D Mark III instrument complete. It comprises (1) a signalling key, (2) a telephone watch receiver fitted with a strap for fixing it to the head for Morse reception purposes, (3) a combined receiver and microphone, and (4) a leather carrying case. It is fitted with two dry cells which have sliding contacts, and weighs in all about 8 lbs. The cells are shown in Fig. 2.

Fig. 3 shows the combined electro-magnet and induction coil,

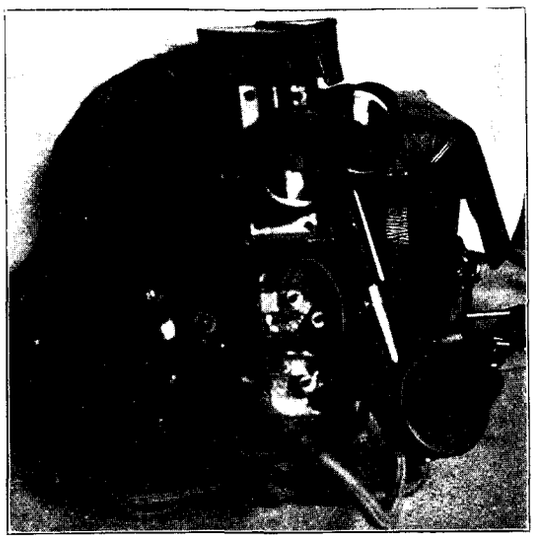


Fig. 2.

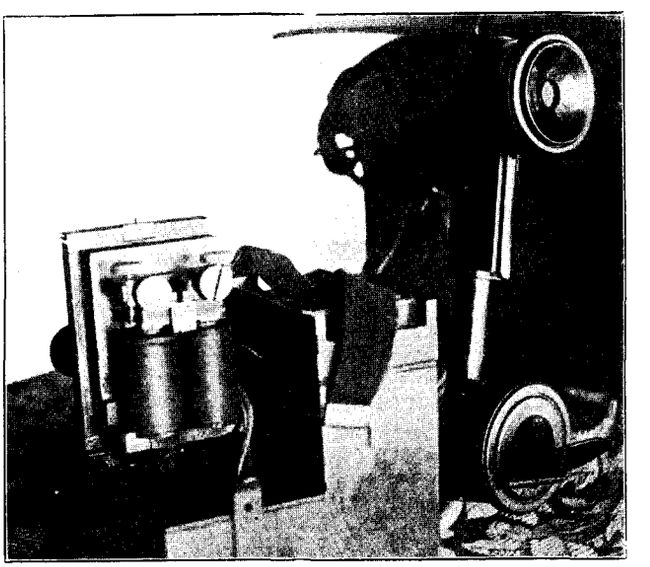


Fig. 3.

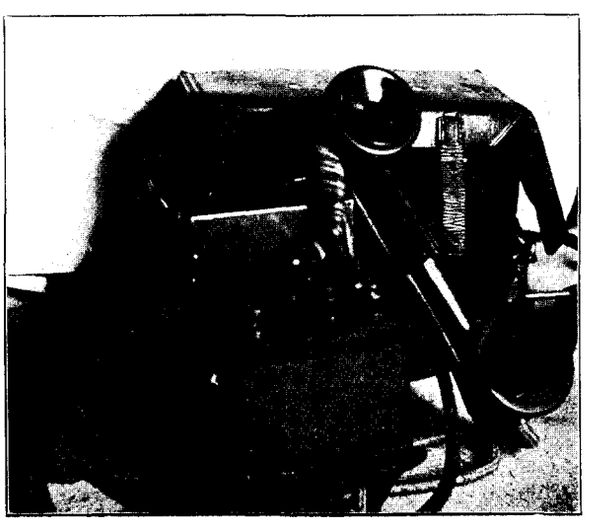


Fig. 4.

which serves to oscillate the buzzer armature, and produce the inductive waves of telephone speech. The armature is situated immediately beneath the regulating screws seen above the coils.

A condenser is fitted to the instrument and is used in connexion with tapping telegraph lines. The base is formed of a brass plate, and by placing the apparatus upon damp soil the need for an earth wire is eliminated.

Fig. 4 shows, to the left, the case of the separate receiver used for telegraph reception.

FIG. 5.

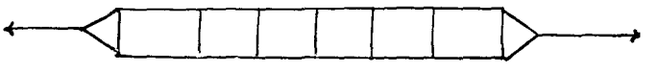
Fig. 5 shows the apparatus being used as a telephone, and Fig. 6 as a telegraph instrument.

In practice the instrument was proved to be capable of producing telephone speech through a disconnexion of one foot where each

FIG. 6.

end of the disconnected wire was touching the earth, and it was found possible to get good strong buzzer (or telegraph) signals through a disconnexion of seven paces and faint readable signals through one of eleven paces, each end of the wire touching the earth. No effect was obtained if the wires at the disconnexion were held clear of the earth.

An interesting and valuable line connexion is used to cover zones subjected to heavy gun fire, shown as follows :—



Examination of such a connexion will show that it can be burst at several points without fear of total line disconnexion.

