

THE
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COST AND VALUE.*

BY E. HARE.

NOT uncommonly we are prone to appreciate the tyranny of words only when associated with legal phraseology, chiefly because ambiguity in that connexion usually implies that one of the parties involved suffers thereby in a very direct and substantial way, *i.e.*, in pocket. It is bad enough when a word will bear two or more constructions, but when it becomes entangled in a misty context, hopeless confusion ensues in the lay mind, needing the interposition of argumentative experts, not to decide the meaning of the word, but the intention of the person who originally used it, whose intention and construction may differ widely from that of the person to whom it was addressed. Thus you will see that if every word had but one meaning, and no other meaning could be read into it, the trained interpreter of legal and other documents would find it hard to live, and the troubles which arise from misapprehension and misconstruction, wilful and otherwise, would vanish.

Take the simple word "cost"; we use it every day and when we use it, we know or think we know precisely what we mean, and, ordinarily, have no need to qualify it; but if we have occasion to qualify it we may find ourselves involved in some difficulty. The sense in which we most commonly use it is in the parting with money for something we want; and, having completed the transaction, we say we have purchased something—a book, for example—and that it has cost us so much. And this coincides with the modern dictionary meaning of the word, which we find to be "the price charged or paid for a thing."

On reading this interpretation, the question immediately occurred to me: Is this the original meaning or is it quoted in deference to its present common acceptance? For in my view it is decidedly cloudy, inadequate and misleading; if not wholly erroneous. In the first place the price charged for a book is not the cost of it, and in the second place, the piece of money you part with in exchange for it is but the token of something which you have done for someone else. Therefore this piece of money, which is your possession, is to you and to the bookseller merely the equivalent of the book. He parts with the book which, in

itself, is of no value to him, and you part with the money which in itself is only of value to you so far as you can exchange it for something else. The money is not the cost of the book to him because he has added something for profit, while to you the money represents the cost of some work which you have performed and you now exchange it for something which you hope will prove to be equal in value to the work you have performed to earn it.

The real cost of the book lies, first, in the remuneration paid to the author and, second, in the actual cost of printing, binding and advertising. The profit added at different stages is not part of the cost, for it is not represented by any work expended upon it.

There is another aspect of cost which is governed by quantity. Suppose, for example, only one copy of a book were published or even that the author's manuscript only were available; the result would be that although the cost of production would be infinitely less, you would probably have to pay as much or more for the hiring of it than if it were purchaseable outright; or, in other words, you would have to perform the same or more work on behalf of someone else; there would have to be as much or a greater cost of energy on your part, before you were in a position to acquaint yourself with the work of the author, although the value of the book to you would be the same.

But value and cost are two very different things. The cost of a thing is, as we have seen, purely a question of labour; the labour, on the one hand, involved in the cost of production and, on the other, that exerted by the purchaser to obtain possession of the product—of which the coin which he exchanges for it is but the token. Even the material of which it is composed costs nothing and stands for nothing until labour is expended upon it. You may buy a forest and call it potential timber, but the act of purchase in itself represents expenditure of thought, planning and negotiation, *i.e.*, labour. A sheep is worth nothing until it has been killed.

When we come to value we come to something far less tangible than cost, often hypothetical and frequently undiscoverable. An article may be valueless—fit only for the scrap-heap—as a book which neither interests nor teaches; or worse than valueless, positively harmful, as when the teaching or contents of the book are pernicious; or of undiscoverable value as when we know not to what extent our actions or lives may be influenced by the good the book contains, or to what use we may put it. This is so far as

* Paper read before the Brighton Telephone and Telegraph Society.

the buyer is concerned; in itself it is of no value to the seller; his object being to exchange it for money which again he will exchange for something else. By which we see that all such transactions are really matters of barter or exchange reduced to an easy method by the medium of coin of the realm.

Shortly, therefore, neither the cost nor the value of a thing is truly represented by the sum of money charged or paid for it.

You may possibly think that all this is verbal affectation, a mere juggling with words, that I am really putting, not a real but an artificial construction on quite ordinary terms which they will not bear in actual and common practice. Let us see if this is so. When we speak, for example, of the cost of a town hall on which say £15,000 has been spent, what we have in our minds is not a pile of 15,000 sovereigns, nor even of the rate of a penny or so in the £1 which has been levied upon us individually to provide that sum of money, but of workmanship of which our money is the symbol; the cost lies in the expenditure of human toil and human invention, and the money only conveys to us some idea of the army of labourers and artisans who have lived for a time on the work they have produced. The structure has been reared at a cost of human energy, and whether that energy has been kept alive by payment in kind—as in days of old—or by money to be exchanged for kind, is of little importance.

To make the point clearer, here is a homely illustration. There was, many years ago, an old man, intellectually well endowed, in the service of the United Telephone Company, who had fallen upon evil days and was in receipt of small pay for book-work of a comparatively mechanical nature; and he was allowed to undertake for a firm in Liverpool the revision of a marine code. He told me that by means of this special work he was enabled to gratify a special wish, viz., the purchase of a particular and expensive edition of the, then, new translation of the Bible; and he associated this purchase, not with the money he paid for it, but with the work which the money represented. Thus, the cost of the book was the cost of his labour; the money was merely the intermediary. But, for all that, the whole transaction is correctly expressed by the word "cost"; and if he had been possessed of unlimited wealth this word "cost" would have become weaker by comparison; in fact might have become meaningless; for where there is no effort there is no cost. Because, if you part with a thing which can immediately be replaced without effort on your part there is no loss, and again, no cost.

Demonstration of the false construction frequently put upon the word "value" is easier. The value of a town hall bears no relationship to the cost of it; the cost is ended with the completion of it, while the value lasts until it is demolished, or even as long as the object for which it was erected endures; while, inversely, the intrinsic value of the material of which it is composed begins to depreciate as soon as it is built. Even if it were sold, the price paid for it would probably depend on the use to which it would be put. So, likewise in our book metaphor, the value of the book has no reference to its cost, nor even to its contents, but to the effect of its contents on the reader. You may destroy the book, but the value of its contents remains.

It is an old complaint—30 years old to my own knowledge—that the telephone service costs the user thereof too much, by which is meant that the sum charged to the public for all that they see and are able to understand in a telephone call is too high: but what they see and understand is necessarily very limited. They know, of course, that the apparatus before them has been manufactured at a price, as also that there is a physical connexion between that apparatus and the apparatus at the other end; and they know further that two operators for the time being are at their disposal; but they have no idea even of the cost of this seemingly very easy and comparatively inexpensive part of a telephone system. They consider nothing of the training each of those operators has undergone to attain proficiency, to acquire alertness and patience and to avoid mistakes; they know nothing of the requisite supervision; of the minds of inventors continually at work to devise improved methods—and who do not exercise their brains for their health's sake—nor of the army of men and women continually engaged in keeping their accounts, the cost

of whose work might be substantially less if the accounts were settled with greater promptitude. These and a hundred other appurtenances of the business are invisible and undreamt of; the visible part is only a fragment of the whole. If we could put all these things in our windows like the owners of some great store or make the cost of upkeep as spectacular as the inside thereof the suggestion of excessive charges might be modified. Even the casual purchaser in some large drapery establishment little reckons what a comparatively small portion of the eighteen-pence or eighteen pounds he or she spends represents the mere manufacturing cost of the article purchased; that not only the gorgeous decoration of the place, the brilliant illumination and the army of salesmen are distributed over the prices charged to customers, but that allowance has to be made for the undue time occupied by some of the said customers to make their selection; and yet all these things are plainly apparent. The salesman who serves you probably knows that there comes a point when excessive urbanity and patience on his part would have a material bearing on the margin of profit, and has to draw a subtle line between a desire to satisfy and the need to get rid of you as speedily as possible.

In our case speed is the very essence of the commodity we distribute, and we have neither time to parade our courtesy nor opportunity to display the complex ramifications of our machinery and accessories. Nevertheless they are there and must be paid for.

On some occasions when this complaint as to the charge being too high has been made to me, I have answered it with this question: "How do you know it is?" And the replies have varied: such as, "it is cheaper in every other country"—a wild statement gathered from hearsay—or, "it is more than I can afford," which is sometimes true and sometimes doubtful, or "you have a monopoly and can charge what you like," and so forth. But as to any reasoned evidence on the subject, none has ever been forthcoming, for the simple reason that those who speak in this way know neither what the service costs to maintain nor have reckoned its real cost to themselves. If we analyse these three replies we may find what they are worth.

Consider first the well-worn point of comparison with other countries, and you will soon see what a vista of probabilities is opened up, and how, as soon as you get beyond the fringe, you become enmeshed in economic problems. Gold is gold all the world over, and yet, for complicated reasons, it goes farther or is more abundant or scarcer in some countries than in others, and consequently labour is dearer or cheaper, as the case may be; dearer or cheaper, that is, only in comparison with other countries where the conditions differ. It does not follow that because money is scarce the people work less, or work longer, or better or worse, but merely that they receive fewer coins as tokens of their labour; and it is only when the cost of their production is compared with the cost of similar productions in another country where gold is more abundant that an apparent cheapness becomes observable. The actual labour cost to the workman in energy is the same in both cases and the difference lies solely in the amount of wages paid for it.

Some years ago I was sent over to Stockholm to assist in making some enquiries in regard to the cost of the telephone service in that city, and incidentally I was told that an income of £200 a year in Sweden spelt opulence. But mark this; the charges—at all events to strangers—in the hotel where I stayed were by no means proportionate to such—to us—modest means, because the standard silver coin, the krona, was equal to about 1s. 2d. of our money, and I had to pay 1s. 2d. for everything which in this country would cost 1s.: this was, however, purely an artificial system with no sound reasoning in it. The fact remains that where average incomes are small the cost of living is proportionately small and you cannot compare individual items of expenditure, such as, for example, the charge for a telephone service, unless the financial and economic conditions are the same, except by exhaustive investigation. It is obvious to us that with an income of £200 a year an annual charge of only £5 would be an appreciable item. Further, it would be difficult to find

the cost of any one article or service in one country to be exactly equal, in money, to the cost of the same thing in any other country; although the value of the article or service may be the same and the labour expended upon it the same also.

What is perhaps a more important factor than economic conditions in the cost of a telephone service is its quality, and quality in this connexion is another word for speed: speed being the essence of it. I once suggested to my bootmaker that I wanted a pair of boots something cheaper than I had been in the habit of paying, and his answer, with a Johnsonian touch in it, was this: "Sir, we have but one quality." There is our case in a nutshell—equality of quality; and anything else would land us in insuperable difficulties. It would mean complexities in apparatus, varying speed of traffic as between one circuit and another, varying loads as between one telephonist and another, and worse than all, varying rates of pay: not to be thought of. Speed in telephony governs the cost, and if the public demand a quicker service they can no doubt have it so long as the speed does not kill and they are prepared to pay for it. Suppose the public demand a service one second quicker than that now given, you must increase your operators, who must be paid; and you may speed up second by second until each operator spends the greater part of the day in idleness, in which case you will pass the point of efficiency and get deterioration; which opens up another question. Leisure begets carelessness and rust, and with less work there is less cost in energy to the operator, and having passed the boundary of efficiency the result of her work becomes of less value. Is the operator with more leisure and less cost to herself in energy to receive the same pay as when she was called upon for greater exertion and concentration? The fallacy of the whole position is easily discernible. Suppose an extreme case, viz., that each telephone subscriber had a separate operator to himself; to the unthinking subscriber the conditions would be ideal, because he would conjure up a vision of instantaneous attention at all times and would perhaps be prepared to pay a higher price for a fancied higher value; whereas the position would be similar to that of a very small exchange with an aggregate of say ten calls a day; and we have yet to learn that an exchange with say ten subscribers is better operated than one with a thousand. What he would have to pay for would not be the cost of a super-efficient service but for the superfluous time of the operator and the superfluous cost of waste space in the switchroom caused by the spreading out of the multiple. In a word, the quality of the service must be left in the hands of the expert and not of the layman.

Before you are in a position to make comparisons between the cost of telephone service as between one country and another, you must examine first the economic conditions of each and then the quality and speed of the service given.

The next adduced reason for complaint which I have quoted is "I cannot afford it," with, therefore, the implication that it is too dear not for everybody, but for me, inviting preference. Now there is rather more in this argument than appears on the surface, because, as a rule, no one dreams of condemning the price of an article merely because he cannot afford it: he is content or forced to do without it, and would deem its purchase an extravagance unless prepared to sacrifice something else to obtain it. The tempting comment on such a state of affairs is, "if you cannot afford a telephone, of course, you *must* do without it.

But we cannot deal thus airily and summarily with such an important factor in everyday life as the telephone has now become, knowing as we do what an incomparably useful adjunct it is to the social and business welfare. As we are not in a position to adapt our charges, as some doctors adapt their fees, to the purse of the individual, it behoves us to endeavour to persuade the halting or dissatisfied that they *can* afford it and ought to afford it, assuming of course they really want it; and it is not too much to say that if the want of it is, or has been really felt, the value of it is at least equal to the price of it; as everything else is so long as the price is proportionate to the cost. I am not, of course, speaking of those who unfortunately could not by any effort find the money to pay for it—nor is it likely that to such, an exclusive telephone would appear to be a necessity—but of those who

hesitate to lay out a sum of money—which it may have cost much labour to obtain—unless they see a definite and immediate return. Perhaps a reasonable suggestion to such as think they cannot afford it is: try it for a year and use it sparingly; say, only on such occasions as when you have felt the need of it in the past.

It will usually be found, however, that those who deery the price do so not because the thing is really expensive or that they know it is expensive, but because it seems expensive in comparison with something else or with no comparison at all; and they confuse a private service with a public service, expecting, as it were, a private motor-car for the price of an occasional taxi-cab; and the telephone is after all a species of locomotion—locomotion of speech; and as talking is the easiest thing we are called upon to do in this world it has some claim to cheapness; and as you can cover more miles by telephone than in the case of any form of physical locomotion it would appear that in some degree that claim is met.

Besides, is there anyone who at the end of a year can say exactly what his telephone has really cost him; that is to say, what the net cost has been. Who keeps an account of such things? Leaving out of the question the business man to whom time is literally money, there are thousands of people, to whom time is not money, who measure and are forced to measure it by the immediate and solid return it yields, and leave out of account the saving in such things as trouble, anxiety, sickness and greater calamities by means of the instrument on the wall or table. The consequences of the invisible and unexpected are often more dire and more costly than anything we can buy, and to be insured against them in any degree is well worth a little sacrifice. It is not only what we have actually earned but what we have averted that we should put to the credit side of our telephone account.

Then we come to the question of monopoly—a Government monopoly—with the implication that the monopolist can charge what he pleases. So he can if he is under no restraint or regulations; but I very much doubt if such conditions prevail anywhere in this country at this era, and certainly not in a Government Department, subject to the highest tribunal in the land—the representatives of the people themselves—to whom every one of us is responsible through our Chief. Excessive charges mean excessive cost and the cost in our case means chiefly labour—the labour of the individual from top to bottom; and this is a point which touches us in a sensitive place. The cost of the service may be divided into three parts: a return on the capital subscribed by the public—which, if you follow the Post Office balance sheet you will find is not represented by a staggering percentage and may be dismissed at once—the cost of material, and the cost of salaries and wages.

What we spend on material is purely a matter of markets and tender combined with a necessary amount of acumen on the part of those responsible for the purchase thereof; and I have never heard of any contracting firm exulting in the conclusion of an easy bargain with the Post Office; nor, among the many complaints from telephone subscribers have I come across one that animadverted on extravagance in this respect or objected to improved apparatus; although the number of people who would welcome a new instrument regardless of expense may be counted as many. I think, therefore, we may safely say that complaints of the charges for the service are not based on the cost or super-quality of the material.

There remains then only the cost of labour, and this means one of two things: either there are too many of us or we are paid too highly for our work. Now, there is one thing among many where a Government Department is unlike a private concern; it cannot hide the remuneration it pays to its servants, and sequentially its servants cannot conceal their wealth from the prying eyes of the curious or interested. One has only to refer to *Whitaker's Almanack* and other available data to make a fairly near guess of individual official incomes, and I do not think that anyone could regard the amounts thereof as preposterously extravagant if they recognise all that must be involved in the management of such an enormous undertaking as the Post Office; although to the

unthinking it may seem strange that such simple things as the penny stamp, the sixpenny telegram and the penny or twopenny telephone call, need so much human machinery in the production.

Possibly, however, it is the seeming simplicity of the machinery that gives rise to the notion of excessive telephone charges, because the members of the staff who are above all in daily contact with the public are the telephonists, and it may be that they are credited with absorbing the lion's share of the telephone revenue for the very easy task of putting two people into communication with each other; in other words, that the cost of a telephone call lies mainly in the physical operating of it.

But, after all, is it in truth the cost of the telephone message with which the public are most concerned—is it not really the value of the service rendered? Here we reach what seems to me to be a very interesting point. Every one of us who helps to manage and administer the service and who makes daily use of it has some idea of its value, but how valuable it is to other thousands we have little conception; and if we did we might, quite erroneously, deem ourselves substantially underpaid—erroneously, because in this world the effect of our work is usually an undiscoverable quantity, and perhaps lasts beyond our lifetime.

In a paper recently read in London by the Controller of Stores we were told that the Clothing Department of the Post Office keeps eighteen hundred stock sizes of various official uniforms. How many stock charges, think you, should we have to formulate if we attempted to charge for each telephone message according to its value? One, for example, for calling a cab, another for calling the fire brigade, another for netting a profit of £10,000, and so forth. Clearly impossible and ludicrous; but this is not the value of the telephone to us, it is the value to the user. We have, of course, no more right to put a chance or fancy charge on our commodity than the butcher has on his meat or the stationer on his pens: the meat may save a family from starvation or hasten the death of a gourmand, and the pen may produce drivel or enlighten the world, but the price of it is the same in any case; only the meat must be fresh and the pen operative. At the same time the cost of bad meat and the cost of a bad pen might be the same to the producer, as if they were both good.

In like manner the cost of a bad telephone service might be the same as that of a good service, but the value would be entirely different; and it is in this sense that the public are concerned with the value and not with the cost. The value of the service lies in the virtues of the administration and of the staff; in the high standard aimed at, in alertness, zeal, and the laudable desire to be in the forefront in one of the greatest inventions of modern civilisation.

If—and it is a great “if”—the cost of this service is really too high, only those who administer and carry it out are aware of it; and we can even go further and say it is individual and not general knowledge; for the cost is made up of the multiplication of sums of money paid to the individual for the use of his or her brains and intelligence during so many hours of the day or night as the case may be.

My essay would be very incomplete if I found nothing to say on cost and value regarding ourselves—regarding the cost of our work to ourselves, the value of our work to the Department and to the public.

At the first blush we might think that the question of cost lies solely in the remuneration for our services, whatever those services may be, even as two and two make four; but, believe me, the matter is not nearly as simple as that, and it is even doubtful if two and two have anything to do with it.

First there is the cost to ourselves. I know, and you know, that there are thousands of men and women this very day, of ability at least equal to our own who have spun as hard or harder than we have spun, who have gone home worn and jaded, who have earned as great a reward as we have, but who have not got it; and that is the cost of their work to them. You may say, “that is their misfortune.” Very good; but the corollary is that in our case it is our good fortune; that is to say, we may not have gone home exhausted or worn or jaded, but at the same time we

have earned and got our pay. An argument perfectly sound, but as Touchstone has put it, there is much virtue in an “if.” We have earned our pay if, and if only, we are satisfied in our innermost consciences that our work has cost us something in brains and energy; and unless we have some such feeling we may find it difficult to realise that the cost to ourselves is altogether adequate to the cost to our paymasters. Unlike Longfellow's blacksmith, we may scarcely have earned a night's repose; in which case the cost to ourselves has been insignificant.

On the other hand there are hundreds of us who at the close of each day are honestly conscious of having really achieved something worth talking about, of perhaps having done something more than is ordinarily expected of us, and of which there are notable examples in those heroines of the switchboard who have earned the admiration of the world in times of war and storm and flood. But they and others who thus rise to and excel the occasion are not immediately clamorous for special reward. The value of their work and of the work of any of us who step outside our usual routine to further the interests of the service and the community is incalculable, as in like manner may be the harm resulting from the mistakes or heedlessness of the weak and erratic.

An inverse analogy may be found here in the telephone service. The telephone subscriber pays a fixed sum for his installation and his calls; if his calls fail at the right moment or involve him in loss, he has no claim on the Post Office for compensation; neither in the event of extraordinary good fortune such as a happy coup on the Stock Exchange or the opportune arrival of a fire engine can the Post Office exact an appropriate fee.

Our value lies not in the cost of our work to ourselves or to those who pay us for it, but in our efficiency and earning power—the earning power, that is, that gains the approval of the public and with it the revenue to be derived from the service rendered to them. Efficiency and value with us are much the same thing; the value of the telephone service itself lies in its efficiency, and if it is inefficient the fault lies with those who serve it; but the effect of inefficiency is more easily discernible than the thing itself; for there are many men and women who possess valuable qualities estimable in themselves but unfitted for the particular work in which they find themselves engaged; efficient it may be in everything else, but, who, guided by those very qualities are led to do the wrong and weak thing, strive as they may to do the right and strong; and their inefficiency may be obscured or excused by such virtues as strict integrity and honesty of purpose.

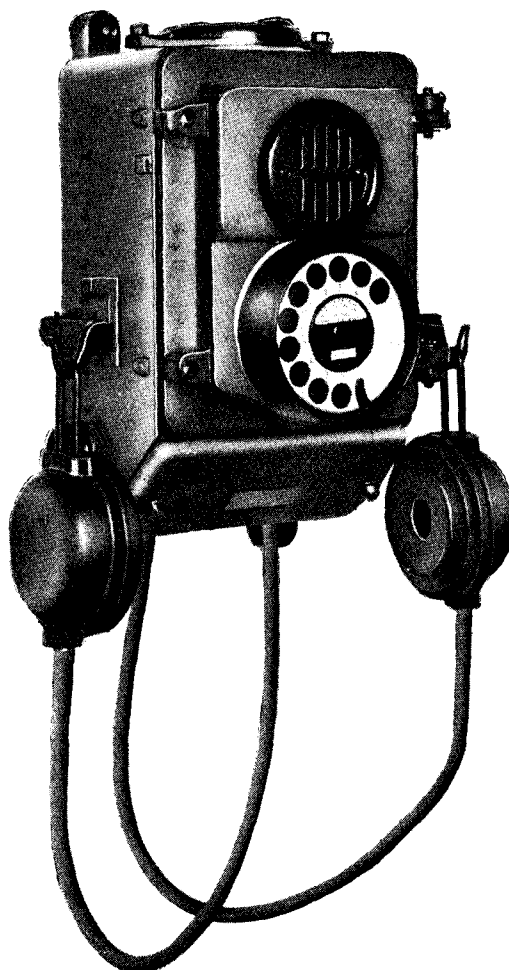
Which, after all, are valuable assets, though not always conducive to success, and especially to what is known as commercial success. Fortunately for us our course lies tolerably straight before us, and we have no need to twist the truth or to distort facts to gain our ends, individual or general, as sometimes falls to the lot of those whose means of living depend solely on the profit they make out of their dealings with the public.

Our individual success which carries with it the success of our enterprise, probably hangs very much on our aptitude for proving our value regardless of the cost to ourselves.

ICELAND TELEGRAPHS AND TELEPHONES.