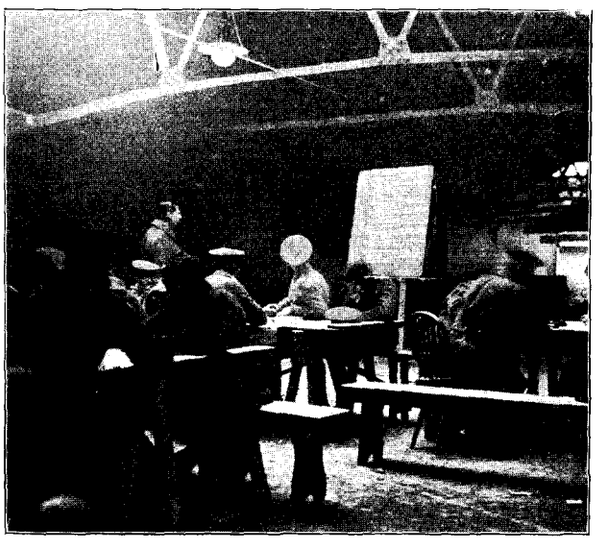


FIG. 7.

Fig. 7 shows a corner of a class-room, and Fig. 8 a portion of a field in which practical demonstration was undertaken. The manner in which men of varying age and vocation have applied themselves to learning, not only flag signalling but Morse telegraphy is worthy of the highest praise. Written examination however

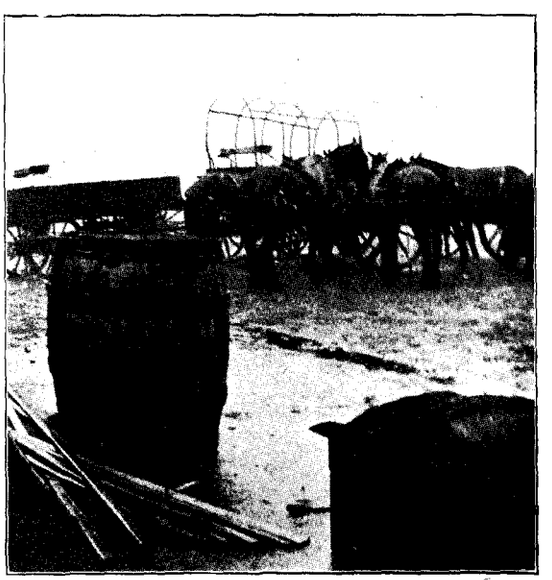


FIG. 8.

showed some were of opinion that practical electricity could be obtained from "lightning" and "rubbing together in various ways"; that the use of a "poorest" pot eliminated polarization, that an "aldinating" current produced effect through a condenser, and that the molecular theory was based on the supposition that articles were formed of "mollycules."

PRESS-THE-BUTTON TELEGRAPHY.

BY DONALD MURRAY, M.A.

(*Continued from page* 99.)

V.

THE previous articles of this series were in the main a sketch of the development of modern high-speed printing telegraphs during the past fifteen years. These years have brought clearly into view a number of fundamental principles which are so obvious now that it is difficult to understand why they were not obvious at the beginning of this twentieth century evolution of machine telegraphy. It is proposed in this article to give a summary of these principles, which will enable readers to understand why the British Post Office and other administrations, including the Western Union, are moving in the direction of multiplex instead of automatic telegraphy.

I have already dealt with the five-unit alphabet in the December number of the JOURNAL. Victory is now assured to it, and I shall therefore mention briefly that there are already over 400 Baudot circuits in various parts of the world using the five-unit alphabet. The Western Union has adopted it, and in a year or two it will be in use on all the leading Western Union telegraph circuits in the United States. The Siemens automatic system now employs it. The Murray automatic and the Murray multiplex have always used it. The Morkrum and the Wright systems have both adopted it, as has also the Harrison system (about which I hope we shall hear a good deal more later on). The success of multiplex printing telegraphy depends essentially on the five-unit alphabet, and those who wish to study in detail the reasons for this remarkable extension of the use of this alphabet may consult my paper on "Setting Type by Telegraph," Institution of Electrical Engineers, 1905, Vol. 34.

THE FIELD FOR THE AUTOMATIC.

In considering the respective advantages of printing telegraph systems we have to keep in view four possible economies as follows :

1. Time.
2. Labour.
3. Line.
4. Office Equipment.

Experience has shown that compared with multiplex systems the only advantage that the automatics can show is increased carrying capacity on very long lines. From a telegraphic point of view the longest of all lines are the big ocean cables, and for reasons that I have already explained, automatics using the cable modification of the Morse alphabet hold the field in connexion with long ocean cables, and will probably continue to hold it for a good many years to come. On very long aerial lines the only automatics that can show substantial line-saving are the Murray automatic and the Siemens automatic. They both use the five-unit alphabet and they both correct from the signals themselves. The Siemens automatic, however, uses distributors at each end of the line, and distributors require anywhere from ten seconds to a minute to establish synchronism. On very long aerial lines interruptions sufficient to upset synchronism are by no means infrequent, and an automatic system that does not instantly re-establish synchronism is at a considerable disadvantage in working on a very long aerial line. Another trouble in connexion with very long aerial lines is that it is difficult to preserve at all times the duplex balance, even if it is practicable to use it at all. The capacity to work simplex is therefore necessary in such cases; but on account of the use of distributors, simplex working with a multiplex on very long lines is difficult and involves much loss of time in reversing. The Siemens automatic through its use of distributors is faced with the same difficulty. The Murray automatic printing telegraph alone shares with the Wheatstone the advantage of being able to work simplex instantly in either direction on a long line and of re-establishing synchronism instantly (in half a second), and it has the advantage over the Wheatstone, thanks to the five-unit alphabet, of being able to transmit 60 per cent. more traffic over a very long line. It is for this reason that the Murray automatic retains a good though limited field in Russia and a few other countries with very long aerial circuits Whether it will pay to break up these long circuits and work them in sections with multiplex apparatus and perforated tape retransmission is a question for the future. Up to the present all telegraph administrations have preferred to work these long circuits direct, and as long as direct instead of sectional working is wanted on very long aerial lines the Murray automatic enjoys unique advantages for such circuits.

Looking at the matter in another aspect, the main strength of the multiplex systems lies in their numerous low speed channels in each direction on one wire, but the longer the line the fewer the channels, until when we have a line that will only give say 50 words a minute with the five-unit alphabet we reach a point where it is difficult to get more than one channel each way with the multiplex, and it is then down to the level of the automatics with one channel each way—with the additional disadvantages of the multiplex for long lines already mentioned. On shorter lines where the automatic printing telegraphs have to be worked at a high speed to compete with the multiplex systems, the automatics suffer severely through wear and tear of their printing and other mechanism. On very long lines, where the speeds are necessarily low, they are relieved from this high speed strain. In fact it may be accepted as a fundamental principle proved by experience that "high speed kills automatics."

THE DISADVANTAGES OF AUTOMATICS.

For all land lines of ordinary length up to say 1,000 miles, the following is a summary of the grave disadvantages of the automatic printing telegraph systems compared with multiplex systems :—

1. There is considerable loss of time in transmission, because messages have first to be perforated in batches of at least one or two and usually three or four. They have then to be handed over to the transmitter attendant to be passed through the automatic tramsmitter. This entails a delay of anywhere from five to ten minutes. On a very long line such a delay is of no practical importance, but on shorter lines it is a serious handicap.

2. There is further and quite serious loss of time in getting corrections and replies to enquiries (RQs), because there is only one channel in each direction on one wire. On a short line with heavy traffic only most careful organisation can prevent serious confusion and delay on an automatic system if RQs are at all numerous. Delays of 30 minutes from this cause are by no means uncommon with automatic systems. On very long lines with low speed and less traffic the delay from this cause is less and also less important.

3. In regard to labour saving, automatic systems suffer from the inherent drawback of an extra attendant to feed the transmitter. Also the trouble in getting RQs seriously reduces the labour efficiency. The concentration of all the printing in one printer should save labour, in theory, but in practice it does not, because one operator cannot possibly watch the printer and check all the messages as well as the RQs on a busy circuit with heavy traffic. On very long lines the traffic is necessarily smaller and the value of the line is so great that it pays to waste some labour to increase the carrying capacity of the line.

4. It is only on very long lines that the automatic can show any line-saving compared with multiplex systems. On all lines up to 500 and probably 1,000 miles, the automatics are completely out-classed by multiplex systems so far as carrying capacity on the line is concerned. With automatic systems the limit of speed is about 160 words a minute and the commercial working speed may be taken as not exceeding 140 words a minute. With multiplex systems 180 words a minute (1,080 letters a minute) is a commercial working speed. This speed has been used with the Baudot for years, and it is by no means the limit, which will probably be found to be somewhere about 240 words a minute in each direction.

5. In regard to office equipment, automatic printing telegraphs come out badly, because it is necessary to have them more or less in duplicate to avoid interruptions to traffic, and the apparatus is in any case more expensive than the multiplex. The necessity for duplication adds gravely to the capital cost.

6. With the Wheatstone and Murray automatic systems a serious item is the cost of paper tape. For handling 1,800 messages a day the Murray automatic used about £100 worth of paper tape

per annum compared with £14 worth used by the Murray multiplex for the same number of messages. With the Wheatstone automatic, including a receiving perforator and printer, the comparison is £80 a year for tape compared with £14 a year for the Murray multiplex.

ADVANTAGES OF THE MULTIPLEX.

The advantages of the multiplex may be summarised as follows:

1. There is practically no loss of time in transmission. Transmission with the Baudot is direct. In the Murray multiplex, with perforated tape transmission, the delay between perforation and transmission is reduced to a few seconds (three seconds if necessary) and transmission takes place while the message is being perforated. No automatic system can approach this briefness of delay in transmission.

2. As there are a number of separate channels with multiplex systems, corrections and enquiries (RQs) are very easily and quickly dealt with. From four to eight RQs can be handled simultaneously on from four to eight channels of the multiplex. Also each RQ goes over its own channel and is received on the printer adjoining the sender of the message, so that each pair of channels is equivalent to a Morse duplex in the facility of handling RQs. The multiplex in this respect presents all the advantages of the Morse key and is greatly superior to any automatic system. The RQ trouble is one of the worst features of automatic systems when working at high speed with much traffic.