WE have received a report of the working of the Iceland Telegraph and Telephone System for 1915. The total number of telephone instruments working is 1,392, of which 656 are in Reykjavik and 414 in other towns; 142 are Service instruments and 179 private. The total number of exchanges is 67 and of telegraph instruments 11, the telegraph work being largely conducted by telephone. The total route length is 2,001 km. and the length of wires 5,850. There are 128 telegraph stations open. It may be mentioned that the current numbers of *Elektron*, the organ of the Iceland Telegraph and Telephone Society, contain translations of articles by Mr. A. B. Hart, of the Engineer-in-Chief's office, and by Mr. J. G. Whittle, of the Manchester Post Office.

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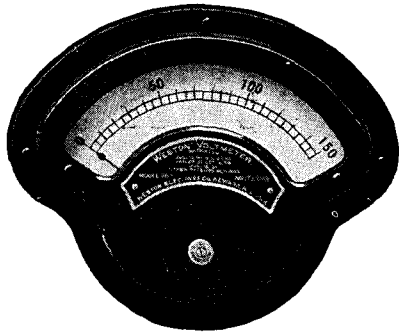
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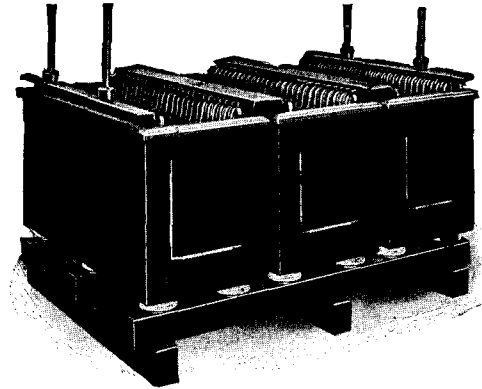
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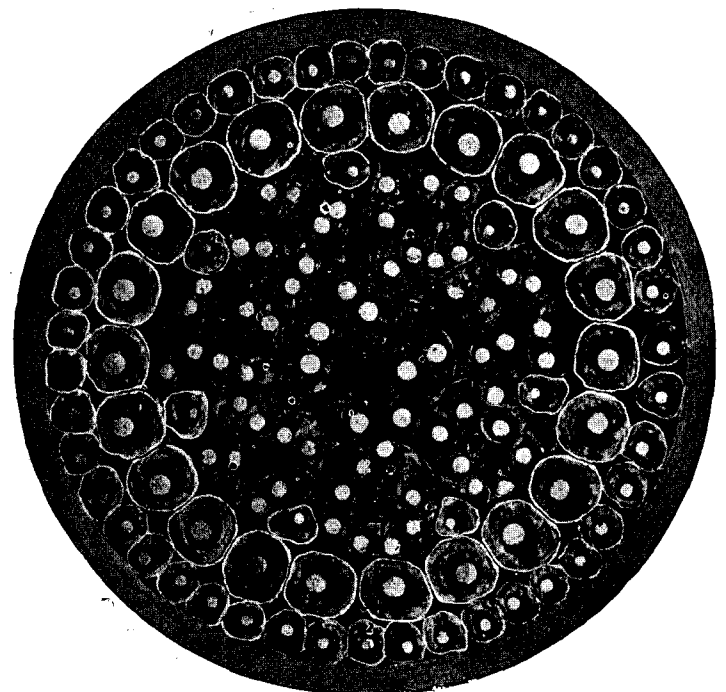
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THE BLIZZARD IN THE CARDIFF DISTRICT.

(DAMAGE CAUSED ON THE NIGHT OF MARCH 27, 1916.)

By B. WAITE (*District Manager, Cardiff*).

It is not often in this country that the telegraph and telephone plant suffers so severely as on the night of March 27 last. Now that the damaged plant is, so far as it affects the general working of the lines, nearly restored (temporarily), it may be of interest to other districts to have some information as to the extent of the damage. When the effects of the gale came to be reckoned



up it was found that out of a total of 133 trunk circuits working into the Cardiff trunk exchange, the only circuits left were sixteen Newport lines which are underground. Fortunately new underground cables to Swansea and Pontypridd were on the point of



completion, and these were joined through and wires connected up. Altogether, for the district, the total faults were :

Trunk ends.	Junction ends.	Subscribers' line faults.
348	572	5,311

A few of the larger exchanges are given as follows :—

Exchange.	No. of working lines (normal).	No. of lines working after storm.
Aberdare	180	42
Barry	414	213
Cardiff	4,242	2,862
Llandaff	163	66
Merthyr	248	38
Newport	1,400	500
Pontypridd	275	38
Porth	119	8
Tonypandy	158	3
Whitechurch	147	56



Forty-eight of the small exchanges were actually closed down for a time.

The photographs supplied to me by the sectional engineer, Newport, give some little idea of the damaged routes, but are fairly representative of miles of route similarly damaged.

The following information supplied me by the Superintending Engineer of the South Wales District, is of interest :—

Number of poles broken	...	...	316
" " " blown down	...	...	311
" " " blown over	...	...	4,455
Miles of wire down	...	...	1,290
" " " to be regulated	...	...	5,063

The following statement shows periodical result of restoration, the last subscriber's circuit being joined through on Aug. 19. The trunk and junction circuits still remaining faulty are awaiting the re-erection of routes, which, owing to the small number of gangs available, it has so far not been possible to complete :—

	Trunk ends.	Local junction ends.	Subscribers' lines.
As at March 29	348	572	5,311
" April 4	317	530	4,830
" " 17	214	372	3,958
" " 24	216	329	3,589
" May 6	187	321	2,579
" " 13	132	260	2,075
" " 23	123	217	1,587
" June 2	83	181	894
" " 12	76	151	648
" " 19	60	129	375
" " 26	57	134	213
" July 3	48	126	149
" " 10	41	99	103
" " 17	41	96	70
" " 24	36	66	36
" " 31	33	45	4
" Aug. 7	26	35	2
" " 14	23	31	2

All this damage naturally brought additional work, complaints by letter came in shoals, accounting work was considerably interfered with, outstanding rentals went up, refund warrants had to be issued for the time lines were out of order, &c., &c.

It is however very pleasing to be able to report that with few exceptions the subscribers fully realised the position and waited patiently until their lines could be restored. The engineers worked all hours possible with the staff available, supplemented to some extent by the aid of the military, to get the lines through with the least possible delay, and I have to acknowledge with gratitude the valuable assistance and help I obtained from the engineer's staff to enable me to keep well in touch with the subscribers whose lines were affected and to give them information from time to time of the progress being made.

DEATH OF SIR GEORGE FRANKLIN.

WE regret to record the death of Sir George Franklin at Llanudno on Sept. 23 at the age of 63 years. He was well known to many of our readers as President of the National Telephone Company at the time of its transfer to the State in 1912. He was a director of the old Sheffield Telephone Company, and joined the board of the National when it acquired the Sheffield Company. He became Vice-President in 1902 and on the resignation of Sir Henry Fowler he was elected President.

NEW TELEPHONE RATES IN SWEDEN.

NEW telephone rates came into force in Sweden on Jan. 1, according to the *Journal Télégraphique*, which publishes the text of the new regulation. Uniform changes are projected for the whole country. The importance of the change, however, is much diminished by a clause to the effect that the new tariffs will not apply "for the moment" to the area within a radius of 70 km. from the centre of Stockholm. This exception is no doubt due to the competition of the Almanna Company, already the cause of the extraordinarily low rates in force in Stockholm; but in telephonic matters the omission, for a period undetermined,

of Stockholm from Sweden is not unlike the omission of the rôle of Prince of Denmark from Hamlet.

It will be seen from the following figures that an attempt will be made to place the telephone service on a more remunerative basis. The principal tariffs are :—

- (1) For all main stations : entrance fee of 15 kronor (16s. 3d.).
- (2) Lines for which the Administration bears the cost of service—

	Kronor.	£	s.	d.
With a maximum of 900 calls per annum	40	2	3	6
With a maximum of 2,500 calls per annum	60	3	5	3
With a maximum of 5,000 calls per annum	90	4	18	0
Above 5,000 calls per annum	120	5	10	6

The 40 kronor tariff is for residences only, except by special authorisation of the State.

If the number of calls made exceeds 10,000 the Administration may call on the subscriber to pay for a second main station.

It will be seen that only message rate services are provided for; and the abolition of flat rates in all larger towns where the system is built and worked by the State is implied. The existing rate for a business telephone in Stockholm (State system) is about £2 14s. 6d., with an installation fee of the same amount. That rate, however, includes unlimited calls and costs nearly 11s. per annum less than the proposed rate which is limited to 2,500 calls. The existing measured rate (which applies to Stockholm only) is about £1 12s. 6d. for 600 calls per annum.

In the provinces, again, the superseded unlimited rate was from £2 14s. 6d. to £4 7s. 6d. (according to the extent of the local system) with an entrance fee of £2 14s. 6d. It will be seen that the subscriber will be in no case the gainer, except where he is in the largest provincial towns and is satisfied with 2,500 calls per annum.

There is another series of tariffs for exchanges where the subscriber bears the cost of erecting his line and of service. The charges are as follows :—

	Kronor.	£	s.	d.
Where no free trunk or rural calls can be exchanged	30	1	12	8
For a maximum of 600 free trunk or rural calls	40	2	3	6
For a maximum of 2,000 free trunk or rural calls	60	3	5	3
For a maximum of 4,000 free trunk or rural calls	90	4	18	0
Above 4,000 free trunk and rural calls	120	5	10	6

The subscribers under these tariffs obtain unlimited local communication.

The trunk exchanges are :—

	By day.	By night, 9 p.m. to 7 a.m.
Up to 45 km.	10 öre	10 öre
45 to 90 "	20 "	10 "
90 to 180 "	30 "	(say 4d.) 20 "
180 to 270 "	40 "	20 "
270 to 450 "	50 "	(6½d.) 30 "
450 to 540 "	60 "	30 "
540 to 630 "	80 "	40 "
630 to 720 "	100 "	(1s. 1d.) 50 "
720 to 810 "	130 "	(1s. 5d.) 60 "
Above 810 "	160 "	(1s. 9d.) 80 "

For trunk calls with right of priority over ordinary calls a double charge is levied. For specially urgent calls with priority over the foregoing 50 kronor (£2 14s. 6d.) plus the double charge is levied.

The late tariff was : up to 100 km. 2d., up to 250 km. 4d. and so on, so that there is here a gradual increase until a distance exceeding 1,400 km. (875 miles) is reached, when the new rate is cheaper.

W. H. G.

AN AIR RAID NIGHT.

(NORTH-EAST COAST, EARLY SUMMER.)

READING the short paragraph under "London Telephone Service Notes" in the June number of the *Telegraph and Telephone Journal* in regard to operators' work and behaviour under a threatened air raid leaves, the impression that a few notes of operators' work and behaviour under actual air-raid bombardment conditions might be of interest.

The day's scheduled duty of most of the traffic staff is ended and they depart to their homes, not in peace exactly, but in hope that there will be "nothing doing." The traffic superintendent sits by his telephone at home while the operators take their well-earned rest in the manner which best suits each individual: a few go to a theatre or other place of amusement, and some—shall I venture the remark—have sweethearts.

The traffic superintendent's bell rings and an answer is immediately given. "Is that you, Mr. Traffic Superintendent?"—"Yes!"—"Well, I think there is something out of the ordinary going on."—"Thank you!" A hurried meal and a glance at the emergency staff for the night is the next part of the programme; then by bicycle to the post of duty.

"All well, girls?"—"Yes!" The work of the switchboard does not reveal that anything out of the ordinary prevails except that certain well-known people (military, naval and police are well known—even the indicators wear the staff officers' distinguishing colour) are very busy with hurried calls to many parts.

Time passes and the expected message comes from the source of orders for business and for the use of the machinery to bring the ever ready and loyal staff to their posts.

Away go the telegraph messengers to the homes of the staff, and theatre managers call for telephone girls in an enigmatical phrase calculated not to alarm the public. Five, ten, fifteen minutes pass quickly and the girls come trooping in. Headsets are fixed and the girls are at the switchboard before one realises they are there.

There is not enough traffic to keep all the staff at work and one hears of little episodes of their hurried journey to the office. A fund of humour is in the various circumstances in which the staff were found at the receipt of the call. Time passes and news is picked up that the enemy is not far away. Instructions are awaited and the staff is ready. "Supervisor!—Here it is!" and then there is a period of solid work which means so much to all concerned. "Here's a man who doesn't understand, Mr. Traffic Superintendent," "Put him through to me!" That matter is soon settled as a man's voice and a bit of sharp, straight talk settle the doubtful mind.

Now a wait (we had waited before), but this time the news comes that the enemy is heading towards us. We have heard this tale in times past and it does not alarm anyone, so we wait on imperturbably.

They are really coming towards us! Seen at X some 30 miles away, now at Y a few miles off. We "carry on," dealing with the urgent traffic which has arisen and hope the enemy will not reach us. Bang! Bang!!! and five (or what appears to be five) nearly simultaneous explosions occur to the south of us.

Bang! Bang!!!—more explosions!

Calls come from sources which must have attention and they get it in splendid time;—five seconds answer?—they get answers in less than one second! Bang! Bang!!! more explosions and very near—near enough to shake the building. But the service still goes on without interruption. "Number, please," is heard in steady tones from the operators.

No need is there for keeping girls to their positions, no need of calming words. The work had to be done and was done, engrossing the mind so fully that the whirr of the engines of the Zeppelin were unheard and no moment was left to dwell on the awful nearness of the frightful menace overhead.

The Zeppelin has apparently departed—for good we hope—and the alarmed subscribers commence doing that which they are requested not to do—ringing the police to make enquiries.

The police lines are at once blocked so arrangements are made forthwith to filter all calls to them.

Enquirers asking irrelevant questions are requested not to proceed with their calls, or a ready answer is given to their queries. Casualty and fire reports are noted and passed in quick time to the police who take them rapidly and act.

The casualty reports received were dealt with by a woman, a travelling supervisor, who, although not scheduled for duty, repaired to the exchange to lend assistance immediately on hearing the "call" at a theatre.

After this rush had died away the work of the exchange fell practically to zero and then a period of weary waiting ensued. The girls seemed tired, but still game, after their trying experience.

After normal conditions are restored, how to get some refreshments for the staff is the question; and the necessary people are sought. At last after a talk with the friendly chief constable he refers us to that splendid organisation the St. John's Ambulance Association, and they are found ready to do everything for the staff.

After dismissal the staff went to an agreed upon place and were served with refreshments (hot coffee, &c.). Then away to home.

Much has been said of the behaviour of telephonists in emergencies, but I venture to add my tribute: they acted as Englishwomen and in accordance with the traditions of the race: they served most valiantly amidst the "terror that flieth by night."

J. M.

THE "SIGNALS."

The *Times* special correspondent in an article "Making Good the Advance" says:

The non-military mind, again, probably has no idea of the magnitude of the machinery of the modern army for keeping up communication among its several parts. The "Signals" of a single corps includes a telegraph and telephone system equal to that of a considerable town, with hundreds of miles of wire, all of which has to be kept going under continuous shell fire. It may transmit over 1,000 messages a day, besides receiving 400 or 500 and sending out 600 or 700 of its own origination. These are, in rough, the actual figures of one day's work of a single corps. In addition to all of which nearly 1,700 sealed messages, or packages, were received in the day from the hands of despatch riders. To see the plan of the lines of any "Signals" unit is a revelation of the ordered complexity of an army organisation of to-day. And when we advance, as we have advanced here in the last two months, the whole thing must be continually pushed up behind our troops, new lines laid, new posts established through all the shell-swept zone.

Only the other day I was pretty far forward talking with two officers of the troops holding the front line in the hole which afforded such shelter as there was. A man, killed by a shell, had literally fallen in at the door a few hours before I came. A sergeant of the R.E. came in and reported that he had got two lines up to "Z.B. 17" (some 50 yards farther along the trench) and thought he could make a shelter for his men there, and then he would go on to "F.C. 3." He came in again five minutes later to report that Corporal Blank was killed by a rifle bullet. "He was the best man I had," he said.

I do not know, but I have no doubt that the lines were laid to "F.C. 3" that night. It is all wonderful, and all done as a matter of course. Nobody thinks that he is a hero, and when a commanding officer wants to know he "can't get any names."

One interesting "Signals" unit which is out here is the South African. The *personnel* of the unit, from the O.C. down is composed of men who were in the Government Telegraph Service in South Africa when the war broke out.

PRESENTATION TO MR. ASHBY.

On leaving the Canterbury District for Norwich, Mr. C. F. ASHBY, who had been District Manager of Canterbury for the past ten years, was presented by the staff with a barometer, bearing a suitable inscription, together with a silver-plated tea set, waiter and cake stand.

The Telegraph and Telephone Journal.

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

<i>Editing and Organising</i>	{	MR. JOHN LEE.
<i>Committee</i>		MR. J. W. WISSENDEN.
<i>Managing Editor</i>	-	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. III.

OCTOBER, 1916.

No. 25.

OUR THIRD VOLUME.

THE commencement of our third year finds military considerations still paramount and a vast and increasing number of the Post Office staff with the colours. This necessarily means a decrease of actual and potential readers, for though the JOURNAL circulates well amongst members of the Forces both at home at abroad, it is not to be expected that all those who are preoccupied with their new and engrossing duties maintain the same interest in telegraphic and telephonic movements as they would were they engaged in their normal work. We have nevertheless much on which to congratulate ourselves. Firstly there is the willing assistance rendered to us by contributors and agents, especially by the latter in their efforts to maintain the circulation among a depleted staff. Secondly there has been a steady increase of the number of our readers in the Colonies. India, Ceylon, the Straits Settlements, South Africa, East Africa, the China stations, Australia, New Zealand and Canada all have their regular readers, and in allied and neutral countries the JOURNAL finds its way to the most distant places. Thirdly, and not least, our readers in the field continue to express the pleasure they obtain from the regular receipt of a publication which keeps them in touch with their old life.

The plans for launching the JOURNAL matured in the summer of 1914 and no sooner were they completed than War with Germany was declared. Nevertheless we found, on the issue of the first number, our estimated circulation nearly doubled, and received a steady influx of valuable contributions on the most varied subjects. We hope that we may fairly claim to have been able to maintain the standard of the early numbers. In the volume just concluded we have endeavoured to keep our readers posted

in the principal developments of telephone and telegraph work. We have dealt at some length with both Telegraph Economics and Working, with much discussed questions of Tariffs and Phonogram Practice; we have touched on Field Telegraphy, on the Training of Telephonists, and the Development of Printing Telegraphs, and have published many articles dealing more especially with the life of the operator, and have been glad to record her devotion to duty in times of difficulty and danger. We have not neglected the past, as witness various documentary and historical articles, and we have treated from time to time of telegraphic and telephonic affairs in India, Australia, Canada, the United States, Belgium and Germany; nor have we forgotten to record the social functions and other good works of the staff in connexion with the various War Funds.

It would perhaps be profitable here to ask our readers what we have not done. Whilst we reiterate a former declaration that our central purpose is to disseminate information and to encourage the discussion of all subjects of interest in our work, we are willing to learn in what other directions the scope of the JOURNAL could be usefully widened. We again remind our readers that our columns are open for their views, and invite their suggestions, for only by their cordial co-operation will the purpose of the JOURNAL be fulfilled and its success assured. At the same time we warn correspondents that suggestions on the one side that there is too little telegraph matter and on the other side that there is too little telephone matter in our pages are not helpful. Careful scrutiny will show that the balance has been pretty evenly maintained, and we think that on the whole few articles have been so abstruse or so technical that the uninitiate might not read them with some profit. We enter on our third volume full of faith in the usefulness of our task, and full of hope in the maintenance of our ideals.

"GILBERTIAN."

THE extraction of amusement from the minor misadventures and daily occurrences of life is on the whole a happy gift, and the possession of a well-tempered sense of humour is one of the surest safeguards of national sanity. There are those who deny that womenkind enjoy the latter attribute in full measure, but into so thorny a controversy we are not disposed to enter. Certainly there are many people who, like the friends of Mr. Peter Magnus in *Pickwick*, are easily amused, and find situations "truly Gilbertian" which really might equally be considered "truly Miltonian" or "truly Homeric."

A lady writes to a daily paper, and indeed repeats her complaint in the evening press, that she has had some correspondence with the London Telephone Service about some disputed calls. The Post Office inform her that it sees no reason to doubt the accuracy of their records, and at the same time sends for her guidance her a little leaflet, entitled "How to avoid the risk of Overcharges." That the Department "sees no reason to doubt its records" and at the same time sends her such a paper seems to the lady "a truly Gilbertian situation." The leaflet, however, merely points out that if subscribers do not tell the operator when she has given them a wrong connexion, or when they abandon a call because their

correspondent does not answer, she is not aware that a conversation has not taken place and will charge for the call in either case. The Post Office has, in effect, no reason to doubt the correctness of the number of calls recorded, but if the subscriber fails to report wrong connexions and the like it is still possible for him or her to be technically "overcharged," and it would be unreasonable to expect the Administration to accept subscribers' records, which experience has shown are frequently incomplete, especially as regards calls made by employees and unauthorised persons on their own behalf.

The writer finds a parallel for this Gilbertian situation in another Government Department which, she says, warns us not to discuss naval and military affairs in public lest they convey information to the enemy, although we have been assured that all undesirable aliens and spies have been long since deported and locked up. If the lady were assured by the police that all burglars and suspicious characters in the adjacent counties were under lock and key but was nevertheless advised that it would be prudent still to bolt her windows and lock her doors at night, would she find the situation "truly Gilbertian." We are not, of course, concerned in the defence of other Departments, but we also find a parallel, not in the Gilbertianism, but in the inconclusiveness of the two cases.

LIEUT. R. H. PIKE PEASE.

WE regret to record the death of Lieutenant Ronald Herbert Pike Pease, of the Coldstream Guards, who was killed in action in France. He was the son of the Assistant Postmaster-General, and was only 19 years old. We are sure that the sympathy of the whole staff will be with Mr. Pike Pease in his great loss.

HIC ET UBIQUE.

WE continue to receive reports of the devotion to duty of the staff in the hazards of war. In the recent explosion of a munitions works in Yorkshire, the telephonists, Miss Pearson and Miss Hirst, remained on duty until their usual time for relief. Mr. S. Simpson (Skilled Workman, Class II), who was in the neighbourhood, at once hastened to the exchange and gave both confidence and assistance to the telephonists. He advised the telephonists to retire (Miss Pearson had been twice knocked down) and for a short while operated the exchange by himself, although frequently advised by people in the neighbourhood to leave. The telephonists shortly returned to work and, as before stated, remained at their posts until the time of their ordinary relief. At the same time Mr. W. Mansley (Skilled Workman, Class II) arrived on the scene and assisted Mr. Simpson in attending to the batteries and other matters. These two engineering officers remained on duty until eight o'clock without refreshment. The traffic superintendent, in view of reports that further explosions were expected, remained overnight at the exchange with two assistant supervisors and a telephonist. Fortunately no additional mishaps occurred. The Secretary's commendation has been conveyed to all these officers.

At an exchange on the north-east coast during a recent air raid the windows were blown in and the property in other ways damaged. The telephonists on duty continued to work the switch-board and, it is understood, the Military authorities have written and complimented them upon their services during the bombardment.

THE latest telephone exchange to be converted to automatic working is Dudley, where that system was inaugurated on Sept. 9 last. The new exchange has accommodation for 500 lines with an ultimate capacity for 5,000.

WE have before us the first "Telephonic Directory" for the Isle of Man, issued in the early 'eighties. It consists of a single card with 44 numbers, only 33 of which, however, are appropriated to subscribers. Following the instructions and detailed directions of the number of rings to be given for different purposes are the following notices:—

"Persons that are switched through should be as quick as possible, as other parties may be waiting to speak to the same parties that they are speaking to.