3. The labour-saving with the multiplex system, and especially the Murray multiplex, is much greater than is possible with any automatic system. In fact it is doubtful if there is any appreciable "quantity" labour-saving with any automatic system compared with the Morse key and sounder. There may possibly be a saving in the "quality" of the labour employed on the keyboard perforators, but if such a saving is possible with automatics, it is equally possible on the multiplex keyboard perforators, and with the multiplex there is a considerable saving in the "quantity" of labour. At the sending end of the line all the operators on the multiplex are keyboard operators. There is no extra attendant to feed the messages into an automatic transmitter. With the Murray multiplex the transmission is entirely automatic and the typists devote their whole attention to perforating the messages on their keyboards. The great facility with which RQs are dealt with also relieves the sending operators and enables them to handle more messages per hour. Page printing on the multiplex also gives the printer attendants time to assist the sending operators by signing and timing their messages, thus increasing the number of messages transmitted. Further important labour-saving can be effected with multiplex systems by means of "echelon" or series working. Radiating networks or forked circuits with the multiplex also effect time and labour economies not possible with automatic systems. The operator averages per hour obtained by the British and other administrations, as the result of experience extending over some years, leave no doubt about the very marked economy of labour with multiplex systems compared with automatics on all circuits, except those of great length.

4. Reference has already been made to line-saving. For distances up to at least 1,000 miles, that is to say for all distances in the British Islands, the multiplex can beat the automatic so far as carrying capacity on the line is concerned. The maximum speed of multiplex systems is higher than that of any automatic, and the percentage utilisation of the speed is much better with multiplex systems than with automatics, in all cases where the line is not too long to permit of several multiplex channels being obtained.

5. So far as office equipment is concerned, the multiplex systems cost little more than half what the automatic systems cost, the reason being that with multiplex systems the apparatus is, by the very nature of the thing, duplicated several times at each end of the line. Hence if one printer or one transmitter breaks down, it only means the stoppage of one channel out of several in one direction. With an automatic system a stoppage of the transmitting or printing mechanism stops the whole circuit in one direction. To avoid this calamity it is necessary to have the whole automatic apparatus in duplicate, so as to provide a working and a reserve set. Automatic apparatus being high speed is also necessarily more costly in construction than the low speed apparatus required for multiplex work. Automatic working is like lighting a room with electric lamps in series. If one breaks, the whole room is in darkness. Multiplex working corresponds to the usual multiplex arrangement of electric lighting. If one lamp breaks the other lamps continue in service.

6. An important practical advantage of the multiplex systems, such as the Baudot and the Murray, is that the speed of the individual machines is low. The wear and tear therefore is much less than with automatic systems, which depend for their carrying capacity on the high speed of one machine. With the multiplex even 180 words a minute on the line is obtained with a speed of each instrument of only 40 to 45 words a minute. Low speeds mean low maintenance costs.

7. The important saving in paper tape with multiplex systems compared with automatic systems has already been pointed out.

8. Multiplex systems have the great advantage that the speed on each channel being low, 40 to 50 words a minute, there is plenty of time for the printers to print direct from the line signals. The advantages of direct printing in saving time, labour and paper tape are obvious. In systems such as the Murray automatic, which perforate tape at both ends of the line, the delay and waste of time and labour and tape at both ends of the line is serious with high speeds and heavy traffic. With low speeds on very long lines these disadvantages are correspondingly reduced and more than counterbalanced by the importance of the increase of 60 per cent. in the carrying capacity on the long line.

9. Multiplex systems have an advantage over automatic systems in greater ease in varying the strength of the staff to suit the traffic. For instance, with a multiplex working quadruple duplex, two, four, six or eight channels may be opened or closed in accordance with traffic requirements. With automatic systems this labour-saving is a good deal more difficult to arrange satisfactorily.

10. The multiplex provides in a very convenient way for the reperforation of messages at the sending station. The reperforated tape is produced *simultaneously* with the printing of the message in page form *direct* from the line signals, and the reperforation is under the control of the sending operator at the distant station, so that he can reperforate or not reperforate messages as required. As the result, all reperforated tape is intended for retransmission. Where all messages are reperforated indiscriminately, those for retransmission have to be sorted out, a time and tape wasting plan.

11. Owing to their low speed and comparative simplicity, multiplex systems are easier to understand, easier to adjust and run, and easier to maintain than any automatic printing telegraph.

12. It has always been supposed hitherto that for news work automatic systems, such as the Wheatstone, have great advantages over any other. Careful investigation, however, shows this to be a mistake, and the Murray multiplex at any rate has special advantages for news work. It is certain that multiplex apparatus will be installed all over Great Britain within the next few years, just as arrangements are already being made to instal the Western Union multiplex all over the United States; and it stands to reason that the multiplex network of machinery all over the country will not be allowed to lie idle at night if it can be utilised for news work. Multiple tapes can be prepared with great ease for simultaneous transmission over a number of multiplex circuits, and the Murray multiplex page printer, being a type-bar machine, is a fine manifolder, thereby providing forthwith plenty of duplicate copies of messages in page form at the receiving offices. The improved Murray multiplex synchronism is also so good that there will be no difficulty in working YQ circuits. The facilities offered by the multiplex for reperforation and retransmission of Press messages are excellent, and the cost of the tape for transmission and retransmission is only about one-third of the cost of the corresponding Wheatstone tape. For the smaller news circuits I am in hopes that the Harrison tape printer will come in as a valuable auxiliary, forming, with the multiplex, a complete network all over the country for the transmission of news, as well as commercial messages.

The foregoing analysis of the advantages and disadvantages of multiplex and automatic printing telegraph systems is not mere theory, but is based on actual experience extending over fifteen

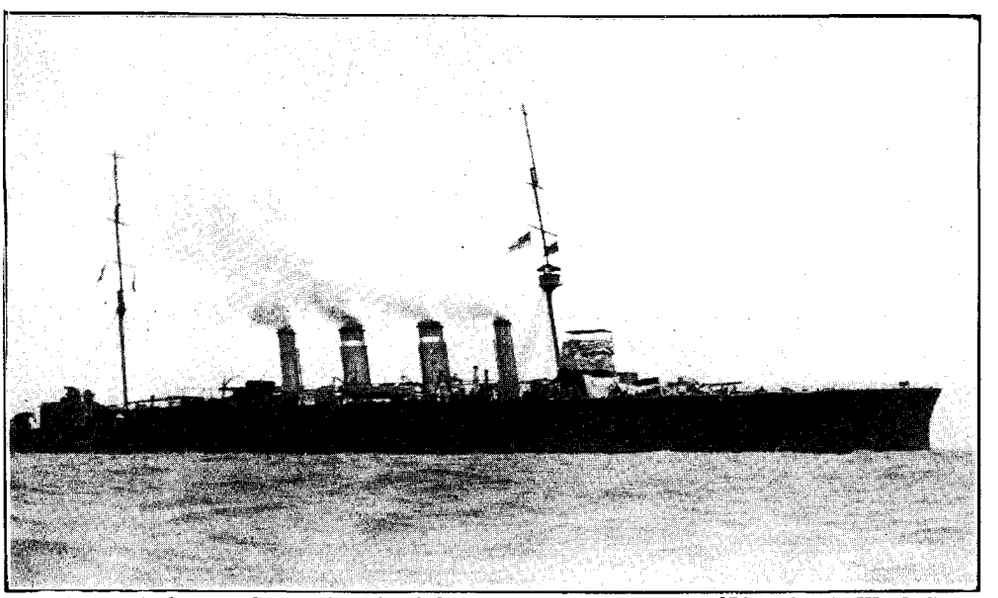
years. I occupy the unique position of having invented both an automatic and a multiplex printing telegraph and of having had them constructed and tried on ordinary commercial telegraph traffic for some years. I therefore speak on the subject without prejudice and with the authority derived from experience.

The sixth and last article of this series will be devoted to an illustrated description of the main features of the improved Murray multiplex printing telegraph.

(To be continued.)

THE RAID AND CAPTURE OF THE "EMDEN."

BY the courtesy of the editor of the *Zodiac*, the extra-official organ of the foreign service cablemen of the Eastern Telegraph Company, we reprint some pictures of the raid and capture of the *Emden* off the Cocos Islands. The lively first-hand narrative of their correspondent, Mr. Phil Andere, is too long for reproduction *in extenso* here, but we are permitted to make some extracts from it.



H.M.A.S. *Sydney* at Cocos after the fight. *[Photo by A. W. J. Peake.*

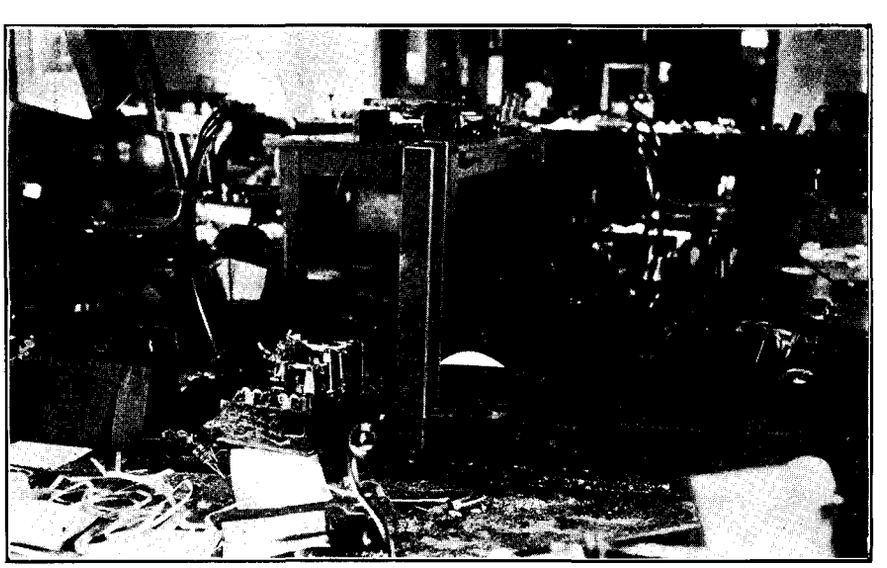
We had been surprised (says the article, referring to the hurried departure of the *Emden*) at such an early hour that many of us had seen nothing of the *Emden* except the crosspiece of her wireless aerial, which showed above the palm trees on the west point of the island. There was naturally a rush to the barrier as soon as the launch and boats had departed, to see the German cruiser as she steamed away.

The *denouément* of the morning's excitement was worthy of the best traditions of the old Adelphi Drama. In fact one might go so far as to say that it could never have been printed except between the covers of a "penny blood." Scarcely had the *Emden* cleared the island by some 500 yards and hoisted the German ensign to the truck of both masts when another warship was seen tearing up at full speed from the nor' nor' east. The general conjecture was that she must be the *Minotaur*, but later opinion favoured the *Newcastle*.