"Profane language must not be used on any consideration, but as much straight speaking as you like."

CAN TELEPHONISTS MAINTAIN TELEPHONE EXCHANGES?

BY C. W. BROWN (*Superintending Engineers' Department, Croydon*).

I REALISE that I am upon a subject which, during the present crisis, is in all probability being weighed in the scale as a "possible," and I ask my readers to remember that the opinions set forth herein are those of an individual only. Having been fortunate enough myself to pass through the various stages in the maintenance of telephone exchange equipment, I will endeavour to give impartial opinion on the question "Can telephonists maintain telephone exchanges from the engineering side of the work?"

The very first feelings in the mind of the girl who for the first time enters a "live" exchange for training are complete bewilderment, and her last thought at the end of that momentous day is "shall I ever grasp the work." So with the lad who enters the exchange to be trained as an engineer—complete bewilderment, masses of wire, and mystery following mystery.

The subsequent training of the telephonist and the engineer are entirely and completely different. The telephonist's training follows certain definite lines, while the engineer is trained primarily in two channels—viz., technical work and practical work. On the technical side he learns the theory of magnetism, electricity and telephony, and in the practical portion the care and use of apparatus and tools is learned. The question to be answered is, "Can the trained telephonist suddenly pull up, burn her boats, so to speak, drop into the engineering work and quickly become a capable telephone engineer?"

That women are decidedly practical is borne out by the fact that since the outbreak of war many have taken up work on munition machines, driving motor vehicles, &c.

For the purpose of this paper I am dividing the work in an exchange into the following heads:—

- (1) Cord repairs;
- (2) Fault clerk;
- (3) Test clerk;
- (4) Power attendant;
- (5) Exchange inspector;

and I propose to deal with the work in the order shown.

Of course in the smaller exchanges the duties 2, 3, 4 and 5 are amalgamated and carried out by one officer.

Now under (1)—cord repairs—let us consider what work has to be done. The cords are cut off to rid them of the bad portions, and the covering of the conductors is stripped, trimmed up to certain specified lengths, neatly bound with thread, and waxed; in most cases small metal tags are soldered to the bare ends and

the plug is screwed on, the tags screwed down and the whole is ready for testing. Summing up there appears to be a liberal application of thread and wax, the frequent use of a pair of scissors and the use of a small soldering iron. I think that, with a few days' training—during which time her fingers will receive much unkind attention—the telephonist would make a perfectly satisfactory cord repairer. In connexion with using scissors and thread it is "hats off" to the ladies.

Under (2)—fault clerk's duties—we have both clerical and engineering work. The clerical portion consists of entering records and preparing the necessary schedules for routine work. The engineering portion consists of a thorough knowledge of routes and composition of wires and cables, resistance and the standard types of apparatus for subscribers' circuits. The fault clerk's duties take many months to learn thoroughly, and we find from experience that the best man for the job is he who is an intelligent paper man and has actually been engaged upon the maintenance of one of the apparatus branches.

As regards the clerical portion, this can be learned in a very short time by the telephonist, and I do not hesitate to say that this portion could be safely handed over. As regards the engineering portion I am forced to the conclusion that by adopting the "learn as you go" theory the telephonist could be trained to perform these duties, and therefore the duty as a whole may be considered as one which could be transferred without appreciable loss of efficiency.

As I am facing hard facts, backed with a definite knowledge of these duties, I feel that my audience will not suggest any "selfishness" when I say that should the powers that be ever decide to transfer the fault clerk's work I, for one, will shed a few silent tears—probably of the crocodile type—when on obtaining the *fault clerk*, a female voice answers and discourses with me upon mighty matters once the engineer's cherished property. However, away with sorrow—and away with the much worried fault clerk.

The duties of the test clerk—item 3—figure amongst the most important of all the duties. The mere testing of a subscriber's circuit to ascertain the condition thereof can be carried out by any intelligent person after a few lessons—as indeed is already done at the testing operator's position in the exchange, but wait! do not for one moment think that our friend the test clerk will agree to be flouted and trounced in this fashion. To be efficient he must be a highly trained technical man. He must know telephone circuits from A to Z. He must be a past master at the art of fault localising, and you must agree that his training is that of a specialist. Think of the time and money which would be wasted if a bad test clerk, that is, one who was not efficient, had control in a large exchange junction testing calls, for, even when exceptional care and skill are combined with sound knowledge, it takes years of patient and hard work to produce the ideal officer. Let us probe a little deeper; take the case of the Croydon test clerk. Croydon is a junction centre and practically all junctions are contained in main cables. The test clerk is called upon to say exactly at what point in a cable any fault exists—after, of course, such has been proved to be *in* the cable. To do this he resorts to special testing apparatus and upon the result the main cable is opened. It costs anything from 40s. to 50s. to open a cable at one point, and if false tests are given, the bill quickly runs up and the Service suffers serious delays. Rule of thumb methods are useless in the test clerk's duties; fresh tests crop up daily and he must be able to adapt himself to all and sundry testing. Now, ladies, what do you think of your chances in this respect? I think you will begin to appreciate my difficulty now. If I say you cannot carry out such work, then I must be able to substantiate that statement, if I say you can carry out the work, then woe betide me when a test clerk meets me any night in our now exceptionally dimly lighted thoroughfares.

Seriously, however, I suggest a division of the duties into two parts, (a) similar testing to that now carried out at the testing operator's position, and (b) junction testing and the testing of special circuits. In the case of (a) we need only teach the telephonist

how to localise, then we can hand this portion over; and as regards (b) I conclude that it would be impossible to expect her to carry out this portion without having had the same advantage as those gained by the test clerk during his career. Now it is out!

Next in order we arrive at the power attendant's duties. The power plant—including the secondary cells—constitutes the hub of an exchange; should the power plant collapse, then the remainder of the exchange promptly shuts down and disorganisation follows. The power man has a personality of his own and he can become one of the greatest of nuisances should he decide to become "seedy." For example, do we realise who is the culprit when the calling lamps suddenly become dim—the power man; and who, when they become too bright, causing them to burn out and cause horrible burning smells—the power man. Yes, and when there is "an awful noise on all positions"—the power man. Aye, and when the ringing suddenly disappears—the power man, and when the busy back isn't a busy back—the power man. Who gets smothered in oil and grease and gets his throat lined with copper dust in order that others may pursue the calling in comfort? The power man! Now what offers for his job?

The power attendant specialises in a distinct branch, and only men with a sound technical knowledge can take the responsibility of maintaining a plant efficiently. It is a simple matter to start a motor running, and it is even within a child's capabilities to throw in a switch or two, but there, is it not simplicity itself to perform many of the automatic operations connected with every walk of life and every profession? The mere opening of a ledger and totting up a few columns of figures do not call for more than the application of a fraction of common sense, and the chartered accountant probably performs such operations many times during a day, yet you and I could do the opening of the ledger and the totting up of the figures without training and without knowing anything of an accountant's work. So with the power attendant—there are subtleties which he commands and which he learns from constant practice; he must know thoroughly his circuits, the conditions necessary to obtain the maximum efficiency at a minimum cost, the expert handling of special tools and the correct adjustment of his machines; if the plant is allowed to run on blindly then its existence will be short and sweet. The knowledge obtained from practice combined with a sound theoretical knowledge is specially necessary for this branch of the work.

The secondary cells are extremely sensitive and, owing to the varying nature of the loads, frequently require special treatment. It is also often necessary to meet a contingency and then the trained man's knowledge becomes evident.

Again, we must remember that during the present crisis one never knows when the supply power for the motors may be cut off suddenly—a contingency of this kind almost happened during the recent great coal strike—the trained man would immediately know what is best to be done to run the plant temporarily. Physical abilities enter into this work to a great extent—for the power attendant does not periodically resemble a sweep without having exerted himself.

Weighing these facts carefully it is *not* a job that the telephonist could undertake.

The next and last of the duties is that of the exchange inspector. He normally takes the most important work in the exchange—viz., the maintenance of the circuit apparatus. He is in charge of the exchange as a whole and must be capable of dealing with matters which cannot be handled by other officers in the exchange, besides having to advise and guide those officers in their normal duties. The routine testing of all the plant falls on his shoulders, and before being placed in his position he must have passed through the other phases of exchange work. You will see that it must necessarily take some years before the man can reach this stage, years spent in studying all branches of the business. The removal of faults in the exchange apparatus is, however, his speciality and the various working adjustments of the apparatus take a long time to learn. He cannot afford to wait for troubles and then set about to *learn* how to clear them—he must *know*.

If the Croydon girls aspire in any way to the exchange

inspector's job I venture to suggest that that gentleman will willingly hand them over the pilot lamp circuits to tackle when they next commence their pranks!

Can we compromise with this work? I think we can say this: telephonists could be trained to carry out routine tests and carry out minor adjustments, but in view of the long and difficult training required I say most emphatically that they cannot take on the exchange inspector's load.

I have only covered the principal duties, there being of course several side lines, such as connecting new subscribers and junctions, diverting circuits and repairing head sets, these jobs being spread over the several duties. Ah! those head sets! When reading a paper of this description one has to be above corruption, for do you know that I almost received a communication from the engineers to the effect that if I could manage to get the telephonists to take over the repairing of head sets, they would overlook anything I said which was adverse to their views!!

I have now come to the end of my arguments, arguments which I have laid before you all quite frankly, my little transgressions from the topic I ask you to forgive and should circumstances ever necessitate the transfer of any of these duties, I can assure you that there will be no lack of willing teachers. We must and will attain the objects in view in this great crisis and our cause will be defended come what may.

If the paper has interested or amused you I ask for no better repayment than to hear an animated discussion, for although my humble opinions have received an airing I await with interest the voice of that ever present factor "the opposition."

TELEGRAPHIC MEMORABILIA.

DURING the critical days which immediately preceded and those first days which coincided with the historical entrance of Roumania into the European conflict, there were hints here and there in the British Press regarding telegraphic delays between that country and the British Isles. The cause of these delays should not be far to seek, seeing the extraordinary pressure which naturally resulted from conditions so abnormal, alike political as telegraphic. Even a cursory glance at a telegraphic map of Europe would show how restricted have become the telegraphic outlets for Roumanian diplomatic, military and news traffic, especially with this island and with certain other of the allied countries. Let the same map be studied from the necessity of an *all-ally* route, and the difficulties would appear to be materially accentuated.

How far these difficulties have been foreseen and met by the prescience of the High Command of the British Post Office and the Allied Governments more closely concerned, this is neither the time or place to disclose. It is, however, safe to say that whatever weaknesses may have developed in the direction intimated it may probably surprise the carpers to know that the home Telegraph Department has not been unalive to the complicated possibilities of the situation. By certain critics the value and importance of international telegraphy to the Empire has always been fixed below its minimum value as a British asset. It is indeed well that within the Service itself there are officials with full experience in these matters and with sufficient authority to back up their ripened knowledge so that the danger of neglect has been almost placed outside the zone of possibility.

The British Telegraph Service naturally does not lay claim to an immunity from errors of judgment or to a complete freedom from narrow-visioned critics within its own circle. As an institution it probably contains a percentage somewhat below that of the average British citizen. It would not be surprising, however, if from time to time there have arisen those in our own midst who, from lack of opportunity of acquiring the requisite knowledge or from other causes, have also failed to correctly appraise the value of international telegraphy in general and Anglo-Continental telegraphy in particular, and therefore the value of the submarine cable system which stretches out its many nerves to the shores of Europe.

A study of traffic curves and the nature of the pre-war and

present war-time traffic should do much to enlist the sympathy of those who at times most certainly appear to be misinformed regarding these essentialities. The suggestion is thrown out for what it may be worth that the Traffic Department should direct a special section of its studies to this branch of the Service. It would repay minute study both now and after the war. It would remove much misunderstanding, much misconception, no little avoidable friction and would save considerable ink and paper; at present apparently quite necessary. Questions now bandied about could be referred for competent and more instant decision.

Some publicity has been given by certain evening newspapers to the number of marriages made from the London Telephone Trunk Exchange. From this it has been an easy transition to the qualities necessary to make an ideal telephone operator, which qualities it is argued, also by another easy transition, tend to recommend these same admirable ladies as the wives and mothers of the future England. One cannot but admire the consistent manner in which Miss Heap endeavours to maintain the high standard which she deems necessary for a telephonist of the first water. We only wish that the Telegraph Service were in as favourable a position to take up the same attitude. This, however, is impossible at the present moment when the army has naturally and rightly claimed so many of the male members of the staff. There has undoubtedly been deterioration and a quite unavoidable falling away from that high efficiency which constitutes the essentials of the ideal telegraphist. May the sacrifices made by the telegraph staff be remembered, and something of their present weaknesses forgiven when the present difficulties of carrying-on are recalled and realised.

Recent temporary residence "Somewhere on the South Coast" has proved to the writer that for private purposes during the present war conditions, the telephone is much cheaper and speedier than the telegraph system, and it is up to the Telegraph Service to see that after the war the advantages of the two Services are more equally balanced.

"Business as Usual" during the war would appear to be the motto amongst the purely technical professors of the German Telegraph Service, as is evidenced by perusal of a recent catalogue of telegraph and telephone literature. Amidst the din of the present conflict one reads the following title of a series of articles written by a German ex-member of the Anglo-German Telegraph Commission, which sat but two years prior to the war, and entitled: "Berechnung über den Stromverlauf in Telegraphenkabeln." To those who knew the competent and kindly author of these essays one could well imagine the possibility of complete detachment which this enthusiast could readily bring to a subject of this nature even in the midst of war's alarms. The incident, though simple, may be full of suggestion to thoughtful readers. In any case it may be quoted as an example of the earnestness of some of the best of Germany's telegraphic specialists.

J. J. T.

LONDON TELEPHONE SERVICE NOTES.

"Two years old! What an interesting age!" That is a comment to be heard practically everywhere that children are to be found. Is it, one wonders, true of journals also and more especially of this journal. In any case for a "War baby" born shortly after the outbreak of hostilities THE POST OFFICE TELEGRAPH AND TELEPHONE JOURNAL is to be congratulated on the fact that it has shown so much vitality and is able to "run alone." We wish it many happy returns of the day and no "returns" of the issue.

The Americans must surely be right in their claim that the "telephone girl" makes an ideal wife, if one may take as evidence the rate at which the staff of the London Telephone Service leaves to get married. Week by week sees the resignation of several of Miss Heap's carefully chosen sweet-voiced and gentle-mannered maidens, and were the pages of the JOURNAL only open to accounts of the "interesting ceremonies" there would be room for little else. The problem of filling the gaps becomes daily more difficult and if any reader should have a brilliant suggestion for overcoming

this difficulty they should at once forward particulars to the Superintendent F.E.S.

As we mentioned last month the coming session of the London Telephonists' Society is to open with a *conversazione* in the Memorial Hall, Farringdon Road. The date fixed is Tuesday, 10.10.16—easy to be remembered *and there will be a full moon*. Admission will be free to all members of the Telephonists' Society. That alone is worth the money as the advertisements say, but membership of the society also entitles one to attend a whole series of interesting meetings. The president, Mr. J. Stuart Jones, is to lift the veil and let each and every one of us into some of the mysteries of that centre of all telephone, as of other Post Office activities, *The Secretary's Office*. One's pen seems to kindle a flame even as the words are written, but what joy to have presented to one glimpses of the great throbbing heart itself!

There are also to be papers by Mr. Corner, of the Traffic Staff and Buildings Branch, and by Mr. John Lee, Deputy-Chief Inspector of Telegraph and Telephone Traffic. The latter is to speak of the "Telephone as a Factor in Social Reorganisation," and anyone who has once had the pleasure of hearing Mr. Lee is certain to come that evening, whilst those who haven't yet had that experience will be well advised to make a special note of the date. Mr. Lee's interest in the society does not end with the writing of papers, as he has offered a prize for an essay on "The Telephone in Modern Drama." Since there seems to be little modern drama without the telephone the competition should be well contested. Mr. Corner has chosen a fascinating subject for his paper. "The Struggle"—what a host of possibilities it presents. One thinks of a different struggle each time one contemplates the matter, yet it is more than probable that not one of these will prove to be "the struggle" of which Mr. Corner will discourse. Whatever else we miss we shall struggle to get to that meeting.

Apart from the meetings arranged by the London Telephonists' Society itself, the members are entitled to attend the gatherings of the more imposing "Telegraph and Telephone Society" which meets in the Institute of Electrical Engineers. There are two such gatherings which should have a special interest for the London Telephone Service. The January meeting is to be addressed by Miss Heap on "Women's Work in the Post Office," and her address will be followed by a discussion. We shall expect to see a large muster of the Telephonists' Society present that evening. Mr. M. C. Pink, last year's president of the Croydon Telephonists' Society, speaks in April on "Subsidiary Telephone Services." The subject is an interesting one and will gain in its treatment by Mr. Pink.

CORRESPONDENCE.

THE GERMAN TELEGRAPHIC BLUFF.

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

It seems to be ponderously difficult for English people to free their minds from the German obsession. Here for instance is "J. B.," in your issue of the JOURNAL for September 1916, repeating the legend that Gauss and Weber invented the five-unit alphabet and that it is a German discovery! At the end of his translation of M. Lucien Fournier's delightful article on the alleged Siemens automatic system, J. B. says:

"In closing I should like to add that according to information imparted to me, the honour or credit of the discovery of the five-unit principle belongs to Germany. Two eminent German scientists flourished about the middle of the nineteenth century, Gauss, a clever mathematician, and Weber, a distinguished physicist, and their theories appear to have been the source whence Baudot evolved the principles governing his fine instrument. It is, therefore, evident that M. Fournier is not in possession of *all* the facts."

J. B. is not in possession of *all* the facts either. Neither am I, but I know enough to say that this legend about Gauss and Weber is all tommyrot, and that the "honour or credit of the discovery of the five-unit principle" does not belong to Germany. The honour belongs to Francis Bacon, who "invented" the five-unit alphabet in 1605, provided always that no one did so at a still earlier date. I take this statement from a very interesting article in the *Railroad Man's Magazine* by Mr. Donald McNicol, of the Postal Telegraph Company, New York. He quotes it from Bacon's *Advancement of Learning*. Mr. McNicol gives the Gauss and Weber alphabet, first used in 1833, as an unequal letter alphabet composed of dots and dashes, a predecessor of Morse. There is no trace of the five-unit alphabet about it, and also it is quite obviously an imitation of the alphabet of Baron Schilling, of Petrograd, in 1832. Incidentally the article shows that there is very little Morse about the Morse alphabet. Baron Schilling anticipated him by about twelve years.

Gauss and Weber's theories were not "the source whence Baudot evolved the principles governing his fine instrument." Baudot himself expressly states that he got his five-unit ideas from Wildman Whitehouse.

Permit me to close by saying bravo! to M. Fournier. More power to your pen-bayonet, which you have used so effectively against the printing telegraph Boches! I enjoyed your article immensely, even if it was "chauvinistic." Also may I point out to J. B. the horrid chauvinistic fact that Bacon and Whitehouse were Englishmen. I rejoice in that fact, and I rejoice over the Frenchman Baudot's great achievements, and I gloat over the miserable telegraphic record of the Germans. I suppose that is very "cynical" and "quasi-scientific" and "one-sided," but there is only one side for M. Fournier and me, and that is the *right* side. We leave the wrong side to J. B. and the Boches. I do wish English people would drop their absurd pose about being fair to both sides. Some of us carry it so far that we help the enemy by being unfair to our own friends.

DONALD MURRAY.

[We leave the defence of his facts to our correspondent, J. B., who is of course responsible for them. We are much indebted to Mr. Murray for yet another contribution from his store of historical knowledge; we do not begrudge him a single gloat; but as it is a contradiction in terms to talk of being fair to one side and unfair to the other at the same time, we are led to wonder what exactly is Mr. Murray's concept of the word "fair."—ED., "T. & T. J."]

REVISION OF TELEGRAPH TARIFFS.

MR. JOHN SCOTT, Postmaster of Sheffield, has invited the views of officers in his district on Mr. Lee's paper "Telegraph Tariffs and Economic Needs." We publish, in abridged form, the opinions of Mr. J. F. SIBETT, Assistant Postmaster, Sheffield, and hope to find room for others in another issue.

"There is a great deal of truth in Mr. Lee's statement that our shop window has become a little darkened and depressing, but I would go further and say that many of the shopkeepers and assistants in the past have done very little to improve the business or encourage the public to purchase the goods.

Our first attempt at anything in the way of popularising the telegraph service was on the introduction of the 6d. telegram. The figures for that period show how much the public appreciated the reduced tariff. In the years 1880-1 the telegraph traffic for the United Kingdom was 29,411,982, whereas in 1890-1, after the reduced rate was in force, the figures had risen to 66,409,211, and in 1899 they are given as 90,415,123. It may be argued that business methods have changed and that the increase was due to the change, but is it not more probable that the reduced rate allowed the business man to make more use of the telegraph system and that the telegraph changed the methods of business? The telephonist has displaced the telegram in many of those business houses, but there is still the need for a cheap service where "prompt business" is the trade motto.

I remember seeing over one enquiry office window at a large firm in Coventry the following notice:—"Please state your business briefly and quickly, we read the daily papers!" That firm prospered in a very few years and bought up many other firms. It advertised, it telegraphed, it telephoned. In fact it was always out for the latest improvement and still follows that practice in its business.

What is good for one firm should be good for another, and as a business institution the Post Office should be prepared with goods to suit the demand. That demand is in my opinion a cheap flat rate telegram. The business man must know what price he has to pay if he wishes to use the system. If he telegraphs it is usually on important business. He makes up his mind quickly that he will send a wire, but if he has to refer to books to find the cost or make enquiry of his clerk he will prefer to dictate a letter and get the job off his hands. Varying rates are unpopular with the business man and with the general public, where those rates are not generally known. If all business men in the same locality are to have equal facilities for easy correspondence with their source of supplies the flat rate is preferable. Why should Jones have to pay more to order his fish from Stornoway than Smith who orders his from Lowestoft, if both reside in Norwich and order by telegraph? If Jones had to pay more he would have to charge more than Smith for his fish or be content with smaller profit. Just so in other businesses. If we are to encourage the use of the telegraph we should be able to offer it to one and all at the same rates at a popular price.

Varying rates according to distance would give rise to difficulties at the counters. Every reference which has to be made to books slows down the rate of acceptance. The sender of a telegram is one of the most impatient of counter customers. He always *knows* there is an office in the place he is wiring to. He *knows* there is no postage to pay. He *knows* the abbreviated address is correct although not registered. He can't wait for the clerk to look up the place in the guide. The betting man comes in two minutes before race time, and unless his message is coded before the race starts, his telegram is useless. All these points suggest the necessity of a flat rate. Then there is the A.G.D. side. The only check now necessary is on the stamps against the number of words. If distance was the governing factor numerous records for every town would be necessary to check by. Enquiries are occasionally now made into portage charges as to distance of house from office of delivery, and it seems that very elaborate methods for checking the charges on telegrams would have to be instituted which would be both costly and troublesome if other than a flat rate was in force. On general economic lines and in fairness to seller and purchaser who use the telegraph system, and

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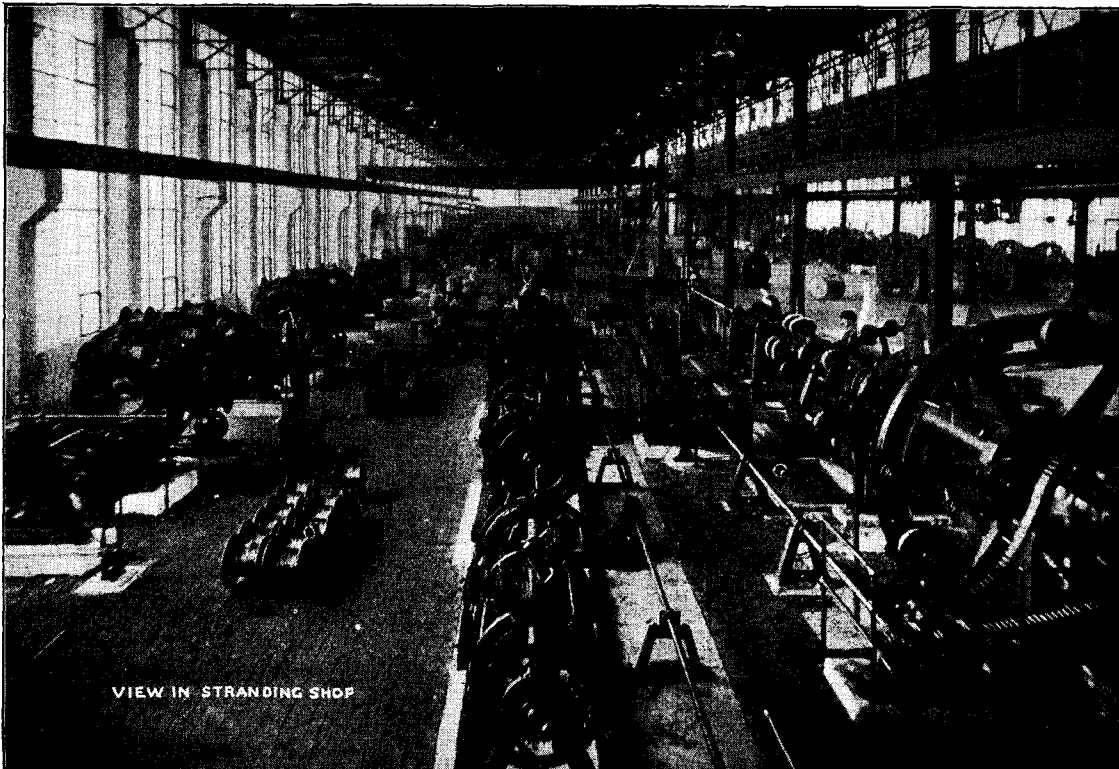
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also on the grounds of economy in departmental management, I am of opinion that the flat rate is justified.

2. I am of opinion the telegraphs should be made to pay. The system is now as complete as it ever has been, and where the traffic is low the telephones lines are being utilised for the joint service. With this combined service there should be a great decrease in maintenance cost as compared with the old arrangement of separate lines for telegraph and telephone, especially as in many cases the Post Office is paying as much as £1 per mile to railway companies for the upkeep of wires on their systems. The extension of the telephone to rural districts, the consequent restrictions of delivery fees under three miles, the substitution of telephone circuits for A B C's in village offices and of telephones and telephonists for sounders and sounder clerks in the larger villages and small town offices should all help to reduce the cost of telegraph service, and at the same time increase the output of the plant.

I am of opinion the business, as a commercial undertaking, should be made to pay. Although it may be that every person benefits directly or indirectly it seems fairer that the users should bear the cost of the service in the first place rather than the service should continue a burden to the State. It is more satisfactory to show a balance sheet with a profit than with a loss, and it is more encouraging for the management and the staff to know they are running a paying concern than to know they are year by year working at a loss.

3. I do not favour the idea of any differentiation of tariff. So long as the postal side is able to send a letter for a penny to any part of the British Isles and pay railway companies at half or two-thirds parcel rates for the conveyance of the mails and still show a good margin of profit I think it is up to the telegraph side to show that the popular-priced telegram is still within the bounds of possibility and is in fact practicable.

Telephone subscribers should be encouraged to have their telegrams telephoned to them by making a reduction from their telephone account of an appreciable amount in accordance with the number of telegrams delivered by telephone. The addressee is entitled to this consideration not the sender. The value of the messengers' service could be estimated. Many subscribers do not appreciate the system of telephone delivery and they refuse to adopt it because they are required to find a clerk to take down the message which the Post Office is paid to deliver by messenger. I attach great importance to this point and I feel the Post Office could do a lot towards the reduction of messengers if they made some concession to the telephone subscriber in the way I suggest. I remember visiting a large firm once to ask them to have them to have their telegrams telephoned and the prompt reply I got was—If you will send us an operator we will agree, but we can't spare a clerk to take down telegrams which you now hand in at our office. If I could have offered some monetary inducement to them they would have agreed, and it would have paid the Department.

It is perhaps wandering from the point, but another case in memory is that of a trainer of race-horses whose stables were over two miles from a village sub-office. He was willing to have a telephone line to his stables and to have all his telegrams telephoned if the Department would make some reduction in the rental on account of the saving in delivery fees the arrangement would effect, but the hide-bound regulations said, No! we can only let you have the line on the usual conditions, and in effect we prefer to keep sending a messenger to you many times a day at a greater cost than the concession you seek, rather than depart from the standard rates. I could quote several other cases where the attitude of the Department has been discouraging rather than helpful in extending and popularising the service.

4. I still favour the 6d. telegram rate. Sixpence is a popular price, and if economy were exercised I feel convinced the service should pay. I fear 8d. is too high, but 6d. and 4d., I feel confident, would be acceptable rates and would result in a great increase of business.

On the postal side reduction of rates has, I believe, always led to an increase of revenue. The machinery is there and it is as easy to send a bag full as half full of letters. The cost is very little more. So on the telegraph side. The plant is there, and if we can fill the lines with cheap rate messages it is better than having them idle. A 4d. telegram would no doubt lead to an increase of business and would pay because it would fill up gaps now unoccupied.

5. Complaints of delay which can only be answered by the excuse of pressure of business show the need for a first class service. The person who wires for a train to be met and arrives before his telegram is annoyed beyond the extent of 3d. he would have paid willingly could his message have been given priority over the general non-urgent message. Then there is the business house in urgent need of information or of material who would willingly pay extra to ensure the message being got through quickly, but the counter clerk replies coldly that "it will take its turn with others," and when asked if any idea can be given as to the probable time of delivery replies coolly, that there is now over an hour's delay in that direction. Here is where the need comes in for an express telegram—one that will compete in speed with the telephone service; a telegram that can take priority over all others. Such a service is needed and would be willingly paid for. I would make an extra charge of 3d. for that express service. There would be no extra cost to the Department except that perhaps a messenger should be sent specially with that single telegram instead of taking it with others on the same route. It is often difficult to get a trunk call through quickly at the busy hours, and the man in a hurry always doubles the waiting time in his own mind when complaining of the delay. If that same man could send an express telegram, which would answer his purpose, his mind would be relieved because he would feel that the business was on its way towards completion as soon as the telegram left his hands, whereas there is a deadlock while he waiting to get through on the telephone. I think the urgent or express telegram should be possible during telegraph hours and should be the first quality service. The second

quality service at the 6d. rate would include general business telegrams and telegrams of the betting and speculating class. Practically all this class of business is of an urgent nature but is scarcely "expressly" urgent. It would give way to express telegrams but would take turns with traffic of its own class. Following this there is a good field for a third rate service. The non-urgent message system would provide for the man who misses the post, who is not on the telephone who does not wish to bother with a letter, who is issuing quotations or market prices or who is an advertising agent. It would also take the place of the express letter to a large extent. It would be—"4d. all the way"—as against 3d. a mile on a local service, a consideration to bookmakers and betting men and to business men who use the express letter service considerably. Such a service should fill up the spare time which now exists in large offices and on main lines and lead to new business for rural lines where the traffic is now low on account of the high cost of the service in comparison with the nature of the business to be done. Against the different quality services is the risk of the cheapest one being used to the largest extent, but a general knowledge of the nature of the average telegraphic message at normal times under the 6d. rate leads one to assume that there would be no risk of a decrease to any dangerous extent of the second quality (under my scheme) telegram, and that the third rate telegram is not likely to cause congestion at transmitting offices shortly before closing time at the delivery offices.

I feel there is much new business forthcoming in rural districts when the lines are already in existence but where the trade does not allow of high priced correspondence being conducted. I served in a district where two extremes in business methods existed. On one side the whole of the villages were devoted to the fruit industry. Trunk and local telephone service grew rapidly as soon as started, telegrams were numerous and these were the general methods of doing business with markets in the North and in London. On the other side was the agricultural district with the old-world farmer and labourer. The post was good enough for them and in some cases they had only a three days' service each week. If, however, the facilities were provided for those farmers they could be educated to use them just as the fruit growers were.

I am hopeful that the losses which have been shown on telegraphs and telephones can be converted into gains if attention is paid to the need for economy in staff, especially highly paid staff, stationery, travelling, engineering, clerical work, commercial clerical work, night duty, Sunday duty, delivery fees, messenger force and supervision, and the cost of delivery is charged for in all cases where the address is beyond the mile radius of the village post office of delivery or more than a mile beyond the town delivery boundary in towns, cities and large villages.

I feel confident this can be done and that we can provide a telegraph service at a figure that will appeal to the general public and be within the means of one and all."

A LETTER FROM BRITISH EAST AFRICA.

THE following letter has been received from Mr. F. J. FORD, a member of the Secretary's Office, who is now a Sergeant in the Signal Service, R.E., and serving with the British East African Expeditionary Force:—

After an intensely interesting journey by rail, boat and on foot I have at last arrived at this small outpost in Southern Uganda, not far from the frontiers of German East Africa and Belgian Congo. After landing at Mombasa we all went as directly as possible into German East Africa, and after certain operations the draft was split up and I was told to take eleven men into Uganda. We were given eight days' rations and three tents, together with a pass for Kisumu, which we reached by means of the railway in three or four days. We travelled under all sorts of conditions, sometimes first class, sometimes in trucks. We managed our meals pretty well, obtaining hot water from the engine. The pace was very slow, mostly owing to the stiff gradients, hair-raising curves in the line and the heavy load. We had a day at Voi and several hours at Nairobi, but our most interesting experience was the sight close to the line, for miles and miles, of vast herds of wild zebras, gazelle, ostriches, &c. The railway reached the height of 8,000 feet through ranges of mountains, and the climate and vegetation changed accordingly. At Kisumu we were re-ratoned and instructed to proceed to this place. An excellent little steamship carried us across the lake in three days to our point of disembarkation, Bukakata. We were enabled to break our trip by visits to Jinga, Kampala and Entebbe, where our arrival was the occasion of considerable interest to the natives. We slept on deck under our mosquito nets and made ourselves very comfortable with the aid of the native crew and Goanese stewards. Anything we wanted we took, in accordance apparently with the Europeans' custom out here, and where we wished to go, we went. At Bukakata (three sheds, several huts and a telephone) we stopped two days, as natives were not available to carry our kits, rations, &c., all of which had greatly increased on account of the additions of beds, tents, lamps, pots, &c., of which we had managed to obtain possession en route. We were then practically cut off from European civilisation, the nearest settlement being Mazaka, two days' march away. We pitched our tents on the edge of the lake, surrounded by perilous swamps beyond which was wooded country harbouring every type of tropical insect and animal. The nights were very weird, constant chattering, buzzing and croaking being heard from every point of the compass. We never failed to sleep peacefully however, as we always kept loaded rifles quite handy. Our march to Mazaka could be made the subject of an interesting novelté, but owing to lack of space I will reserve a description of it until I come back. From what I can

gather we shall have many such marches to undertake before then as there are no railways here and we shall shortly be required some hundreds of miles further south.

Although this place is practically on the Equator the climate is delightful, but the nights are very cold owing perhaps to the elevation. Mosquitos are troublesome and have to be guarded against as they are the principal agents in spreading malaria. There are many other insects here which have to be avoided as much as possible because they are all carriers of some disease or other. Manufactured goods are very dear here, but plants and trees bearing bananas, pineapples, oranges, lemons, pomegranates, &c., are to be met with on every hand. My tent here is pitched under the shade of three trees, one bearing tangerines, another fine lemons and the third pomegranates. A grove of bananas is within 50 yards of the brow of the hill.

The natives here are very decent and in order to be able to get about with greater facility I am picking up as much knowledge as possible of their languages, Kiswahili and Luganda.

Every walk here reminds me vividly of Kew Gardens, and we all find the utmost interest in observing the huge multi-coloured butterflies, immense lizards and grasshoppers, and small monkeys running wild in the woodland. We live largely on the flesh of goats, buck and hartebeeste, and have each engaged a native lad at 10 rupees a month to cook and provide for us generally. The dishes the natives produce are very appetising, but we are warned never to watch them preparing these mysterious feasts, or our enjoyment of meals would be a sensation of the past. Our boys will come in very useful on "safari" or when on the road, as every drop of drinking water has to be boiled and food of some sort or other has to be collected at the end of each day's march. Moreover, our clothing from time to time becomes unhealthily filthy, and often needs mending after a tramp through the jungle. When proceeding from one place to another, N.C.O.'s are allowed eight porters each to transport their belongings, and there seems to be no reasonable requirement which these lads cannot by some means satisfy when you are out in the wilds with them.

I am wondering what is happening at home as no letters have reached me since I left. We often get short reports of the military operations elsewhere, and as far as can be judged everything seems to be going on merrily except from the *deutsche* standpoint.

Of what we are doing here I can of course say nothing, but I have never been more contented or fitter in health. Please let me hear from you at the address given above, which I am told there is no need to conceal.

Kindest regards to all, and hopes of a speedy reunion. It seems to me that I am so deeply pushed into these jungles that I may be the last to dribble back unless something unexpected occurs. Anyhow, I see no prospect of becoming downhearted, although constant separation from the white companions I have made leaves a feeling of loneliness which seems only to be augmented by the presence of an escort of natives.

OBITUARY.

We regret to announce the death of Miss F. L. M. BAMFORD, an experienced Telephonist in the St. Albans Telephone District. Miss Bamford was killed instantaneously by a high explosive bomb which was dropped from a Zeppelin during the early morning of Sept. 3. Miss Bamford's younger sister also succumbed to injuries received at the same time. The bombs were dropped at the small, but pretty little Hertfordshire village where Miss Bamford's home was.

The funeral of the sisters took place on Sept. 6, with a simple service and a short but effective address from the Vicar, in the village church, which had been badly damaged by a bomb. Many beautiful floral tributes were sent, including wreaths from the District Manager and the St. Albans staff, the County Constabulary, her fellow officers, many of the local subscribers, local Post Offices, and from the London Trunk Exchange.

Miss Bamford was of a very cheerful and lovable disposition, took the greatest interest in the working of her local exchange, and had the regard of all her subscribers; and it is worthy perhaps of special mention that just before she met with her death she had expressed her intention of going to her exchange in order to render a willing assistance during the temporary pressure which she felt would be thrown on the resident staff.

The deepest sympathy of all is extended to the sorrowing parents.

The Post Office staff were represented at the funeral amongst others by the Postmaster, Sub-Postmaster and the District Manager.



MISS F. L. M. BAMFORD.

PERSONALIA.

NEWS OF THE STAFF.

LONDON TRAFFIC STAFF.

Transfers—

Miss G. A. GARDNER, Assistant Supervisor, Class II, has been transferred from London Wall Exchange to Avenue.

Miss A. M. DEARSLEY, Assistant Supervisor, Class II, has been transferred from Mayfair to Streatham Exchange.

Miss B. R. PERRIN has been transferred from Park to Western Exchange.

Miss V. K. H. MCNEALE has been transferred from Park to Victoria.

Miss J. L. BEALE, of the Hop Exchange, has been transferred to Kensington.

Miss E. L. HOPGOOD, of the Hop Exchange, has been transferred to Woolwich Arsenal.

Miss I. A. ALLEN, of North Exchange, has been transferred to East.

Miss E. W. DIXON, of North Exchange, has been transferred to Avenue.

Miss BRIGHTMAN has been transferred from Western to Park Exchange.

Miss EGGLETON has been transferred from Croydon to Sutton Exchange.

Miss HILLIER has been transferred from Croydon Exchange to Aldershot.

Resignations—

Miss ANNIE G. GRAHAM, Assistant Supervisor, Class II, of Hampstead Exchange, has resigned on account of her approaching marriage. She was presented with a silver cake basket by the supervisors and a dessert service by the telephonists.

Miss M. R. ROLLASON, Assistant Supervisor, Class II, has resigned in view of her approaching marriage and received many gifts from the staff of the Streatham Exchange, including a cruet.

Miss R. CLARK, the Telephonist-in-Charge at Bexley Heath Exchange, has resigned in view of her approaching marriage, and was presented with a dinner service by the traffic and engineering staff of the Woolwich, Dartford, Erith and Bexley Heath Exchanges.

Miss MAY HACKETT, of Hampstead Exchange, has resigned.

Miss WINIFRED A. JAMES, of Hampstead Exchange, has resigned.

Miss ELLEN MAJER, of East Exchange, has resigned to be married, and was presented by her colleagues with a basket of cutlery and a silver and glass *epergne*.

Miss E. E. YOUNG, of London Wall Exchange, has resigned.

Miss E. ALLEN, of London Wall Exchange, has resigned.

Miss W. O. MARSHALL, of London Wall Exchange, has resigned.

Miss R. E. M. TRITTON, of London Wall Exchange, has resigned on account of approaching marriage.

Miss E. M. MARTIN, of Mayfair Exchange, has resigned.

Miss P. A. PARR, of Victoria Exchange, has resigned.

Miss E. M. WILLMOTT, of Victoria Exchange, has resigned.

Miss E. F. BRADBURY, of Victoria Exchange, has resigned.

Miss E. L. SHILLING, of Victoria Exchange, has resigned.

Miss M. V. ERRINGTON, of Victoria Exchange, has resigned.

Miss G. E. DENTON, of Victoria Exchange, has resigned in view of her approaching marriage. She was presented by her colleagues with a case of fish-knives and forks and other gifts.

Miss M. BAYNTON, of Avenue Exchange, has resigned.

Miss H. ZAMBRA, of Avenue Exchange, has resigned.

Miss G. HOOD, of Avenue Exchange, has resigned.

Miss J. A. COLE, of Western Exchange, has resigned in view of her approaching marriage.

Miss A. BURRELL, of Western Exchange, has resigned.

Miss ALICE M. DYBLE, of the Trunk Exchange, has resigned to be married and was presented by her colleagues with a silver tea service and many other useful gifts.

Miss EDITH BASTIN (Trunk Exchange) was also presented with a silver tea service, among other gifts, on her resigning to be married.

Miss WINNIFRED NATION, of the Trunk Exchange, has resigned.

Miss BEATRICE M. PERMAN and Miss LILIAN M. HOWARD, of Trunks, have also resigned.

Miss SKINNER, of Croydon Exchange, has resigned.

Miss M. WARD, of City Exchange, has resigned in view of her approaching marriage.

Miss B. M. HESLOP, of City Exchange, has resigned in view of her approaching marriage.

Miss MAUD A. WELLERMAN, of Holborn Exchange, has resigned.

Miss Eva L. JARRATT, of Holborn Exchange, has resigned.

PROVINCIAL STAFF.

Miss F. M. PYE, after three years' service on the clerical staff in the District Manager's Office, Canterbury, has resigned on account of ill-health. Before leaving, Miss Pye was presented by the staff with a writing-case.

Miss O. K. MACINTYRE, Telephonist, of Colwyn Bay, has been transferred to Didsbury, and was presented with a week-end case by the Postmaster and her colleagues as a small token of their esteem.

Miss WALKER, Typist, Telephone Office, Belfast, has resigned in view of her approaching marriage, and was presented by the staff with cutlery.

Mr. G. HAWTHORNE, Assistant Traffic Superintendent, Belfast, on the occasion of his marriage was presented by the staff with a silver tea service.

A Hastings Customer

WRITES:—

" Please find enclosed P.O. 13 8, my last instalment due on 10th.
 " Please accept my sincere thanks for all you have done for me.
 " If at any time I can do you a good turn I
 " shall be only too pleased to recommend you
 " to anybody, as I must say nobody could have
 " treated me more fairly than you have done."



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THE Telegraph and Telephone Journal.

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SOME APPREHENSIONS AND A MORAL.—I.

BY JOHN LEE.

THERE are, I think, at the moment two particular aspects of what may be called staff anxiety. One is the anxiety lest the old working conditions should not be fully restored, and that consequently our working arrangements may be less satisfactory to everybody concerned after than before the war. The second is the anxiety lest all we have learned during the war of each other's powers and capacities and potentialities should not be put to full use and the opportunity for a definite betterment of circumstances and a co-ordination of responsibilities should not be realised.

One of the difficulties of writing what is after all a merely personal comment on the situation is that much of the data cannot be revealed. If only one could describe even the portion which one knows of the wonderful work which has been done by telegraphists and telephonists during the past two and a half years, the arguments which would be brought forward would be much more cogent. Most of us know one corner or another of telegraphy and telephony in which the staff has done work higher in its responsibility and more wide-reaching in its national importance than any of us can have expected. Not indeed that those who have spent a lifetime in the Service are surprised with this new revelation of potentiality; we have known it in an inchoate and indefinite way for many years. We have felt that much of the so-called discontent in the Service, often finding its articulation in unjustifiable language, is not the mere discontent of seething agitation but has other elements in its upmake, a sense of thwarted ambition, of realisation of greater possibilities, and of social and professional aspirations, which in themselves are factors of considerable moment in the sum total of fellowship. Naturally enough when these factors are present in large groups of intelligent workers and of workers whose combined intelligence in practice has become—as they themselves know from their daily work—of far greater value in the protection of the State than the citizens of the State are aware, this discontent becomes more evident. It is the "large and liberal discontent" of which William Watson sings. It is really a wholesome dread lest too easily we step back to a humdrum conception of our craft and of its personalities.

Take for example the method of distributing air raid warnings by the telephone system. The telephonist who hears on a tram

or an omnibus a description of the method by which the "Government" distributes these warnings would probably smile at the entire failure to realise the important responsibilities which have been placed upon her and other members of her class. Similarly the telegraphist probably knows something about submarines more than has appeared in the newspapers, and one of the remarkable features of the work of the past two years has been the admirable way in which secrets have been kept and in which the staff generally have refrained from building up a mosaic of little secrets to try and discover the greater secrets of national importance. The spirit of loyalty has outstripped ordinary conceptions of patriotism. It has developed into a professional patriotism which becomes the channel through which our national patriotism flows and the real apprehension is lest this eager professional patriotism and *esprit de corps* should fail to become the animating spirit of the new-born service of communication.

This is to be put in the foreground. It by no means follows that any of us can say that we agree with everything that is said either on one side or on the other side of the historic issue. A prominent bishop rebuking an almost equally prominent layman for a criticism on the Church reminded him that the critic was part of the Church which he criticised. Sometimes there is a little danger lest the word "Department" should be interpreted as referring to sections of the total fellowship of the Post Office to whom certain responsibilities fall. Whereas (like the Bishop's "Church") the word "Department" covers the whole of the State's enterprise which is included under the head of Post Office. It may seem to be a perfectly hopeless endeavour at the present moment to bring this conception of fellowship into the foreground, but however hopeless it may be that is the object of these articles. It is the writer's firm belief that we have reached a stage in economic and social history when the thought, and experience, and rights, and responsibilities of the staff, male and female, of all grades, should be included in an articulate organism which would be a living portion of the total administration.