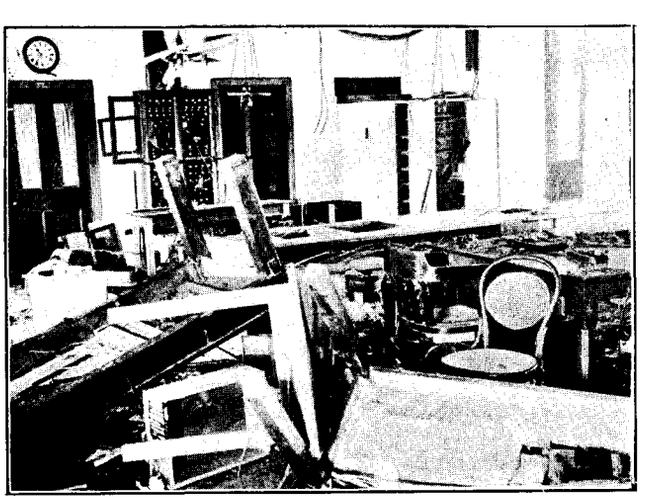
Little time was left for conjecture, however, for scarcely was she sighted than she commenced to fire.

Then followed a spectacle it is given to few landsmen to see—a naval engagement on the high seas.

The *Emden* promptly returned our fire as she continued on her northerly course, but being to leeward the boom of her guns was scarcely audible. The range at which they opened fire is variously estimated at from three to six miles, and after the first few shots a cloud of black smoke settled over the British boat like a pall, so dense in fact that most of us thought she must have been hit and taken fire, but the cheering sight of the flash of her guns as it



Office after *Emden's* visit. *[Photo by R. Cardwell.*



Interior of office after Germans had left. Not a single instrument of any description left standing. Communication on all three cables restored within 24 hours. *[Photo by R. J. Saunders.*

During their brief stay the Germans systematically smashed all the apparatus and cut the cables, not, however, before the superintendent had found time to communicate with London and three other stations with which cable communication was obtainable. They, however, behaved with the consideration which has been a happy characteristic of the officers of the *Emden*.

darted through the smoke made us hope that she was stoking furiously to get speed of the *Emden*.

Meanwhile the latter was answering broadside for broadside, making a splendid picture in her light grey paint, standing out smoke free and clear-cut against the blue background of the ocean; spitting viciously like a wild cat as our shells fell all around her and sent up huge white-crested columns of water.

As a spectacle it was magnificent, but from where we were it appeared to be darned bad shooting on our part, as shot after shot, whole broadsides of them, went over or beyond, or fell astern of the *Emden*.

The Britisher was now so shrouded in smoke that except for an occasional spouting as a shot fell short or went over, for all we could tell each German shell might be finding its mark. Later we found the range, and several shots seemed to drop right alongside the *Emden*, sending the water half-way up her masts.

I think most of us were too intensely excited to cheer, and vented our joy or chagrin at the success or otherwise of each shot in grunts and gurgles. Meanwhile the Britisher was getting further and further away from us, and appeared to be heading off the *Emden*, who continued to fire incessantly, first from her forward then her after barbettes, whilst we replied with a ceaseless cannonade which seemed to have no effect, as the *Emden*, still easily discernible to the naked eye, looked as sprightly and as game as ever.

At this juncture we onlookers were recalled from our point of vantage by one of our old friends, a German officer.

It appears that the party of them had scarcely got half-way out of the lagoon when the *Emden* hauled up her anchor and put to sea, leaving them to their own resources.

The launch and both cutters had returned to the jetty and disembarked the crews, who had set up their four maxims along the path to the settlement.

The German flag was planted in front of the mess-room, and we were for the second time made prisoners of war and put under martial law, which included the liberty of kicking our own heels in the boat-shed.

Four of our number—whether by good-fortune or good scout-craft may never be known—managed to evade the Germans who rounded us up, and saw quite twenty minutes more of the sea fight, further news of which we could not obtain from the German officers and men standing on the roof of the mess-room.

It appears that, shortly after we were recalled, one of the *Emden's* funnels was seen to crumple up, after which she went away "stern on," but on manœuvring round again a second funnel was placed *hors de combat*, which seemed to demonstrate the superiority of our shooting or the longer range of our guns; certainly the latter, as she several times tried to run in close to avoid being outranged.

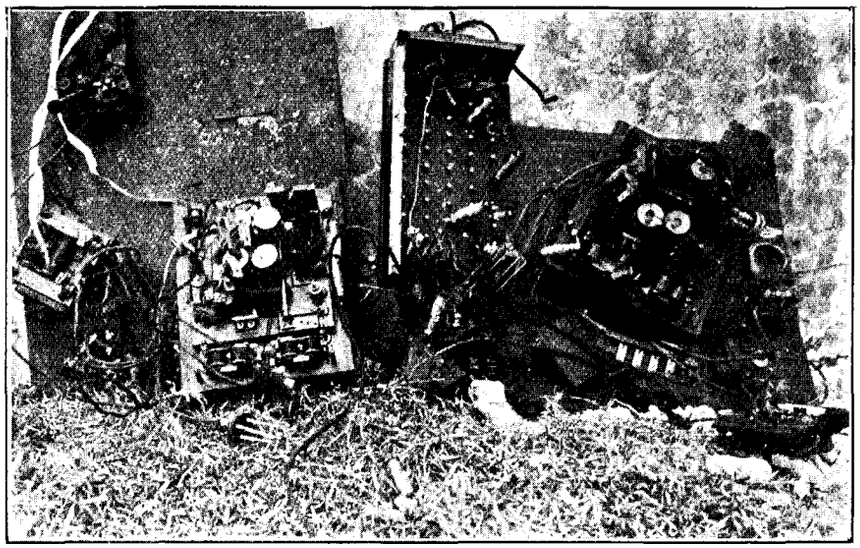
A little later, when she was "bow-on" to our ship and at right-angles to the onlookers ashore, a shell was seen to hit the foot of the foremast, tear it out and topple it gently overboard.