I do not propose to protest a particularly sympathetic attitude. Protests of sympathy always seem to me to be open to the criticism which was once applied to the English summer. "In England," said a kindly Gaul, "you always have to tell people when it is a fine day." I do not propose to adopt that type of sympathetic attitude which needs to be shouted abroad. Unless we begin with the very atmosphere of sympathy we are lost. Our sympathy should be as evident as the sunshine. Nor, on the other hand,

am I an admirer of that sympathetic attitude which while calling itself democratic runs into the fallacy of taking a section of the body corporate as being the democracy. It is probable that there is no living Post Office official who agrees with all that will be said in these articles; it may be possible (and I hope it is) that no Post Office official will differ from all the contentions which shall be made. If this happens happily to be the case we shall see some opportunity for constructive effort in the way of applying the lessons which we have gained from a great deal of good work, much of it failing perhaps in public appreciation, which has been done in past years.

AN "EXPRESS" IDEA.

BY J. WEBSTER (*Newcastle-on-Tyne*).

IT is a matter for some surprise that in the discussion on Mr. J. Lee's proposals for the institution of an "urgent" rate and also a "local" rate for telegrams, no mention has been made of the facilities at present provided for a combined "urgent" and "local" rate by means of the Telephone Express Service. The few members of the public who are acquainted with the Telephone Express Service know its value. For local messages it is cheaper than a telegram and decidedly more expeditious. Indeed, nothing could be quicker. The subscriber calls up the delivery office and dictates his message. There is no waiting at counters, no whizzing through tubes, no lying about at circulation tables. The only delay sustained by the telephone express message is that caused by pressure of business at the delivery office or by encounters, friendly or otherwise, of the delightfully irresponsible youths of either sex to whom such missives are entrusted for delivery.

When it is borne in mind that such a service to any distance up to 25 miles costs from 3*d.* to about 7*d.* to a telephone subscriber, and from 5*d.* to about 9*d.* to a caller at a telephone call office for a message of 30 words, provided the addressee resides within a mile from a telegraph office, and it is also remembered that a telegram for the same address would cost 9*d.* for 12 words, one wonders why telephone express messages are not as common as cold feet.

The reason for the scarcity of telephone express messages lies in the fact that so few of the public are acquainted with its facilities. I have scrutinised the phonogram "A" forms at a large town and found that telephone subscribers very frequently send a telegram when a telephone express message would have been cheaper and quicker. This brings us to the old question as to whether or not the department ought to advertise. With regard to telephone express messages, I certainly think that advertisement would prove beneficial, not to the money bags of the Post Office, but to the efficiency of the community at large. We make no charge for writing the thing down and we very well might levy a copying fee. In this particular means of communication between man and man there is as little interference as possible by Post Office servants and the charges are regulated as far as can be done according to the amount of labour actually performed. For instance, the sender or addressee pays the cost of delivery at the rate of 3*d.* a mile, a much more equitable arrangement than obtains with telegrams where in some cases the total fee paid for the service goes to pay the casual messenger employed for delivery. It is essential for the development of civilisation that each member of the community should have the fullest means of associating himself in thought, word and deed with his fellow-man. To millions it has not been brought home that messages grave or gay and not necessarily pertaining to the beginning or ending of terrestrial existence can for a few pence be sent on the spur of the moment and delivered immediately to anyone within a radius of 25 miles.

The first step towards popularising this service would be, in the writer's opinion, an alteration in name. "Telephone Express" is clumsy, and one has not time nowadays for an expression containing five syllables when a shorter word would

meet the case. What about "rapidity" "memogram" "write-now" "dictagram" or some such suggestive title for the service under notice? If, in these hustling days, the Post Office were a limited liability company, one might see on the hoardings striking pictures of telegraph messengers cycling at a rate considerably above the speed limit, all heedless of dog-fights and other delights, distributing "write-nows" right and left. Underneath would be some such dialogue "Left your keys? Send a 'write-now' right now." [Not in Old England, we think.—EDITOR, "T. & T. J."]

To digress for a moment, talking of cycle messengers reminds me of an occurrence on a recent Sunday. A boy messenger was met wheeling a perfectly sound official bicycle. "Why arn't you riding, Tommy," asked an official who met the boy. "Please, sir, I can't." "Then what are you doing with the bike?" "Please, sir, I told the inspector I had a telegram for—and he told me I had better take the bicycle, so I'm taking it."—Military discipline once more.

A further means of making all and sundry actually realise the existence of what has hitherto been known as the Telephone Express Service would be the simplification of procedure at the delivery office. This would be of special importance at sub-offices.

Many of the readers of this journal will regard sub-offices as an unmitigated nuisance. These would recollect that at sub-offices, telegraphs and telephones are only a small part of the trivial round and common task. Nowadays the "grocer post offices," which "J. J. T." sometimes refers to in his "Memorabilia," are no unimportant part of the national life, whether for investment funds to beat the enemy or for payment to one's kith and kin for beating him in the flesh. Duties at sub-offices are now so diverse and multiplex that all the simplification possible should be attempted. But at the mere mention of "telephone express," the young lady assistant will turn pale. She has to make up so many forms in connexion with each express message, that she is afraid to tackle it without seeing the rules. She hasn't time to look for the rules which are on typed sheets of paper hidden in some corner where of course they ought not to be. In his library of rule books (usually more than a dozen), and in the all-comprising Post Office Guide, the sub-postmaster will search in vain for guidance regarding telephone express messages, and when he does find the instructions he is bewildered by all the forms which have to be filled up. The message is written on the ordinary telegraph "C" form, the upper copy of which has to be impressed with a rubber stamp in order to show within the impression the exchange number of the originating subscriber's circuit and the express fee due (at 3*d.* per mile per 30 words). The writer is unable to understand why there should be any further forms to fill up in these days of economy in paper and time (even sub-postmaster's). However, forms there are, as follows:—

First there is an Express "E" form. This, of course, is because the "write-now" or "memogram" is still regarded as part of the Express Service. The "E" form, be it noted, records exactly what is on the upper copy of the "C" form but without the text of the message. On it, however, the addressee acknowledges receipt of the message and records the time thereof. Why in the name of the late-departed red tape should a man sign a receipt for a 3*d.* express message and not for a 9*d.* telegram? Probably in case someone might forget that the Post Office as well as the War Office has a Practical Joke Department. *Vide* "The First Hundred Thousand."

In addition to the "E" form (which by the way never hereafter seems to be separated from the "C" form, and therefore to a mere provincial seems to be quite unnecessary) the sub-postmaster has to prepare a duplicate "E" form to forward to his head postmaster, who, by the way, does nothing with it except take note of its presence for purposes of his monthly return. As the sub-postmaster has probably forgotten to insert a carbonic paper under the "E" form the preparation of the duplicate usually entails writing out the particulars again. Then there is a form T. No. 130 to prepare, the originating subscriber's number and the express fee having again to be recorded as well as the inevitable date stamp. The form-filling business is not finished yet however,

as the total of the originating phonograms and express services must be summarised on a form T. No. 100. As phonograms are rarely now originated at sub-offices the form T. No. 100 usually deals solely with telephone express messages and unfortunately there is rarely more than one day. Lastly, to crown all, if the sub-postmaster is to be paid for the work he must insert the number of *telephone express messages* opposite the entry "Phonograms" on his daily telegram docket.

Why is not the usual telegram "C" form impressed with the aforementioned hand-stamp, sufficient?

The head postmaster could check the sub-postmaster's entries, forward all "C" forms relative to telephone express messages to the district manager's office, where the necessary entries in the subscriber's accounts could be made, and the "C" forms then forwarded to the Accountant-General's Department for final check.

It must be remembered that the average person gets the bulk of his information on Post Office matters from sub-postmasters and their assistants, and if the excellent service now available for all, by means of the telephone express, is to become known to the public, the procedure must be so simplified that sub-office assistants may not be afraid of it. Only then will they recommend it to their clients. Further their instructions on the service must be incorporated in a proper rule book and not left, as it has now been for nearly four years, on sheets of mimeographed typing.

THE TELEGRAPH GIRL.

(From *Mr. Britling Sees it Through*, BY H. G. WELLS.)

AND then, as if it were something that everyone in the Dower House had been waiting for, came the message that Hugh had been killed.

The telegram was brought up by a girl in a pinafore instead of the boy of the old dispensation.

Mr. Britling was standing at the front door; he had been surveying the late October foliage, touched by the warm light of the afternoon, when the messenger appeared. He opened the telegram, hoping as he had hoped when he opened any telegram since Hugh had gone to the front, that it would not contain the exact words he read; that it would say wounded, that at the worst it would say "missing," that perhaps it might even tell of some pleasant surprise, a brief return to home such as the last letter had foreshadowed. He read the final, unqualified statement, the terse regrets. He stood quite still for a moment or so, staring at the words. . . .

It was a mile and a quarter from the post office to the Dower House, and it was always his custom to give telegraph messengers who came to his house twopence, and he wanted very much to get rid of the telegraph girl, who stood expectantly before him, holding her red bicycle. He felt now very sick and strained; he had a conviction that if he did not by an effort maintain his bearing cool and dry he would howl aloud. He felt in his pocket for money; there were some coppers and a shilling. He pulled it all out together and stared at it.

He had an absurd conviction that this ought to be a sixpenny telegram. The thing worried him. He wanted to give the brat sixpence, and he had only threepence and a shilling, and he didn't know what to do and his brain couldn't think. It would be a shocking thing to give her a shilling, and he couldn't somehow give just coppers for so important a thing as Hugh's death. Then all this problem vanished and he handed the child a shilling. She stared at him, inquiring, incredulous. "Is there a reply, sir, please?"

"No," he said, "that's for you. All of it. . . . This is a peculiar sort of telegram. . . . It's news of importance."

As he said this he met her eyes, and had a sudden persuasion that she knew exactly what it was the telegram had told him, and that she was shocked at this gala-like treatment of such terrible news. He hesitated, feeling that he had to say something else, that he was socially inadequate, and then he decided that

at any cost he must get his face away from her staring eyes. She made no movement to turn away. She seemed to be taking him in, recording him, for repetition, greedily, with every fibre of her being.

He stepped past her into the garden, and instantly forgot about her existence.

THE LONDON TELEPHONISTS' SOCIETY.

MR. STUART JONES' PRESIDENTIAL ADDRESS.

MR. STUART JONES, in his presidential address, stated that the membership of the London Telephonists' Society last session amounted to 804, and that there was reason to hope that that number would be reached, if not exceeded, during the coming session.

He said that he doubted if there was in the United Kingdom another society as large, of which the membership consisted so exclusively of women and which was so largely conducted by women, which had for its primary objects the greater efficiency of the women in their craft and the promotion of the higher efficiency of the craft itself. These objects were, in his opinion, amply realised.

The potentialities of usefulness which the society possessed was certain to increase in the future. As the result of the withdrawal of men for military purposes, women had been called upon in several directions in the telephone service to undertake work hitherto performed by men. After the war much of this work would no doubt revert to the men, but it was unlikely, if not impossible, that pre-war conditions would be reverted to in all ways. The whole tendency of the times, moreover, was to enlarge the part taken by women in industry. A much wider field than had hitherto been presented to women would be available in the future, and it would rest with the women themselves to take full advantage of these new opportunities. They would require to take advantage of every means of increasing their technical knowledge of their craft and the society afforded an excellent means of doing so.

When the full story of the manner in which our women had borne their share of the burdens of the war came to be written, he doubted whether the historian would be able to show a higher example of the heroic behaviour of the women of this country than the conduct of the telephone women in connexion with the defence of our country against attack by hostile airships. During an air raid, the defence measures were largely dependent upon the telephone system, and the manner in which telephonists had stuck to their work under conditions of excitement and nervous tension was deserving of the highest praise. At many towns telephonists had faced the dangers of bombs and of shrapnel in going to their exchanges when they thought their services would be needed.

THE LATE SIR GEORGE FRANKLIN.

ON the announcement of the death of Sir George Franklin Mr. Horne wrote to Lady Franklin expressing the sympathy of the Postmaster-General and the Telephone Staff, especially the former officers of the National Telephone Company.

In reply he received the annexed letter:—

Tapton Holt, Sheffield.

Oct. 14, 1916.

Dear Sir,—Will you accept and please convey to the Postmaster-General and officers of the Post Office my sincere thanks for the very kindly resolution of sympathy which you have sent to me? Such an evidence of esteem shown to my husband is very precious to me in my sorrow.

May I be permitted especially to mention the former staff of the National Telephone Company who had been associated with him for so very many years?—Believe me, yours faithfully,

ANN FRANKLIN.



TELEPHONISTS ON DUTY AT A SUBURBAN EXCHANGE WHO WERE IN THE MIDST OF A ZEPPELIN RAID.

Back Row: Misses F. S. CROWHURST, D. MUNNS, E. G. GODFREY, B. M. PORTER, D. I. POOLE.
Front Row: Misses B. M. JENKINS, E. K. PAYNE, N. WARD (Supervisor), Z. HOPCRAFT, G. E. MALLETT.
 (Mrs. M. HUBBARD, Miss G. MEADE (who are absent from town), and Mr. W. KAYES were also on duty.)

SOME AIR RAID IMPRESSIONS.

BY NELLIE WARD (*Assistant Supervisor, Class II*).

WHEN the emergency staff of a certain south-western exchange were advised to report for duty on the evening of Sept. 23, 1916, they little anticipated the ordeal they would undergo within the next few hours.

It was shortly after 10.30 p.m. that various emergency messages were received, and these were circulated to the specified subscribers in a manner which spoke volumes for the way in which the telephonists have been trained to deal with these calls.

About 12.15 a.m. the distant booming of the anti-aircraft guns announced the fact that the Zeppelins were approaching, but we were unable to pay much heed to them as the traffic demanded all our attention. At 12.30 a.m. the firing grew very heavy and we then knew that the "Zeps." were in the vicinity, and resolved to maintain control over our feelings and perform our duty bravely.

A few minutes later there was a terrible crash, followed by a succession of deafening explosions which literally shook the building. The last bomb which was dropped was responsible for a rush of work.

Needless to say we were only too glad to have this additional labour thrust upon us, as it helped considerably to divert our thoughts from our danger, several of the operators being kept in ignorance of the fact that the throb of engines could be distinctly heard overhead. The noise, however, suddenly ceased and then we set to work to deal with the fire, police and ambulance calls of which we received a large number.

One cannot help admiring the courage of the staff, who never for one moment thought of themselves, but were only too anxious to help those unfortunate people who were suffering from the effects of the raid. Several of the subscribers thanked the tele-

phonists for the prompt and efficient manner in which their calls had been dealt with, and we all felt more than repaid by these expressions of gratitude.

As soon as the final emergency message had been circulated, and advice was received to release the staff, as many as could conveniently be spared were sent into the rest room, but needless to say they were too excited to sleep, but sat up talking until it was light, when, having partaken of some breakfast, they returned to the exchange where they remained until their services could be dispensed with, which was about 10.30 a.m.

Thanks are due to one of the assistant night superintendents, and also to a night member of the trunk exchange who so kindly came and gave assistance in connexion with the calling out of the extra staff for Sunday duty.

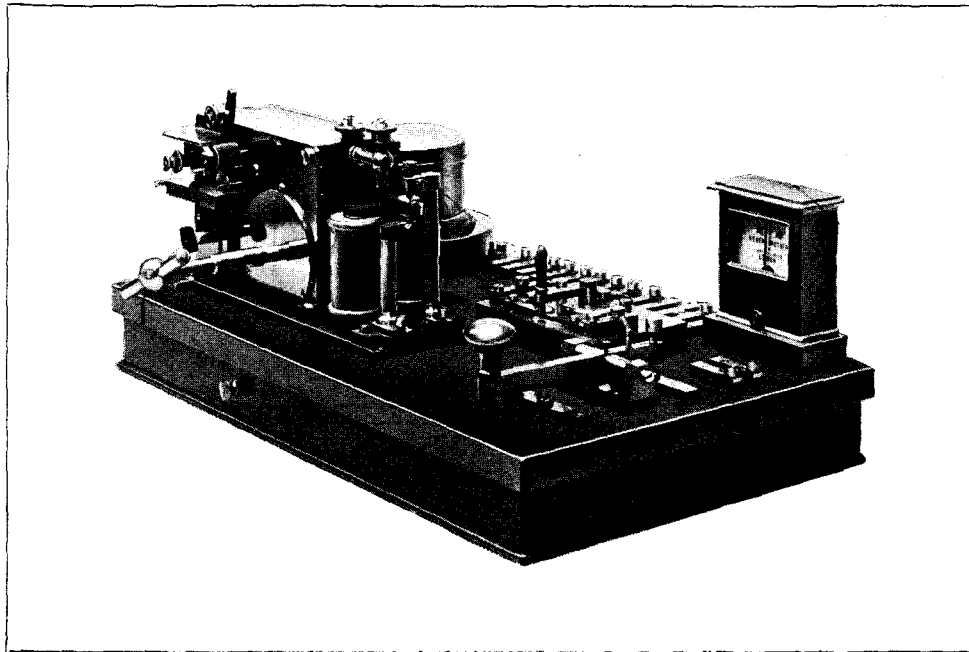
However I am pleased to add that we are fortunately none the worse for our thrilling experiences, but very proud of the fact that we have been able to do a little to help our country in her time of need, but we feel sure that we only did what any member of the "London Telephone Service" in the same circumstances would have done, and we are all perfectly willing to do the same again if necessary.

OUR EXCHANGE IN AN AIR RAID.

BY EVA GRACE GODFREY (*Telephonist on Duty*).

WHO would have thought what experiences a few of us would be having during the night when the emergency call was received early in the evening on Saturday, Sept. 23? There is always a slight feeling of uncertainty when that call is received, and we had no more reason to be uneasy on that particular occasion than on any other. Even when we heard a Zeppelin had been sighted and we could hear distant gunfire, no one seemed unduly alarmed.

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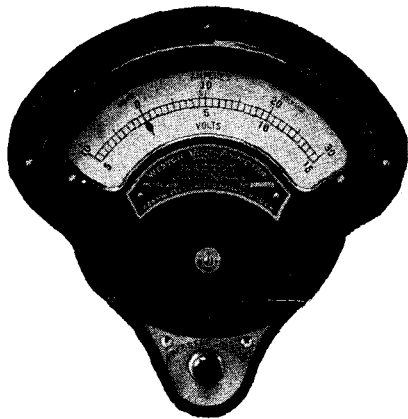
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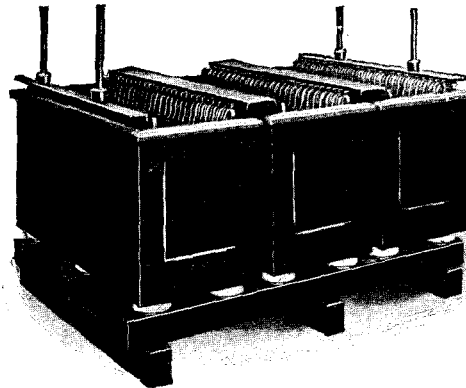
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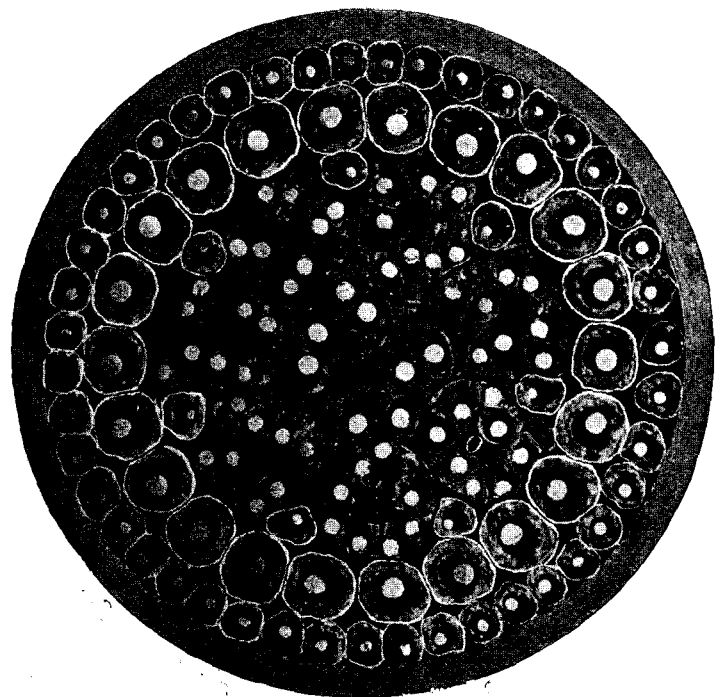
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Although we do not wish for such an experience again, we were pleased to be able to do our work with comparatively steady nerves; and that we gladly did our best to give full attention to the service is one of those things we alone can know.

After the gunfire had ceased, all was quiet for about a quarter of an hour, when suddenly distant crashes could be heard. We did not know how near we really were to danger, and every possible light had been extinguished, except what was barely necessary for working, and the emergency lamps were lit in readiness. In a few seconds—they seemed an eternity—the thunder-like crashes came right overhead. Scarcely had the "boom" and roll of one died away before another came, each sounding nearer. The building absolutely shook, the noise was deafening, and great was the relief when the next crash sounded farther away, and the next still farther. We were thankful to know we were out of any immediate danger. Not even a pane of glass was cracked in the exchange even though, on either side, shop fronts and windows of houses were smashed. Every moment we expected a bomb or shrapnel to come hurtling through the roof, and no one can say but that we had a marvellous escape.

All seemed amazingly calm and collected, although the look on each face showed what each had gone through in those few minutes. The next moment, the only concern shown was that for our relatives and friends, the remarks of one or two showing that even the wounded soldiers in the hospitals connected with this exchange claimed some of our thought and sympathy. Not a word was spoken of personal feelings—they were apparently forgotten; other people's lives were the most important then, and our minds were again centred on our work. Did we need telling to hurry? Here is where we see another instance of the calmness of the British people—I cannot remember one case where anything worse than alarm or shock sounded—none seemed panic-stricken. When they were told they must wait their turn for "fire" and "police" numbers, each realised the inevitable and waited for the number to be given as soon as possible; they realised that each one's need was as great as another's. Not only that, but several subscribers were good enough to thank us for our services and to praise us for being calm and collected. Could these subscribers know how much they cheered and encouraged us, they would feel doubly rewarded for their trouble in speaking so kindly to us at such a time. Perhaps it helped them to keep up their own courage; if so, we are pleased, because only at such times can a real bond of sympathy be felt between subscriber and telephonist. They did what they could; they sympathised with us, and inquired kindly about us.

The work kept our minds well occupied. Was there ever such a long night?—and yet so much was crowded into it! Was ever the dawn so long in coming?—and yet it was light about 6 a.m., probably before.

Amongst the victims of the raid was a poor unfortunate donkey who resided in a field right opposite, and was killed by some bombs which we might have had. We feel sorry that the brute creation should have suffered too, and I know we shall miss him. Poor donkey!

Another bomb fell near an office, wherein was a clock most of us observe as we pass by when coming on duty in the mornings. This particular clock stopped as the bomb fell. Apparently it felt indignant at the outrage and declined to work any longer whilst such dreadful things were happening. Now, we are glad to say, it is going again, so we shall not miss its face in the morning, warning us to hurry or telling us to take our leisure.

Two of the staff had a novel experience about 6.30 a.m., when they knocked up the manager of a dairy near at hand in order to obtain some breakfast. As they returned with the goods, several people stared—remember it was Sunday morning—yes, we were raiders, but of quite a different description from those of the night before.

The police and fire brigade stated that the service was excellent during the raid. This little information pleased us all very much—and it is eloquence in itself, surely!

If one of the objects of these enemy raids is to terrorise, they failed as far as we were concerned. The service remained unin-

terrupted—there was no panic even though the noise was really unnerving.

We tried to do our duty. No one can do more. Our men are showing themselves British and brave, and who shall say our women are far behind? Unselfishness is the motto of those who fight to defend us, therefore is it not right for each one of us to do our little bravely and well?

TELEGRAPHIC MEMORABILIA.

THE writer has been slightly called to task regarding the "Business as usual" paragraph in last month's Memorabilia and with special reference to the allusion to a German technical author. Perhaps on account of the manner rather than the matter of the reference. As level-headed British telegraph officials it would certainly be ill-advised if we were not to recognise that, sooner or later, this country will re-establish telegraphic communication with Teuton shores. This being so, and when so much has happened to discredit Germany and her rulers, when also, doubtless, our memories will long be charged with many a bitter recollection, surely there should be no need to apologise for penning just one appreciative word concerning an enthusiastic telegraph engineer—alien though he be. The world cannot live on unending hate.

War or no war, there are fortunately, still left behind in each belligerent country, telegraphic and other scientific enthusiasts whose complete detachment, though possibly irritating to the majority of their fellow-countrymen, has doubtless a very useful place in the general scheme of things. Such professors, thinkers, students, do but show that, despite the present hurricane which has caused so much wreckage, the restless tide of human thought and progress can never be completely stemmed.

Since scribbling the debateable paragraph in question, from an allied country comes confirmation of this very idea. The merest trifle some would say. One of the technical staff of a French telegraph office quite recently raised the point in the most friendly manner of whether the correcting wheel of a quadruple Baudot installation would be more effective with twelve or fifteen cogs! The French authorities have decided in favour of the former number, against, on their own admission, the theoretical bias in favour of the latter.

It appears that out of 180 quadruple and triple Baudots in France, 179 are equipped with twelve-tooth correcting, or "star" wheels. Italy and Switzerland have also adopted this type of wheel, and at least two Spanish offices, Madrid and Barcelona, have fallen into line. Either nine-toothed or twelve-toothed *étoiles* are utilised with Baudots of the double or two-channel type.

The subject is an interesting one and will doubtless form the basis of many a little battle between the experts in favour of one or the other systems. So far as this column is concerned reference is only made to the incident as one indicative of certain species of detachment which becomes possible to some of the most capable and earnest men and women during war-time. To some folks the subject may seem petty, but if points such as these are productive of improved service then the "detachment" is of real national value and the subject anything but trivial. That the war should be uppermost in our thoughts is but consonant with the fitness of the present world strife, that it should become an obsession would scarcely make for clarity of thought, and hence sanity of action. Digressions into questions regarding the behaviour of telegraph and telephone currents in and out of cables, submarine or otherwise, and even studies into the mathematical why and wherefore of nine, twelve or fifteen cogs in a wheel may indeed prove beneficent in present or *post-war* effect, alike to the officers and to the administrations concerned.

There is a tendency in many quarters during these war-times to speed up machinery to its limit and even beyond. One catches sounds of this complaint outside Government circles, and Government Committees have evidently noted that both human and material energy have been utilised, in some cases up to a dangerous margin. The pressure at certain telegraph centres in the United

Kingdom can only be realised by those who have come into close contact with the traffic and the means available for disposing of the same. To officers responsible, and pressed to obtain every ounce out of any particular telegraph system, the temptation to push up speeds to the top notch of their theoretical values is at once alluring, and—let us be candid—may prove disastrous.

One hears, and the facts would appear to leave little doubt, that Creed circuits, for example, have been pressed to the "150" point, with the result that instead of one circuit proving sufficient, two and three have had to be opened to clear up the corrections thus made necessary.

It would still seem to be essential to insist upon the curbing of these well-meaning enthusiasms, which can only result in confirmation of the old proverb "more haste less speed." At least that is the inevitable result when machinery is taxed beyond the limits for which it was built. No steamer, no locomotive, no boiler that was ever built, has ever worked for long at the speed or pressure at which and for which it was tested. That is a fact which even war conditions dare not ignore.

The Creed has been mentioned, but not because I would withdraw one iota of my admiration for this particular system, which for the work which it was designed to accomplish still remains the "incomparable," but because it is typical of the results to be expected from over-driving of mechanisms, and systems generally.

The idea that telegraph systems have yet been invented which prove infallible in reproducing and in printing electrical pulsations sent out from the distant end of a line irrespective of the electrical vagaries of the intervening telegraph wire seems loth to die. There are of course systems which prove less susceptible to line distortion than others, but up to the present these is no absolute guarantee—especially on lines of open construction—that the signals as transmitted will be received with absolute accuracy. It is therefore simply a matter of degree as to whether the distortion will be sufficient to throw out the mechanism and print falsely or not.

The need for the careful checking and collating of letter and cypher telegrams received over type-writing telegraph systems may be evidenced by a few errors collected in a group of Government telegrams numbering considerably less than 300:—

Thus, group as received	950434	instead of	90434	as signalled.
" " "	151133	" "	12133	" "
" " "	359165	" "	31265	" "
" " "	99242	" "	99642	" "
" " "	TAAETN	" "	AAETN	" "
" " "	OSOTTZ	" "	OSOKZ	" "
" " "	VEERAR	" "	VEEAR	" "
" " "	LREGNI	" "	LRPNI	" "
" " "	POAMD	" "	POATMD	" "

Let the experts determine the probable cause of the errors in each individual case, there is little doubt concerning them. In the meantime it may not be amiss to say that these are actual cases and are well-known types of the mutilations which periodically are almost bound to occur. In the cases quoted above the errors, which did not originate on a Government telegraph system were detected by Post Office officials, measures being taken to cause them to be corrected to their ultimate destination.

The examples quoted above are taken from at least two distinct sources where two different types of apparatus are in use. This much is stated in order to remove any idea of special leaning towards any one particular system of telegraphy. The only leaning one could justly maintain, and that is most stoutly maintained by the humble writer, is that no system of telegraphy is infallible as regards errors and that all need the corrective of human intelligence.

The appeal of the P. O. T. and T. Society of London, issued over the signature of its hard-worked secretary, has been met with some protestation, and perhaps it may be permissible to state that certain would-be members have objected to the term "disastrous war." These maintain that the term is quite inappropriate—from a British point of view!

J. J. T.

[The hon. secretary is of opinion that "the war is a disaster to humanity—look at it from what aspect you will."—ED., "T. & T. J."]

IDEALS.

BY AMY BALL (*Croydon Exchange*).

To speak of ideals in connexion with the Telephone Service may seem to some very out of place. To begin with, what is an ideal? How much and to what extent does it influence our lives and our work? Do we ever meet our ideals or are they just mere fancies? We could go on asking innumerable questions.

An ideal is something which is created in our own minds, around which we weave our fancies and our thoughts, a vague shadowy something, which does not take shape and become perfect all at once, but which takes time and nourishment of thoughts to develop. There are many kinds of ideals in life. This is because each person thinks differently; therefore what appears ideal to one may not seem to another. For we cannot account for those strange impulses which, aroused in different degrees and proportions—in no two people alike—give to each that individual thing we call "character." We do not know whether they are born in us, or whether they are the result of our earliest surroundings. Each nature is fashioned differently, each person has his own will, and his own power of thought, and uses these in different ways, observing different things, interested in different things, therefore liking different things and dreaming different things.

Some ideals are unapproachable; we set them so far above us, and admire them only from a distance. This is usually a mistake, for if we are disappointed in any way we feel very hurt with the person in whom we have believed and whom we have admired, and with ourselves for believing so readily. It makes us inclined not to look up to anyone again, but if we allow for general faults, we are not so likely to be disappointed.

It always seems to me as if our ideals are something like our childish "castles in the air," in the days when we dreamed of fairies and wandered among golden-haired princesses and charming princes in velvet suits and patent shoes. We read the stories; the pictures were conjured up in our own brains; perhaps we longed for our own grown-up days when we should also go out into the world to make our fortunes, and bring back bags of gold to make everyone else happy. After that comes the reality, different no doubt, and we go out into the world in a very unromantic fashion, perhaps we become telephonists. Our work fills up a great portion of our time, and, seeing things as they really are, possibly we are disappointed, but I do not think we quite lose out interest in things unreal. We set up for ourselves a standard, we try to copy that, and as a connecting link, we have ideals. We know in our own hearts what we want. It may be difficult to explain, but we always know when we have fallen short. We are interested in our work or we are not interested, as the case may be. We are given certain work to do, we do that work. We know how it *should* be done, and we know our results are sometimes not ideal. It may take years, perhaps a whole lifetime to bring it up to that standard, the ideal standard we have set for ourselves.

Each operator knows how near to, or how far from perfection she is; she knows exactly what her chief faults are. It takes a great deal to be an ideal operator, for to obtain this standard she must really be an ideal girl, and have an ideal character, for in the exchange self must be put entirely in the background. She has to learn the art of self-control, and she must work for the subscribers alone and devote her thoughts to their interests. She must also have a very contented nature, and be very courteous and obliging, for she has a reputation to keep up. She must put her whole heart into her work, and treat her subscribers as people and not as voices. Of course the voices are a little insight into a person's character. We cannot see our subscriber; we hear his voice, the rest is left to imagination. We provide him with a form to suit the voice, which is our only guide, and as time goes on, we know each form almost as well as each voice. Even so we provide each with a character according to the impression conveyed by the voice and manner of each.

We want a bright, happy-hearted operator, with a cheerful obliging voice which will bring out all that is best in her subscribers. She must never lose interest in her work, must be enthusiastic and sympathetic, for sympathy does a great deal.

As regards the practical part of the work, the operator is responsible for a good deal. First of all she must have a thorough knowledge of her work in every detail. This is the result of patience and practice, as speed is also. Speed is not such an important factor as courtesy. It is the quality of the work which tells in the end. An operator must never give up accuracy for speed either; she must work to avoid giving her subscribers wrong numbers. This necessitates a good tone and good articulation. Of course the operators are not responsible for all wrong numbers given, bad transmission accounts for a good many, but each operator has her part to do.

The cords must be handled in a careful manner to avoid unnecessary faults. The operator must help the operators on either side, and be interested in her subscriber's ineffective calls and do her best to complete them. In this way, aided by a cheerful voice and questioning tone, she will teach her subscribers to place confidence in her and to leave their calls in her hands.

The supervisors who win their operator's respect and affection are not necessarily those who are easy-going. The supervisor has a very difficult task before her, for no amount of liking is any good without respect. She must be very just, as her staff are quick to criticise, and the least bit of unfairness is promptly noted and opinions alter accordingly. She has many difficulties to contend against, more than the average operator can know anything about, for she has to know each of her operators individually, and must understand their different capabilities. She must also be careful lest her work become monotonous, for strange though it may seem, an operator does not expect her supervisor to be tired of her work, as *she* herself is sometimes. A supervisor has always to be cheerful and ready to help, and to listen to both sides of a question and hold in with that which is right. She must give her staff no cause for jealousy, for an example set by a supervisor is far too important a matter to be treated lightly.

My ideal supervisor is a very real being, to me. There is a certain personality about her which is strong enough to hold everyone, to oblige everyone to listen and take her advice: it is a mysterious quality—a kind of charm which enables her, instead of merely standing passively sympathetic, to enter into both the trials and pleasures of all. So she gains that rare insight and wonderful sympathy which make her operators turn to her. Instead of remaining outside as a spectator, she lives in her operator's little trials and the questions which arise during the day. She has great power of judgment, and does not remain an echo of other people's opinions, but thinks for herself, thus encouraging her operators to do the same. She has that wonderful way of administering a reproof which makes the operator feel ashamed at once, without the least bit of resentment. The telephonists do their best for the pleasure of pleasing her, and of gaining her approval. Praise from her is something very rare, she seems to have set a very high standard, but she always gives a word of encouragement just when it is most needed, and understands each little difficulty in a way which is characteristic of her alone. When she has left the exchange her operators feel that something has gone from them; they miss the very sense of her presence. We realise how dear she was to us, and look in vain for the helping hand and the ready smile of one who is not only our supervisor, but of one who, by her sympathy and goodness, is our friend also.

Now let us think of our ideal subscriber. He is usually one who understands his telephone and how to use it. This proves a great help to the operator, for she finds him quite ready to answer her salutation. He gives in his number at once, speaks clearly and distinctly, and is reasonable. He accepts the advice his telephonist gives, does not leave his receiver off, does not grumble if he has a wrong number, and places full confidence in his operator. He clears his line on receiving the advice "Number engaged" or "No reply," thus saving us all a great deal of unnecessary trouble.

Naturally he expects a good service and he seldom appears dissatisfied, because he has gone the right way to obtain one. His cheery voice and his readiness to help makes his telephonist willing also. She works to help him, not merely because it is her duty, but because she understands his anxiety to get through to a certain number, and because she wishes him to know how much his efforts are appreciated. It is this constant working for others which helps to make our business life happy.

The whole service itself is made up of little things, each of which must be done perfectly. Each cord, and each switchboard must be kept in perfect order, and each call watched. Each subscriber's interests must be studied. Everyone is responsible for a part; each telephonist and each supervisor has her various duties. Every junction operator has her duty to perform; she must do her part perfectly, to obtain good service for the operators who are depending on her to complete their calls, and so indirectly give a good impression to the subscribers depending on *them*. And so to obtain an ideal service we must all help each other, each taking our small part in earnest. For we all fit in somewhere, and all our work helps to complete the whole. In reality each little part is a big part, for every one has some sort of influence over others, and an example set is very important sometimes.

And above all this is raised our ideal standard, clear and well set up, quickening our waning interests, urging us to better efforts and helping us to overcome our difficulties, and making our work worth while.

FROM GERMAN EAST AFRICA.

WE publish another letter from Mr. F. J. Ford, received from the Signal Office, Advanced Base of the Lake Expeditionary Force in German East Africa, which is as interesting as the last:—

Since leaving Muanza about two weeks ago in performance of my new duties as telegraph master on this line my experiences have been so varied and interesting that I could fill several pages in description of them. Yet, as usual I can say little, and you can understand the reason when you read the address from which I am writing.

A motor car was sent to bring me from Muanza to Malero, about 60 miles south, and I had an interesting journey over the rocky barren plain through deserted villages, by means of an atrocious road which was constructed as a railway track from Muanza-Tabora by the Germans. My kit, rations, tent, bed, &c., now fill a motor car, so you see I have not done so badly since I came to this country.

After a few days' work at Malero, I was sent out by car, much preferable to *safari*, to establish a post away in the desert, with my black cook and two native porters. It was a lonely spot, miles from anywhere. The nearest water pool was two miles away and the water was disgusting; I even hated washing in it. Strong tea did not disguise its taste. I could get no fruit or vegetables, although fowls were plentiful and I purchased quite a lot for two cents each, or three for a penny. The local natives were very friendly and brought me presents of milk and monkey nuts twice a day. They are almost savage and sparingly clothed in skins. I used to dance with them at nights and make them laugh, having an audience of about 200. From time to time a party of weary Belgians or British officers would pass by, and refresh themselves by resting in grass "banda" which I had erected. It was lonely and cold at night and I managed to pick up a dose of malaria which nearly put me on my back. Quinine did the trick, however, and I was quite well again in a few days. Of the three friends who were with me at Muanza two are now in hospital, Mr. Bride at Haskyne and the other—Warren—is miles away with the Belgians and has dysentery. All are getting on well, I am pleased to say.

A car brought me on to this place a few days ago, but we shall shortly be on the move again, I expect. The water here is fairly good and plentiful, enough to get a stand-up bath occasionally. We have a lot to do, sometimes working during the night. There are no mosquitos, fortunately, but dozens of insects and spiders about 3 inches long are continually walking over our food and persons. Hyenas come every night, but I have seen nothing more dangerous. It is impossible to keep cool when the sun is up, but the nights are pretty cold.

It is a strange sight to see colonial troops, black, brown and white all bearing hardships and facing disease and death for the sake of the old flag. The black chaps are remarkably keen and are not one whit behind the rest in smartness and assiduity. We are a heterogeneous crowd here, and it makes one marvel at the genius of our countrymen in uniting the various units, so different in race, thoughts and habits, into a formidable fighting force, and again at the wonderful organisation under which it is possible to feed and clothe them and keep them in health in the midst of the sun-baked desert so far from the coast. I am truly seeing life and would not have missed it for worlds.

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	{	MR. JOHN LEE.
Committee -		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. III.

NOVEMBER, 1916.

No. 26.

AMERICAN TELEGRAPHS.

THE paragraph which we publish in another column showing the remarkable advance of telegraphy in America during the period of the war will be read with much interest. It is currently being said that the financial central gravity of the world is being moved from London to New York. Hitherto the British telegraph system has been regarded generally as the best in the world and our American brethren who have visited us have never hesitated to pay their tribute of acquiescence with this estimate. Just as the financial interests in London are determined to leave no stone unturned to restore the balance of importance in financial matters as soon as possible, so it may be said that the telegraphic fellowship in England is equally determined that the telegraphic centre of gravity shall come back to London.

We read of amazing developments in America. One enterprising firm, growing weary of a three days' post between New York and Chicago, has installed a multiplex printing telegraph between its head office in New York and its Chicago branch office. And the typists, instead of writing letters for signature, type on the telegraph machine and the letters are printed a thousand miles away so that replies are received in the course of a few minutes instead of in the course of a few days. Of course in the matter of night telegraph letters a country with a wide geographical area is at an advantage, and we are not surprised that our American brethren find it possible to work multiplex circuits day and night with a full load. Similarly, too, we can look with a little envy upon the greater elasticity with which the American administrations can adapt their telegraph methods to industrial needs by means of particularly rapid services. But probably the wide extension of multiplex working, coincidentally with the enormous

extension of industries, and the reaction in favour of telegraphy against long-distance telephony which has resulted, have all had their influence. We should be more than human, however, if we did not view with some envy the position of a telegraph administration which in ten years' time has come not very far short of trebling the traffic, and we hope at a later date to give further information about the methods by which this great work has been achieved.

ZEPPS. AND ZEAL.

A RAID by German airships such as that in suburban London to which we refer in other columns was a blunder from every point of view. There was no military damage, despite the wireless announcement to the contrary. With one exception the missiles fell on private houses and gardens, and private citizens were the victims; while, we on the other hand, accounted for two airships and their crews. Some residents in the districts concerned may have been temporarily scared: the deep "oom" of bombs—so unlike the honest bang of guns—is not an accustomed sound which can be ignored, and nerves may have been unstrung for a time. But this weakness soon gave way to indignation and anger. There was fierce delight and wild cheering at the vivid glare which betokened that another "Zepp." and its occupants had gone to their doom, a pleasing feeling that we had found the answer to the Zeppelin menace and that our airmen had now contracted a habit of disposing of at least one hostile airship on each opportunity. *Punch* has aptly described in picture the variety of costumes adopted in haste by those taking part in the rejoicings. Few were injured, many cheered themselves hoarse, and others carried out with great zeal and an absolute disregard of self multifarious duties in connexion with the public welfare. Our special constables, voluntary aid detachments and mechanical transport units were indeed good Samaritans, and their deeds are probably only appreciated to the full by those whom they succoured. But what would these up-to-date Samaritans have done without the telephone or the telephone without the telephonists? So last but not least among the zealous workers we must count our telephonists, of whom we must feel very proud when we read Miss Ward's and Miss Godfrey's accounts of their experiences. We are not permitted to describe the extent to which the telephonists enter into the arrangements for ensuring the safety of our fellow-countrymen and the discomfiture of the raiders. Field-Marshal French has himself given them well-merited thanks.

Before the war, women telephonists were regarded as frail creatures who must on no account be allowed to work at night; but times have changed. Telephonists themselves realised that rushes of traffic could only be properly dealt with by those who were accustomed to operate under day conditions. Women telephonists had their opportunity and nobly indeed did they rise to the occasion. They may like their brothers and sisters be scared at the explosions close at hand. They may even weep, as we believe they did at one exchange; but nevertheless and in spite of tears they pursue their work without interruption, and voluntarily come on duty in cases where they think they can be of use. Theirs is not

the frenzied cheering in the streets nor the excitement of actual participation in the works of rescue. They merely perform their ordinary duties in an ordinary way under extraordinary circumstances, and what greater zeal can we find than this. Hats off to the telephonists!

THE IMMUTABLE CIVIL SERVANT.

It is neither in sorrow nor in anger, but rather in the spirit of harts panting after water brooks in a arid land where the kindly dew of humour is rare, that we refer to the leading article on "The Petty Official" in a recent number of the *Spectator*. Some repercussion from the Army Clothing scandal we expected to reach us sooner or later. Our chastisement, however, does not come from some irresponsible censor in the chattier columns of the provincial press but from the magisterial hand of the *Spectator*, and our case is indeed parlous.

In truth the civil servant has few friends. Although he is of sufficiently numerous brood to fill the dreams of our contemporary with aspects horrid, he is chiefly known to the public at large through the doubtful medium of the humourist. He is still conceived of as coming at 11 and going at 4—with substantial intervals for restoration—filling in those crowded and glorious hours with the signing and initialling of documents which he never reads, and drawing for all this "quite substantial salaries." But we are something more than initiallers. The *Spectator*, with a Goethean touch, finds that we are the Spirit that Forbids. This sounds Mephistophelean, but we take it to be the Spectatorial way of alluding to the system of checking and safeguarding public expenditure, for, despite the ease in point, safeguards do exist, and the projects of the ingenious are weighed before they are adopted or rejected.

Whitaker's Almanack will enlighten both the *Spectator* and the man in the street on the subject of the emoluments of higher officials, although of course it does not touch the rank and file. Nevertheless the well-paid signatories and initiallers are computed at "several hundreds," and the *Spectator* handsomely admits that "probably the large majority are scrupulously honest"! For an overgrown body waxing so huge that it threatens to strangle the national life in its grip, "several hundreds" seems a modest figure. May we hope from this that it has dawned on the *Spectator* that some of the other hundred thousand "petty officials" are doing useful work for their country, numbers of them working without holidays, without Saturday afternoons, with few Sundays even during the great crisis through which the nation has passed. Or does a scandal in the Army Clothing Department nullify the whole of the good works of the Civil Service? A humane French proverb says that to know all is to forgive all. We see the *Spectator* haunted by nightmares of a gigantic swarm engendered by an unholy union of the Circumlocution Office and Neo-Socialism, crossed with a strain of the South Italian jack-in-office of which it speaks, and of those strange government officials one meets in the pages of *Maupassant*—and we seem to understand. *Hinc illae lachrymae.*

HIC ET UBIQUE.

WE shall be pleased at any time to publish group photographs (similar to that on p. 18) of telephonists or others who may have been on duty during an enemy raid in their immediate vicinity. Unfortunately we cannot publish the name of the locality concerned, but the pictures will nevertheless serve as records of these events.

WE learn from Mr. Donald Murray, who keeps closely in touch with all telegraph progress, that a New York correspondent of his says:

"The telegraph in this country has had a great shaking up during the past few years, with the result that the people are sending about 150 million messages over Western Union wires alone. That is two and a half times more traffic than was handled ten years ago. That is going some. This enormous traffic could not very well be handled by hand sending." Mr. Murray adds:

"I think you will agree that these figures from America are very remarkable, when you bear in mind that America is the classic land of the telephone. The Postal Telegraph Company, I should say, will have at least 50 million telegrams a year in the United States, so that the United States telegraph traffic is now at least 200 million messages a year, not counting railway telegrams, or more than double what it was ten years ago.

"Another interesting point about this huge increase of American telegraph traffic is that it coincides with the introduction of machine telegraphy on a large scale. It is the old story. Workmen fear that labour-saving machinery will leave them workless; whereas it generally increases the amount of work as well as the national well-being."

He is of opinion that there will be a similar big increase in Great Britain in the next ten years.