The *Emden* then swung away to port, still blazing away merrily, until a shell struck her "aft," and she commenced to vomit clouds of white smoke, amidst which tongues of flame shot skyward, and she continued to burn until both ships were "hulled down" and nothing but their topmasts were visible amidst the smoke.

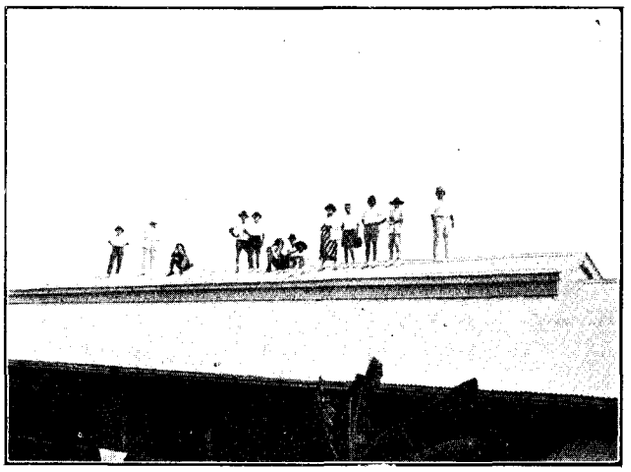
Having seen all there was to be seen, the fortunate four returned, and were placed under guard with the rest of us. The last of our number came along half an hour later; this was our embryo Press correspondent. He came along rubbing his eyes and explained that he had fallen asleep on the beach and had awakened to find ten yards away from him a party of Germans with a maxim.

Those Germans who had been unable to rejoin the *Emden* judged it prudent to commandeer the schooner *Ayesha* and make their escape, leaving their British prisoners once more at liberty. On the approach of the victorious *Sydney*, the staff bolted for the jetty, and a boat hail asked "Are there any Germans ashore?" to which we replied in the negative. The first cutter had a German aboard, presumably to act as interpreter if the occasion required it.

The crew then told us that the *Sydney* had smashed the *Emden* to scrap-iron, and she had been forced to run aground in North Keeling, an island isolated from the main group, and some fifteen miles to the north, where she remained a total wreck, with no funnels or bridge, and only her afternast standing. The officer in charge requisitioned the services of our doctor and one of the staff to assist him, also all our medical stores. They were in a hurry to return to the *Emden* to take off prisoners and tend the wounded. The boats' crews were ashore just long enough for us to hear numerous yarns and give them a filling of well-deserved beer. They said that the action lasted 80 minutes, and that the *Emden* was game to the last; even when aground and with only one gun working they refused to surrender. Captain Glossop, of the *Sydney*, said he felt ashamed to do it, but he had to give her one more broadside.



Some K.P.'s and a bridge. *[Photo by R. Cardwell.*



Watching the fight from the roof of the Telegraph Headquarters. The *Sydney* visible on horizon. Only mast of *Emden* visible. *[Photo by R. J. Saunders.*

Three of the staff went off in one of our boats to see what she looked like, and were invited on board. As she was on the point of leaving the visitors could only take a hurried look round, but they could not discern a scratch on her—which seems incredible in a cruiser just come out of action. Everything was perfectly clean and in order, and she even had her rails up. The only unusual sign was the blistered paint on her guns, which is not to be wondered at when it is remembered that she fired close on 600 rounds. The yarns told by the men were numerous, and at times contradictory. One gun-layer stated that the *Emden* fired the first shot and then the *Sydney* opened at 11,000 yards. Another gunner said the *Sydney* fired the first shot at 7,000 yards and hoisted a signal "Come out and fight!" to which the enemy responded with a broadside. A third yarn says that the *Emden* fired a torpedo which missed the *Sydney* by twenty yards!

Return of the Germans after failing to rejoin the *Emden*. German flag hoisted, and island placed under martial law. *[Photo by R. J. Saunders.*

The first man killed on the *Sydney* was the range finder, who was hit by a shell which carried on and nearly scooped up the captain, but did not

explode. This shell damaged the range-finding apparatus, we were told, which accounted for the bad shooting early in the engagement.

One shell lodged under a gun-shield on the unengaged side of the *Sydney*, killing three and wounding sixteen, these being our only casualties. A jolly old bo'sun told one of us that the crew were mostly youngsters, and he had thought they would bolt at the first shot, but he was delighted to see them stick to their guns with the greatest eagerness. Later in the fight they became so keen that each gun-crew after firing a round would run out from the shield and cheer at the effect of the shot, thus exposing themselves to great risk.