THE *Electrician* in a recent issue suggests that we should offer a solution of a problem of etiquette in answering the telephone. Should one say "Robinson speaking," or "Mr. Robinson speaking"? Personally we prefer plain Robinson, unless it is obvious that we are in communication with some office boy or domestic servant. The *Electrician* tentatively suggests the employment of initials, but we do not view with favour the use of a collocation of stray vowels and consonants. "H. S. de V. J. Baffington," for instance, might be trying on the telephone, while "R. U. Smith?" has its obvious inconveniences.

It is interesting to note from General von Armin's memorandum that not only were the Germans outgunned, out-manoevred and outfought by the British on the Somme, but that we were also superior in transport, aeroplanes and—telephones! It is notorious that in civil life everyone considers the telephone service of his own country is the worst in the world, but a German General in war time is unlikely to depreciate his own service without good cause, and it is gratifying to find the British superior in this respect. *Apropos* of the service at home the *World* comes out with a bitter article of the exaggerated type on its shortcomings, and is especially cross with the *Daily Mail* for publishing an article in praise of the telephonist. It must certainly be gall and wormwood to the *World* gentleman to hear of his *bête noire* that "there is no more popular woman-worker than the telephone girl," and that the public have learned to appreciate her efforts. We believe it to be quite true, in the main.

BINDING CASES FOR VOL. II.

THE September issue completed the second volume of the TELEGRAPH AND TELEPHONE JOURNAL. The Editing Committee have made arrangements for supplying subscribers desirous of binding their copies with a cover of buff cloth, with strong back and imitation gilt lettering, at a cost of 1s. 6d. each. Orders should be sent to the Managing Editor, G.P.O. North.

DISTRICT TRAFFIC NOTES.

BY M. B. OLDBURY (*Nottingham*).

THE organisation of a District Traffic Department is a task which has been accomplished in a number of cases during the last four years. Prior to 1912 there were numerous traffic departments, but the number has been increased considerably since the transfer of the National Telephone Company's system to the Post Office, and in the hope that other articles may be written on the subject, a few notes have been made on various items of district traffic department work. The staff organisation of the department naturally varies according to the size of the telephone district, this being governed not by area, but by the number of telephone stations in the district, the number of supervising officers being in accordance with a prescribed schedule laid down by Headquarters. The work may be said to fall within two main categories, viz., 1. Office duties. 2. Exchange duties. Under the first item we get correspondence, traffic study, including the checking, criticism and comparison of traffic records, the examination of observation and service inspection reports, travelling supervisors' reports, local, junction and trunk questions, with a view to efficient and economical working, routing questions, &c. In this district the principal items of the correspondence are dealt with by or under the direction of the traffic superintendent, who allots the remainder to his assistants. Typical cases are as follows:—

Telephone Complaints.—If appertaining to operating matters, these are circulated to the exchanges concerned, or if relating to local engineering matters to the test room, by docket, or in the outer area of the district to the relative engineering department.

All complaints are recorded on receipt for statistical returns required by Head Office, and the more important ones are studied in the traffic department, the necessary enquiries being conducted by a senior traffic officer, but in the case of serious complaints by the district manager personally. Minor complaints are settled verbally with the subscriber, when the case is completed. Post-cards D.M. No. 35 are used in connexion with the ordinary engineering faults. Written replies are sent in the most important cases.

With regard to the subject of communications to the public on service matters, operating of private branch exchanges and so forth, it is helpful to have a good interviewer on the staff, such as a service inspector or similar officer, who can call upon complaining subscribers, or subscribers at whose premises switchboards are not being operated to the best advantage. Particulars of the latter cases are obtained from studies in the exchanges. He can obtain or furnish details as the case may require, settling complaints either at the time or on a subsequent visit, when the investigation has been completed. Touching on the subject of private branch exchanges the growth of these has leavened the service with a considerable number of subscribers' irregularities, and it has been found that the supply of information to subscribers as to delay in answering at their switchboards, delay in clearing and dilatory operating generally, results in co-operation on the part of subscribers, to the general improvement of the service.

Other office duties relate to the regulation of the supply of tickets to the exchanges where the periodical quantities require revision, to disputed trunk call questions received from the chief clerk's department and to correspondence with other exchanges and other districts on these subjects, to correspondence with postmasters, engineers and other districts respecting matters reported on by travelling supervisors and other visiting officers, and to issuing instructions from Headquarters on traffic matters to the exchanges in the district.

The system of filing is to take the exchanges as the unit, in order that papers with regard to any exchange (if a particular exchange is concerned) can be at once referred to. General items are, of course, indexed under the subject heads, as for example exchange codes, diaries. Carbon copies are retained of all correspondence, and until the cases are completely dealt with are kept in japanned trays as current matters, divided up as follows, one tray for each:—

1. Postmasters.
2. Engineers and local staff.
3. Secretary, accountant-general, surveyor and independent postmaster.
4. Public.

There are two other boxes for military and kindred matters which it is necessary to keep apart from the ordinary subjects of correspondence. We have a system of local circulation of papers in the building which is necessary with two large exchanges in the same premises as the district manager's office, one a large exchange with a staff of 70 and the other a trunk exchange, staff 40. A press is subdivided, the compartments labelled: Local supervisor—trunk supervisor—travelling supervisor—observation officer. Probationers make regular collections of papers from the traffic department, and distribute the reports, enquiries, &c., to the officers concerned.

All periodical records, quarterly, half-yearly and ordinary records, are recorded in tabular form in books, under the heading of the exchange, before being filed away in binding cases; thus a comparison of the number of calls at each exchange for past periods is quickly available. The figures obtained from the official quarterly records since their introduction, to date, are instructive and valuable. The tabulation applies to both local and trunk traffic, the main basis of the records being, the returns on forms 177 and 92, for valued local, junction and short trunk traffic, and the tablet returns, forms T. 108, for the traffic on the trunk routes. A separate book is kept for valued traffic at the combined exchanges, also one showing the trunk traffic (unvalued) and telegram work on each trunk route separately.

The balance of staff books kept for the two main exchanges, indicating the employment of the relief force for annual leave and district reserve are daily examined by a supervising traffic officer to ensure that the relief force is suitably employed.

A book is kept showing the lay-out of each switchroom in the district with particulars of the operating staff, type of switchboard and size, type of ringing, machine or hand, &c. This has been built up from dimensioned sketches made by travelling supervisors and other officers, and is found very useful for reference purposes in connexion with questions of removal of apparatus and other items in conjunction with the typed forms furnished to the Secretary giving particulars amongst other data of the staff at each exchange whether on department's or private premises; thus forming together a complete record of all exchanges in the district.

Plans are kept of the rural call office lines, junctions and trunks in the two sections which comprise the district, also separate area plans for the trunk areas; these plans are added to and amended on receipt of forms T.E. 175 from the superintending engineer.

Graphs.—A series of framed graphs are prepared by the observation officer and are available for reference and study. The following items are shown thereon in regular periods:—

- Percentage of engaged and lost calls.
- Percentage of registration irregularities.
- Percentage of calls answered in ten and twenty seconds.
- Average speed of—plug in—answer—disconnexion.
- Percentage of operating and subscribers' irregularities.
- Average answer and clear on (separately) flat rate subscriber's line, measured rate line, party line, total of exchange.
- Night and Sunday tests. Average plug-in, answer, clear and total operation.
- Percentage of credit tickets in respect of operating errors.
- Percentage of under-registration.
- Percentage of over-registration.
- Percentage of originated calls ineffective.
- Total weekly traffic, week by week, Nottingham local exchange.
- Total weekly traffic, week by week, Nottingham trunk exchange.
- Panel records.

Sketch plans giving details of incoming junctions and outgoing junction multiples, and of distribution of lines on trunk sections at independent trunk exchanges are hung in the traffic office for reference as required.

Supervisors' Conferences.—A number of supervisors' conferences have been held, presided over by the district manager, at which also the traffic superintendent, assistant traffic superintendents, observation officer, exchange and travelling supervisors have been present. Many interesting traffic questions have been brought up at these conferences, the proceedings of which were placed on record at the time and the minutes subsequently typed. Suggestions for improvement in methods of working have been made, and later, studied by the traffic superintendent and staff. The settlement of the points raised being reached, each case is subsequently filed in a relative skin and labelled "Supervisors' Conference" No. 1, 2, &c., for future guidance and reference.

A system of free discussion by the traffic superintendent and assistants on important matters in the district is adopted in order to ensure that each member of the traffic supervising staff has knowledge of the matters which are under consideration. Opportunity is also thus given of making suggestions and of being in a position to carry on the line of action or study (in the case of assistants) during the absence of the traffic superintendent. Free interchange of ideas is encouraged and no watertight compartments exist, with, it is thought, benefit to the department as a whole.

There is now, and has been for some time past, considerable correspondence of traffic matters with military officers, and those of us who are prevented from joining the Army for one reason or another sometimes feel by reason of the exchange of views, in which we take part, perhaps with mutual benefit, between the Military and Civil branches of the Government, that we also are doing a bit of "our bit," if circumstances do not allow of complete service in the all-pervading khaki Army.

The great storm in March last added tremendously to the correspondence and work of traffic departments in those districts where the havoc was great, and has been, it is thought, an extreme test of the working arrangements that exist between the engineering and commercial departments, which have indeed been very close; alike in conference, telephone and telegraph and correspondence. The task of restoring communication has been a heavy strain on the engineering branch with its depleted staff, and it has been necessary for the district traffic departments to be in close touch in order that the subscribers should be informed (in reply to innumerable written and verbal complaints) of the extent of the damage, and "in due course," to use a hackneyed phrase which has been eminently appropriate, of the restoration of the service. The printed circulars received from Head Office for distribution to subscribers whose circuits were interrupted were of considerable service in this connexion. The organisation has been severely tried and, speaking from the traffic side to which my brief only applies, it is hoped, not found lacking. With regard to the attitude of subscribers, speaking generally, they have shown a full appreciation of the extent of the damage, gained in many cases from ocular demonstration, and have accordingly been courteous and forbearing, despite the disconnexion of service, and consequent resort to the less speedy transmission of the post, or, for local work, to the introduction of a messenger force. Further, we are glad to receive, on behalf of the department, many expressions of thanks for the work done.

Exchange Duties.—Each visiting officer prepares a written report with regard to visits. These reports are filed in date order, in separate filing covers, one for each exchange. On the outside of the cover is a summary of the visits, including the rank of the officer in each case. A record is also kept of them in an indexed book, so that periodical visits may be made, in accordance with the standard laid down. This is based on the relative sizes of the exchanges, the larger exchanges being more frequently visited and smaller ones less frequently. The intervening periods are graduated in proportion to the number of stations on the respective exchanges. In the present times the visiting is restricted as much as possible in conformity with Head Office instructions on this point. As a corollary to the reports referred to, a file of papers is retained for each exchange of any importance, and the particular matter or matters which may be on hand can be at once noted on reference to the file. The following cases are typical:—Phonogram work heavy, militating against the handling of the ordinary traffic;

multiple facilities under consideration; difficulties, traffic or engineering, with neighbouring exchanges; staffing for season traffic (fruit, potato, flower seasons); extra staff necessitated for pressure of military calls, monitorial and enquiry work, night and Sunday operating. And there are of course many other cases.

A regular line of study is taken and recorded for reference in the file by means of the copies of correspondence. The officer who visits an exchange takes the relative papers, also the last report of a travelling officer, and is thus in possession of the latest facts regarding the exchange: continuity of action and study being thus obtained.

With regard to the two large exchanges at the headquarters of the district, these are to some extent under the direct supervision of the district manager and the traffic superintendent. In addition the two assistants to the traffic superintendent take personal charge of these exchanges from a traffic point of view, the senior officer being in the main responsible for the larger exchange, the local and the junior officer for the trunk exchange. A portion of the day is spent in each exchange in watching the handling of the traffic and generally advising and instructing the supervisors. This does not imply that both the assistants do not assist the traffic superintendent in either exchange as required and as the traffic superintendent and the assistant traffic superintendent may be absent at the same time naturally the work relating to both exchanges falls to be performed by the remaining officer, so that constant touch is kept by the traffic supervising staff with these larger exchanges. The district manager deals with staff cases for the independent postmaster, and the traffic department on his behalf has consequently certain duties in connexion with these in the exchanges.

In conclusion I may say that whilst it is recognised much of the foregoing incomplete account of the work of a district traffic department is not new ground, it was felt, as intimated in the opening lines of these notes that much might be written on the subject which would be of value to traffic officers, and it is in the hope that other contributions may be made that these notes have been written.

BENEVOLENCE.

To the manifold charities of the London Telephone Service must be added the entertainment given to a large party of wounded soldiers and sailors by the staff of the East Exchange on Oct. 7.

The guests, who numbered over one hundred, met in the large hall of the British Soldiers and Sailors Home, and after a sumptuous tea settled down to enjoy the festivities. The chief feature of the latter were the hair-dressing and bun eating competitions for which special prizes were given.

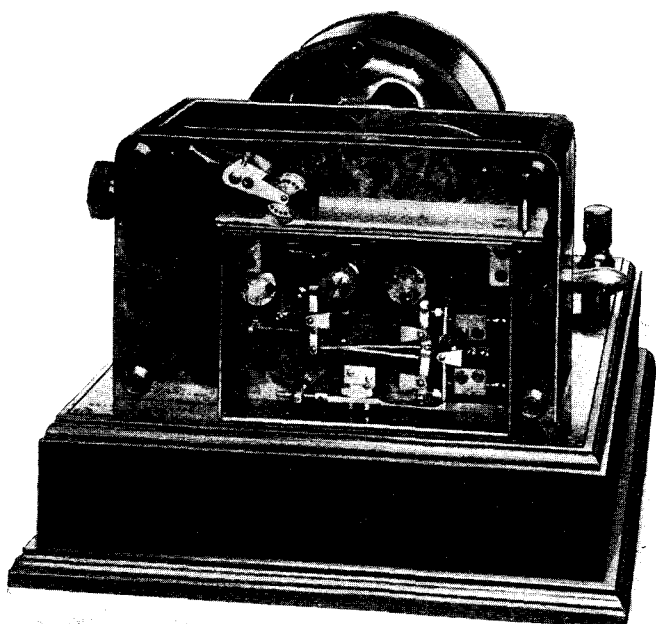
The hair-dressing competition proved a great success, and the results of the tonsorial efforts of the soldiers and sailors were such that the audience laughed until they could laugh, with safety, no longer. Almost as comical was the bun eating contest, and it is to be hoped that the general hilarity was not reflected in the temperature charts of the invalids.

The remainder of the evening was filled up with a concert, and special mention must be made of the recitals given by Miss Lamplugh and the charming dances of Miss Chester.

Hearty votes of thanks were given by the naval and military representatives to Miss Jones and her colleagues at the East Exchange who had organised the entertainment.

MANCHESTER (TELEGRAPHS).

An interesting ceremony took place on Oct. 6, when a presentation was made by members of the controlling staff (men) to Mr. W. R. Beeston, who reaches the age limit this month and is retiring from the position of Chief Superintendent. The Acting Chief Superintendent, Mr. F. A. Carmichael, in well-chosen words, wished Mr. Beeston a long and happy period of retirement, and a larger measure of health in the south than he had enjoyed in Manchester. In the absence (on leave) of the Postmaster-Surveyor, the Assistant Postmaster (Mr. C. H. Gaskell) made the presentation. He reviewed Mr. Beeston's official career from his entry into the Service as unpaid learner at Shrewsbury in 1872, up to the present; and he paid tribute to the great regard in which Mr. Beeston was held by the Postmaster. He reminded his hearers of Mr. Beeston's wide reputation in earlier days as an expert telegraphist, and referred to the unfailing courtesy and consideration shown by him in his relations with the staff during later years, and he asked Mr. Beeston to accept, as a small token of their esteem, a handsome walking stick, on the gold band of which was engraved "W.R.B. from Colleagues, 1916," whilst Mrs. Beeston was the recipient of a fitted seal-leather satchel and purse. Mr. Beeston acknowledged the gifts in a kindly and characteristic speech.



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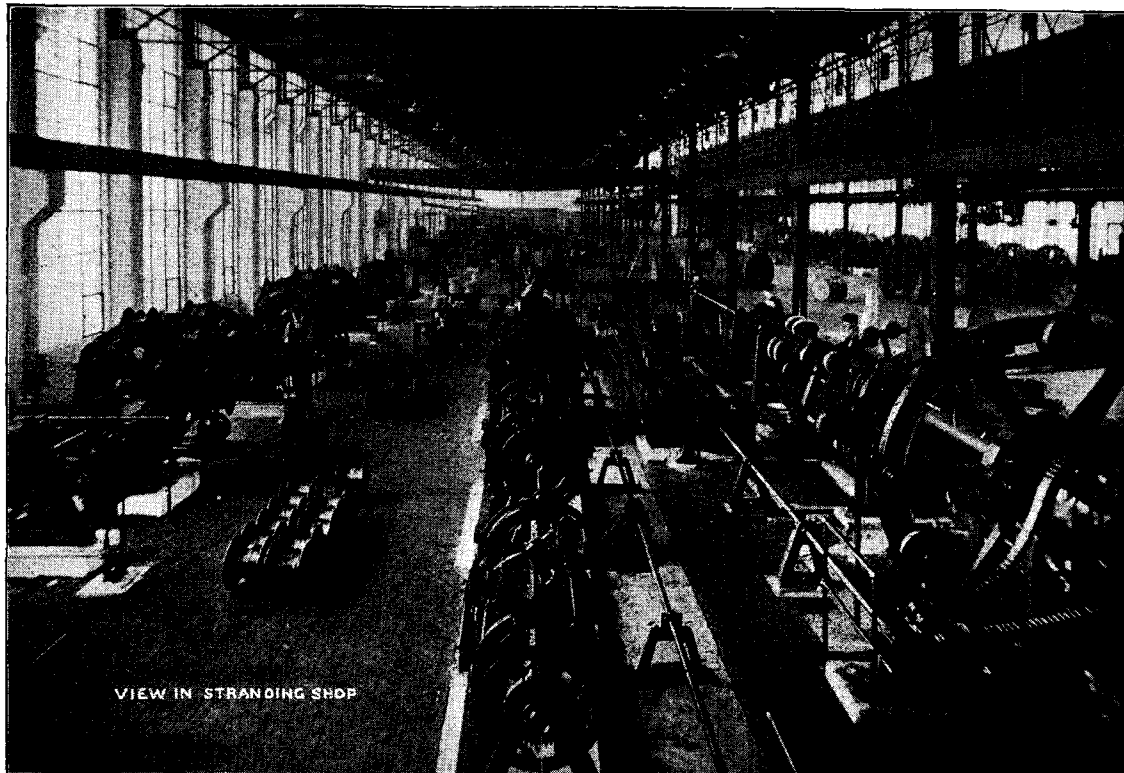
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EMPIRE RAZORALITIES

(Dept. T.J.)

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Still the telegraph line was not working any better as a telegraph line than as a fish line, or a clothes line, so he borrowed a mule from a quartermaster and started out to investigate. He came back in light marching order that evening with a sad secret in his heart, several lumps on his countenance, and minus the wayward army mule.

The simple truth was that the Texas hornets, which are lazy beasts, thought the new insulators were a shelter kindly provided by the Government for their special use. So they had gone to work and filled every blessed one of them from San Antonio down with mud, sour honey and general cussedness, and the line was literally 400 miles of Hades in active eruption. Lieutenant Greely wrote to Washington experts, who promptly got a new breed of insulators, solid as a brick and burglar proof. They were shipped and Lieutenant Greely induced a gang of unsuspecting linemen to sign a cast-iron contract to take the old insulators off.

The "repairing" party left Fort Brown on April 10. By this time the hornets had raised an uproarious family in each insulator, and the first lineman who shinned up to serve the writ of ejection got a dose of trouble that made his hair curl. In his haste down, he let the pole slip up through his hands, burning them, besides taking all the buttons off his clothes. The way the hornets expressed their opinion of signal service hospitality was sinful. It cost 46 able-bodied men, nineteen barrels of bread poultice, and a cask of refined arnica to "repair" the first eight miles, and then operations ceased.

When the linemen got so they could see well enough out of one eye to shoot, they went gunning for Lieutenant Greely, but he had already fled the State in a blue fog, and the next thing heard of him was that he had barricaded himself somewhere in the neighbourhood of the North Pole.

The line remained in an inactive and war-like status until winter, and telegrams were forwarded by the aid of a slow but persevering mule. After the first blizzard had calmed the hornet families into solid lumps, the contractor resumed his labours and recouped his loss by shipping the insulators to Baltimore for canning clams, and seven dozen crates of assorted stings to England for sale as sewing machine needles.

CORRESPONDENCE.

"GERMAN TELEGRAPHIC BLUFF."

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

THERE is a fallacy known to logicians as "*ignoratio elenchi*" which Mr. Murray, in his desire to prejudice the issue, has not hesitated to make use of against me simply because I ventured very briefly to criticise one or two inaccuracies in M. Fournier's article. Indeed the letter is a petty *argumentum ad hominem* which leaves me quite cold. Mr. Murray's historic data are not very convincing. If he had quoted chapter and verse from the *De Augmentis Scientiarum* so that one might have verified the reference, the assertion that Francis Bacon invented the five-unit theory would have carried more weight; meanwhile it lacks confirmation. Again, Whitehouse may have been the source of M. Baudot's inspiration; there is Mr. Murray's bald statement in support of it, but I am sceptical about his being a scientist of the first class. May I invite Mr. Murray to peruse a monograph on Lord Kelvin which appeared in the *Post Office Electrical Engineers' Journal* for July 1912 (Vol. V, Part II). In this article a reference is made to Whitehouse and his connexion with the laying in 1856 of the Atlantic cable, which turned out so unfortunately. Now for my authority, which is perforce second-hand; nevertheless I can quote the actual words which appear to support my contention that the Gauss and Weber theories were the source whence Baudot got his governing principles.

The Controller of the Central Telegraph Office, Paris, said in 1907 that "Baudot in 1872 first interested himself in the improvement of the telegraphs, his endeavour being to combine the advantages of a printing system, like the Hughes, with those of a multiplex system, such as the Meyer, both of which systems had just been brought into use, and to this end he adopted the code of Gauss and Weber which utilised five currents made up of positives and negatives for each letter." I am content to leave the matter at that.

J. B.

DEATH OF CAPTAIN C. S. WOLSTENHOLME.

WE deeply regret to record the death of Capt. C. S. Wolstenholme in an attack on the German positions on July 19. Capt. Wolstenholme, who was Assistant Superintending Engineer of the North-Eastern District, was on the outbreak of war gazetted lieutenant in the 12th Durham Light Infantry and promoted to a captaincy after a few months' service. Capt. Wolstenholme will be remembered by many of our readers as District Manager at Canterbury and Chief Engineer at Liverpool under the National Telephone Company's *regime*.

TELEPHONE HEROINES.

THE telephonist has not loomed large in the public eye as a war worker, yet it is fair (writes a correspondent) that she should be recognised as such. A military friend of mine happened to be in a provincial theatre the other night when the manager came before the curtain and stated that certain persons whose names he read were "wanted immediately." A number of girls quietly slipped out, and my friend learnt, on inquiry, that they were telephonists recalled to duty on account of an impending air raid. An hour or so later the bombs were falling. I am told that the way these girls stick to their posts and "carry on" through the most nerve-racking conditions has elicited high praise from Lord French, who says that their conduct has materially assisted the efficiency of the defence arrangements.—*South Wales Echo*.



PERSONALIA.

NEWS OF THE STAFF.

LONDON TRAFFIC SERVICE.

Transfers—

Miss A. M. WHITE, Assistant Supervisor, Class II, has been transferred from Hornsey to City Exchange.

Miss L. L. CLEAVE, Assistant Supervisor, Class II, of City Exchange, has been transferred to the Military Aeronautic Department, Adastral House.