We heard that one of the *Sydney's* shells landed on the deck of the *Emden*, burrowed under it, and blew a gun with its whole crew completely overboard, four of them being picked up some seven hours later, having been in the water all that time.

At about 9 a.m. the *Sydney* left, expecting to be back at dusk, but she did not turn up. In the meantime the two ends of the Perth Cable were dragged together, triced up to the bow and stern of a cutter belonging to the *Buresk*, a German collier accompanying the *Emden*. The *Sydney* had found the *Buresk* off North Keeling Island, but had been obliged to sink her as the sea-cocks had been opened, and there was four feet of water in the hold. Her cutter, however, came in handy, for the cable being picked up in this fashion was joined through from bow to stern with wire, thus re-establishing communication with Perth—the only cable that had been properly cut!

WITH THE BAUDOT IN CEYLON.

By H. W. PENDRY (*Central Telegraph Office, London*).

TRAVELLERS not infrequently reach Ceylon prepared to find very primitive manners and methods. Perhaps some descriptions of life in this beautiful isle of the eastern seas give support to these notions; for one reads that bulls are used almost exclusively for ordinary draught purposes, and the pictures of the oxen yoked to their palm-leaf covered waggons, together with illustrations, such as that accompanying this article, of the early type of native canoes and the inhabitants of a fishing village, certainly provide good ground for such ideas in the mind of the European visitor.

Nevertheless within a few minutes from the time of landing at Colombo it becomes apparent that West and East have met and that the latter has surprisingly responded to the contact.

You see a large red G.P.O. motor van swinging along York Street towards the jetty, hooting to obtain quickly a clear course between the rickshaws, hackeries and bull-waggons. In the roadway too, it is noticeable that there is a large number of pedestrians, Sinhalese and Tamil, loosely clad in white, many of whom shade themselves with an ordinary black umbrella.

The Sinhalese at once arrest attention owing to the curious manner of the men's head-dress—their hair being worn long, twisted into a knot at the back of the head and held in position by a large erect tortoiseshell comb.

The buildings in this portion of the city, the "Fort" (so called from the period of the Dutch possession), are handsome and well built, with many stories, shady arcades and verandahs. Within a short distance, however, are native "boutiques" which are little better than sheds.

After passing under the fine avenue of flowering shade trees which overspread York Street, we turn into Lower Chatham Street, another wide tree-planted thoroughfare. This promises to form Colombo's Whitehall, for already important public buildings are to be found on either side. Ranged with them, and quite in keeping with its handsome neighbours, is the light stone-coloured structure which houses the Central Telegraph Office, the Telephone Exchange, the "Eastern" cables, and the Telegraph Traffic and Engineering Departments.

In the telegraph instrument room the impression conveyed by the suitably arranged apparatus and the smart well-dressed intelligent-looking operators in their cool white suits, was distinctly favourable. The familiar sounder signals, clicked out sharp and crisp, furnishing evidence of quite average ability and manipulative skill on the part of the Ceylonese telegraphists. Not a few of them also type well at the dictation of the sounder, although it seemed strange to find an "Oliver" on the receiving side of a D.C. duplex in the Orient.

Besides being well supplied with electric light and large fans, the Colombo C.T.O. has an installation of a cord message carrier, modern battery distribution, several quadruplex and Morse duplex, and latterly a duplexed Baudot.

In extent and fittings the room compares well with any up-to-date telegraph office in an English provincial town, but none of the latter can surpass it for its splendid position and the free course of light and air that is obtained.

Prior to the introduction of the Baudot the traffic pressure on the Colombo-Madras lines was partly met by supplying "markers." This was the provision of an extra operator for filling in the signalling particulars of the messages so that the sender could operate the key without a break or pause. It is well-known, however, that such rapid continuous manipulation of the Morse key soon impairs the efficiency of even very good operators.

It was proposed to substitute a double Baudot for one of the Morse duplex circuits. The success of this two-way Baudot arrangement in India encouraged the hope that an 800-mile line, although having a submarine section, might carry it equally well with the provision of a repeater at Madura.

Some delay occurred in obtaining the Baudot apparatus, and in the meantime the operators were initiated into the alphabet upon dummy keyboards, made in a few days by a Sinhalese carpenter. The combinations were readily learned and the fingers trained, from the outset, to conform to the correct "cadence" time which was obtained on a sounder from a motor-driven receiver. An opinion had been expressed that the most suitable operators to train for the

A FISHING VILLAGE NEAR COLOMBO.

Baudot instrument would be comparatively fresh hands, as the facility with which they became proficient in the Baudot alphabet would depend upon their ability to forget Morse. Long experience opposes this view. Among the best Baudotists have been also expert Morse operators who have however welcomed the opportunity to learn the French instrument on account of its easy style of manipulation and greatly reduced number of movements compared with the Morse key. The signaller's efficiency for the older system is improved, rather then impaired, by the alleviation afforded in the use of the Baudot apparatus.

The Ceylonese telegraphists were not much behind their Western colleagues in their appreciation of this wonderfully perfect printing machine. The sending ability of nine operators after five months' actual experience showed the following rates:—

Number of operators.	Average number of messages per hour.
1	70
2	66
1	56
1	54
2	50
2	45

Without doubt a later test will show a considerable improvement and probably all reach the higher total if not pass above it, for the writer has seen a quadruple duplex Baudot dispose of 608 messages during an hour's working—an average of 76 per operator.