Miss A. E. C. JUDD, Assistant Supervisor, Class II, of Stratford Exchange, has been transferred to East Ham.

Miss W. M. LEE has been transferred from North Exchange to Holborn.

Miss ROWE has been transferred from North Exchange to City.

Miss M. BRUCE has been transferred from North Exchange to City.

Miss D. POPE, of Avenue, has been transferred to the Trunk Exchange.

Miss J. BUDDEN, of Avenue Exchange, has been transferred to Victoria.

Miss M. BOWERBANK, of Avenue, has been transferred to Victoria.

Miss E. KASSELL, of Avenue, has been transferred to the Trunk Exchange.

Miss E. G. RICHARDS, of Avenue, has been transferred to the Trunk Exchange.

Miss D. M. BRUBACK has been transferred from Sydenham to New Cross Exchange, and was presented with a wrist watch from the staff.

Resignations—

Miss J. HOLLOWAY, Assistant Supervisor, Class II, of the Trunk Exchange, has retired from the Service.

Miss K. HENN, Assistant Supervisor, Class II, of East Ham Exchange, has resigned in view of her approaching marriage and was presented with a silver cruet.

Miss M. KENNEDY, of North Exchange, has resigned to be married and was presented with several useful gifts, including a set of oak trays and a pair of silver salt cellars and spoons.

Miss I. G. TAYLOR, of Croydon Exchange, has resigned on account of her approaching marriage;

Miss BEATRICE E. CHAPMAN, of the Trunk Exchange, resigned on Sept. 6 in view of her approaching marriage. She was presented with several useful gifts by various colleagues; and by the staff with a silver tea service.

Miss E. FEARON, of the Trunk Exchange, has resigned on account of her approaching marriage. The staff's gift has not yet been presented.

Miss AMY DE LA MURDOCH, of the Trunk Exchange, has resigned in view of her approaching marriage and was presented with numerous gifts, including a silver tea service from the staff.

Miss MAUD EMMINS, of Trunks, has resigned.

Miss KATHLEEN BOYLE, of Trunks, has resigned.

Miss B. STEPHENS, of Avenue Exchange, has resigned.

Miss L. ERRINGTON, of Avenue Exchange, has resigned in view of her approaching marriage.

Miss N. ADAMS, of Avenue Exchange, has resigned to be married.

Miss H. FENTON, of Avenue Exchange, has resigned.

Miss E. GRIFFITH, of Avenue Exchange, has resigned.

Miss E. WILLMOTT, of Avenue Exchange, has resigned.

Miss I. H. NASH, of Mayfair Exchange, has resigned.

Miss FLORENCE M. BRIDLE, of London Wall Exchange, has resigned.

Miss GLADYS NEILD, of London Wall, has resigned on account of her approaching marriage and was presented with several useful gifts, including a dinner service from the staff.

Miss ELSIE M. CAWSTON, of London Wall Exchange, has resigned.

Miss I. SIMPSON, of Paddington, was presented with a tea service and a pickle jar on her resignation with a view to marriage.

Miss M. V. R. COLLINS, of Paddington Exchange, has resigned.

Miss JANE ELIZABETH GWYNN, of Wimbledon Exchange, has resigned on account of her approaching marriage and was presented by her colleagues with a case of dessert knives.

Miss ELSIE SAWTELL, on resigning to be married, was presented with a case of silver tea knives by her colleagues at Wimbledon Exchange.

Miss EDITH SHELLEY, of Wimbledon Exchange, has resigned in view of her approaching marriage and was presented with a set of fish knives and forks and other useful gifts.

Miss E. J. KEEVIL, of Hop Exchange, has resigned on account of her approaching marriage.

Miss L. E. JORDAN, of Hop Exchange, has resigned.

Miss S. H. JONES, of Battersea Exchange, has resigned to be married.

Miss D. JONES, of Holborn Exchange, has resigned in view of her approaching marriage and was presented with a set of tea knives by the staff.

Miss M. BURNS, of Woolwich Exchange, has resigned to be married and was presented with a dinner service and numerous other gifts.

Miss A. L. HAYDEN, of City Exchange, has resigned in view of her

approaching marriage and was presented with tea knives, a butter dish and vases.

Miss G. J. KISSNER, of City Exchange, has resigned. She was presented with several useful gifts, including a silver cake basket.

Miss E. BURNETT, of Romford Exchange, has resigned.

PROVINCIAL STAFF.

Mr. A. ROBERTS, Chief Clerk, District Manager's Office, St. Albans, who has been transferred to the District Manager's Office at Chester in a similar capacity, was the recipient of several useful presents from the St. Albans staff as a small token of their esteem. Mr. Roberts carries with him the sincere good wishes of all those with whom he has been associated in his late district.

Mr. W. H. MEAKING, Chief Clerk, Chester District Manager's Office, has been promoted to be Chief Clerk, Scotland S.W. District. The promotion dates from Oct. 1. The District Manager presented Mr. Meaking on behalf of himself and the staff with a case of fish knives and forks, silver cigarette case, fountain pen and pipes.

Miss S. ROSSER, Assistant Supervisor, Class I, Swansea Central Exchange, has resigned to be married and was presented by the staff with a case of cutlery.

Miss D. G. C. GEOGHEGAN, Telephonist, Swansea Central Exchange, has resigned to be married and was presented by the staff with a silver cake stand.

WAR SAVINGS ASSOCIATIONS IN THE LONDON TELEPHONE SERVICE.

REFERENCE has already been made in the London Telephone Service Notes in previous issues of this journal to the formation of War Savings Associations in the London Telephone Service, and it is hoped that the following information showing the great success of the schemes will be of interest to other offices, the staff of which may be contemplating the formation of similar associations.

Two War Savings Associations have been established, one in connexion with the purchase of Exchequer Bonds and the other for the purchase of War Savings Certificates.

The association for the purchase of Exchequer Bonds has 69 members, the total contributions amount to £61 a month from the staff paid monthly, and £3 a week from the staff paid weekly. The whole of the weekly subscriptions and £58 of the monthly subscriptions are collected by means of deductions from salaries. The total value of the Exchequer Bonds which are being subscribed for is £760.

Previous to the issue of the Post Office Circular No. 2,288 of April 11 last, in which attention was drawn to the model schemes for War Savings instituted by the National Committee, an effort had been made, with a certain amount of success, to induce the staff of the Department to contribute to War Funds by purchasing War Savings Certificates by means of sixpenny stamps fixed to the usual green cards. The amount collected by this arrangement in about six weeks was approximately £360.

On the receipt of the Post Office circular referred to, the National Committee were communicated with and, after full consideration, it was arranged to adopt a scheme (No. 5) which had recently been introduced by the Committee. This scheme does not involve deduction from salaries, and has the distinct advantage of reducing to a minimum the amount of clerical work at the headquarters of the association. The main principle is the purchase of coupons at 6d. each from collectors who have been appointed in this office and in each exchange. The money paid in each week for the coupons is forwarded to the secretary of the association and War Savings Certificates are purchased. The certificates are allotted to the members as they complete their cards by purchasing 31 coupons.

The National Committee were good enough to agree to the scheme for the purchase of sixpenny stamps being amalgamated with the new London Telephone Service Association and arranged to supply War Savings Certificates equal in value to the total number of sixpenny stamps already purchased by the staff.

In order to bring the necessity for saving in the present crisis prominently before the notice of the staff arrangements were made for lectures to be given in the Controller's Office and in the larger exchanges by lecturers from the National Committee. Altogether 72 lectures were given and were much appreciated by the staff.

The new association commenced work on June 14, and up to the present the monthly results have been as follows:—

Month.	No. of coupons sold (including those exchanged for sixpenny stamps).	No. of certificates obtained.	No. of certificates allotted to members.
June	30,525	950	62
July (5 weeks)	38,245	1,241	679
August (4 weeks)	33,774	1,102	739
September (4 weeks)	38,364	1,219	1,057

The number of members of this association is approximately 3,500.

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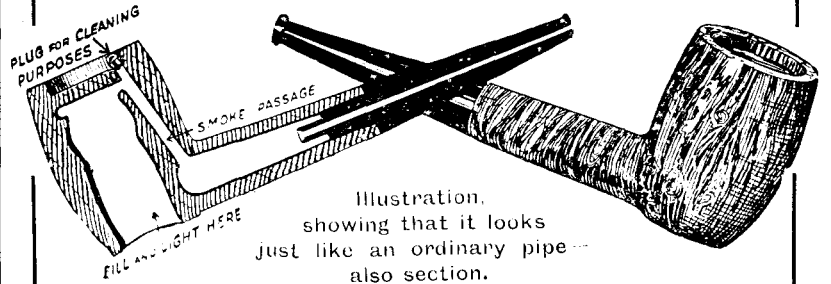


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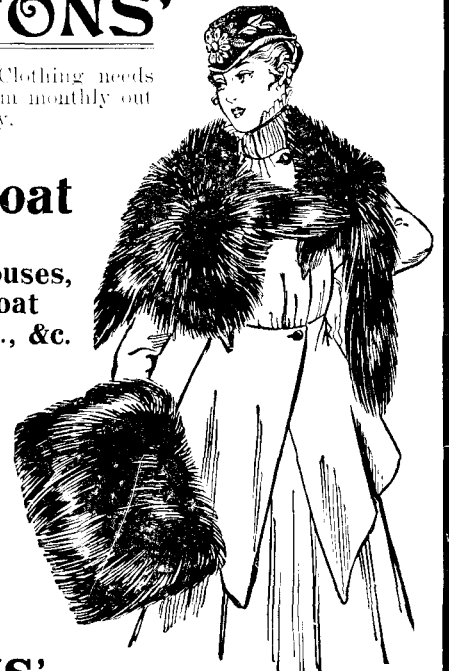
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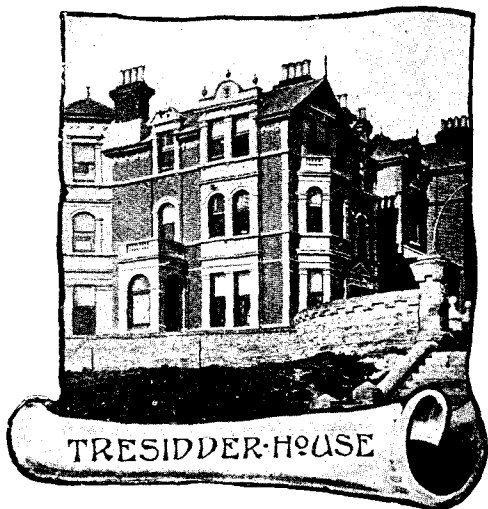
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THE Telegraph and Telephone Journal.

Vol. III.

DECEMBER, 1916.

No. 27.

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SOME APPREHENSIONS AND A MORAL.—II.

BY JOHN LEE.

NOT all the apprehensions are articulated. Some belong to the realm of unspoken fear, and these are the most real. They are unformed in word, largely because those who hold them in their minds are unaware that others hold them also. Among these apprehensions is predominantly the fear lest the increased importance which is being attached to education and training in the world outside should not be recognised within the Service. This apprehension is worlds apart from the Victorian theory that education is a means either to higher remuneration or to more genteel work. Rather it is an apprehension lest the value of education in broadening not only our minds but our sympathies should be overlooked.

The State took over the telegraphs coincidentally with the passing of the Education Act. From 1870 onwards the characteristic of primary education in this country was that it led to what was called "white-handed" work. The "clerk class" became the desirable calling and so it happened that the "telegraph clerk" was a little offended when he became a "telegraphist," a sensitiveness which to-day is difficult to understand. But he was not alone in this veneration of the clerkly function since the authorities showed their esteem also by attaching to what is now the "overseer" the title of "clerk," paralleled, oddly enough, by the title of "supervisor" in the case of women. This emphasis upon the industrial value of the art of writing was made even more definite at one period when "writers" were added to the staff, and looking back over the long years one is puzzled to say whether the "writers," who were not skilled telegraphists, looked down upon the telegraphists or the telegraphists looked down upon the "writers."

The "clerkly" tendency reached its zenith, I think, in 1885, when there was a great influx of young men and young women with educational attainments of a higher order, significant of the advance of educational methods. From that date, I imagine it is true to say, "craft" consciousness began. The body of telegraphists ceased to look upon their inclusion in the general body of "clerks" as their social privilege, and they began to recognise their art of telegraphing and their science of telegraphy as making up a "craft" which placed them apart. It was natural, therefore, that the further evolution, side by side with the evolution of the class-consciousness of other "crafts," should bring them into the main

stream of "craft" consciousness and that—not, I think, without some hesitation—they should take their place in that so-called labour movement which seems destined to achieve results which none of us dared to expect a few years ago. But it is of even more value than this rough estimate would indicate. They have been something of the nature of an aristocracy in this movement; and that sense of aristocracy has not failed to excite some indications of envy. Yet he would be blind to the underlying importance of the movement who did not recognise that the postal representatives made a contribution to it which had its special foresight and its special insight.

At the moment the emphasis which our brethren place upon education is the outstanding characteristic. I do not think that we quite realise the worth of the Workers' Educational Association or the significance of the articles in the Service journals which take a wide outlook on the world of industry and social relations. Now and again we see protests against the latter tendency, but I think that when the history of labour aspirations comes to be written the essential truth will be laid bare, and that essential truth is that whatever individual opinions may have been expressed on social or economic theory, whatever momentary irritations may have been articulated, whatever misunderstandings (and they have been many) may have arisen, the fact remains that in the cultivation of that spirit of craft-fellowship, which now we see to be essential in the construction of a new social state, the deliberate association of the postal representatives with the representatives of other crafts has exercised a special influence. For that reason—and for other reasons—I think that in the wider realm of social reconstruction which we are facing it is an imperative duty to consider in what we can develop our own fellowship, so that our Service might be, if that honour is permitted to us, something of the nature of a leader in the adoption of a new industrial relationship.

One cannot refer to education without touching upon two other aspects. The technical examination, as it stands, is our one tribute to training and mental equipment. My greatest official disappointment is that I never could persuade anybody that an examination of a wider inclusiveness would be an advantage. I should like it to be threefold, (a) technical, (b) the economics of industry as affected by communications, (c) English telegraph (or telephone) practice. There are different types of mind amongst us and I should like to see the examination provide for those different types of mind and, at the same time, take from us a little of that parochialism which is our chief defect. I do not see why telegraph or telephone practice should not cover all our methods

of applying telegraph and telephone science to public needs. I feel sure that an examination which would give alternatives would be fairer as a criterion of promotion than an examination which discovers only those qualifications which belong in the highest degree to the engineers.

The second aspect is that there is an education which goes beyond the mere mental. The American psychologist who protested against the American theory of scientific management on the ground that "it left our hearts swept and garnished—but empty" indicated this defect admirably. There is something cold and unattractive in that conception of education which merely gives dexterity and "efficiency." I look with envy on those of our brethren who have had the opportunity of studying the "humanities" but it is not the envy which would displace them. "Humanity" is a beautiful word for culture and I hope that we shall see in our future reconstruction an emphasis laid on the humanising rather than on the scientific aspect of liberal education as brought to the service of mankind.

"GERMAN OFFICIAL."

OUR old friend *Blätter für Post und Telegraphie* in its issue of Sept. 25 has an article on the "Third German Post Office War Budget." It begins: "Again for the third time during the war the time approaches in which the preparations for a new budget near completion. The budget for 1917 is planned in the first place as a war budget and whether we may hope that during the winter it may be changed into a peace budget no one can say. The third year of war is already in progress. Foes all around.



THE TELEGRAPH OFFICE AT BRUSSELS.

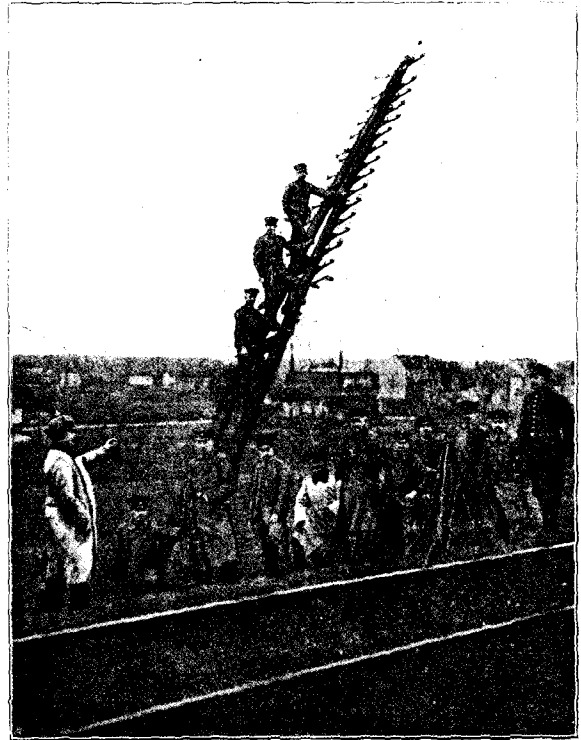
With renewed fury and by calling up all those whom they can buy or compel they seek to deal continued blows and attain their goal of a complete destruction of the enemy. They will not succeed. Firm and true stands the Watch of the Field-Greys," and so forth. After pouring contempt on the starvation-plans of the "Baralong folk" and on their silver bullets, the writer congratulates his countrymen on the success of their last war loan and dilates upon the great burden the higher officials of the Post Office have willingly borne in the war in the efforts and sacrifices they are making and will make.

The article tails off into bitter criticisms of the Government's postponement of the project for amelioration of the lot of the higher officials which was put before the Reichstag in 1914. It is expected that when that body considers the budget a bill will be introduced to remove existing hardships and inequalities. However, as we know, in Germany Parliament proposes and the Government disposes.

Another article in this journal deals with the "Calculation of the Tax on Telephone Charges." This is an Extraordinary Imperial Tax decreed by the law of June 21, 1916. The amount

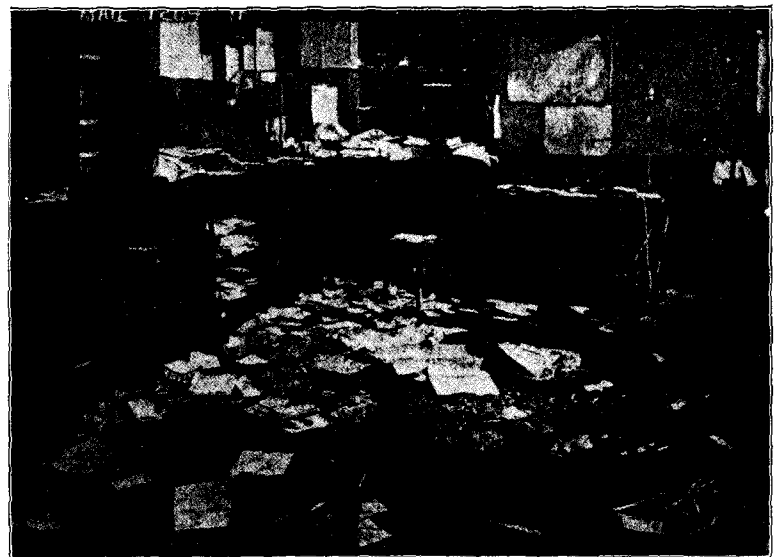
to be paid does not appear, but from the context of the article it seems to be a tax on telephone subscriptions which falls due to be paid on Oct. 1 with the third quarterly payment of the annual charge for town or district telephone service installed before Aug. 1.

Archiv für Post und Telegraphie for February last gives a



A GERMAN TELEGRAPH CONSTRUCTION GANG REPLACING AN OVERTHROWN BELGIAN POLE.

review of a year's German postal service in Belgium. As regards telegraphs and telephones it adds little to the German article which was condensed for readers of the JOURNAL in the July issue. Three pictures of some interest are reproduced. There is some detail with reference to the postal service, and, in general, much



"HOW THE ENGLISH RAVAGED THE ANTWERP POST OFFICE WHEN THEY WITHDREW FROM THE FORTRESS."

self-satisfaction over the "German vigour and inexhaustible joy of creation" exhibited in the re-establishment of the posts and telegraphs in the despoiled country. I forbear comment on the creative spirit of Germany's occupation of Belgium.

W. H. G.

TELEGRAPHIC MEMORABILIA.

SINCE reading page 15 of the present volume of the TELEGRAPH AND TELEPHONE JOURNAL, the present scribbler must confess to an aggravated attack of the, normally speaking, indefensible sin of eavesdropping! For this I crave forgiveness. Wrong-doing is supposed to leave a bitter taste in the mouth of the delinquent. In this instance, despite the moralists, it turned out indeed a rather pleasurable exercise, for the comments on Mr. Lee's opening article, from quite a variety of men and women in the Telegraph Service, and which one has heard on every hand, were unfeignedly appreciative of the kindly tone and temper which always appear to inspire that facile pen.

Laudatory remarks regarding the telegraphs are all too rare nowadays. The very subtleties of the dual crafts of telegraph and telephone are just sufficiently subtle to appear easy and simple to the lay and superficial mind. To this same uneducated (the adjective is a local not a general reference) mentality, a telephonist spends her time in pushing pegs into holes in a perforated wall, and almost as quickly withdrawing them, while the telegraphist wiles away the time in pumping up and down on a black knob in accordance with a code "very easily learnt" and "as easily manipulated."

The tribute to the faithful secrecy of both these Government operators during the last two and a half years could never have come from a member of the public, however well disposed towards Post Office officials. In fact so rare is the crime of divulgence that the British public sees no more temptation in an *open* telegram which must of necessity be read by the many who handle it, than in the *sealed* penny letter: whereas there is a whole world of difference in the opportunities for evil.

No sooner has one mourned the lack of appreciation than, as though to chide the grumbling spirit, there arrives in the C.T.O. itself quite unsolicited commendations from certain other British Government offices on the splendid accuracy of the telegraph work in reference to certain special telegrams which, during these war times, have passed from one end of the kingdom to the other.

Man cannot live by bread alone and, much as hard cash is appreciated in these expensive times, the spiritual, intangible word of praise is an equally necessary and rightful portion of a good craftsman's reward. Yet unless such wages be paid out in the true sympathetic spirit this very praise may prove an irritation. Appreciation of good services rendered rests as much upon attitude and atmosphere as upon written or audible word. When a highly-placed official writes regarding the "fellowship" that "Our sympathy should be as evident as the sunshine," one feels that here at least is one who understands.

The London C.T.O. has never been behind in putting its hand deep into its own hardly-pressed pockets on behalf of the cause that needs assistance. The amounts specially collected within the four walls of G.P.O. West since the war, have run easily into four figures. This, of course, does not include the private calls outside the official circle. There have been collections for war hospitals, widows and orphans, and for prisoners of war, for comforts for soldiers and sailors, for Belgian refugees and even for wounded horses.

The recent concert at Cripplegate Institute for "Tommys and Tars" was a huge financial success, and now comes the "Interkom Club" which has arranged to give performances of Shakespeare's *The Tempest* on Dec. 13 and 15 at 6.30 p.m.

The profits will be devoted to the "Special Funds" for the Post Office Hospital, Kensington.

Then, too, the simple office collection on Red Cross day itself reached the really magnificent figure of £102, and this after the majority of the staff had already been beguiled by the small army of flag sellers at street corner, crossing or railway station.

The good attendance which marked the opening of the P.O. T. and T. Society's meetings was doubtless in no small measure due to the specially interesting subject of Mr. Pendry's paper.

It is hoped that Mr. Pendry's plea for standardisation of the Baudot code so that the same designation of any particular letter may serve for the same letter in any type of printing apparatus

which utilises it, may meet with very favourable consideration in the proper quarters. If this be done "twere well it were done quickly," for delay may mean enhanced expense as the type-printing systems gain ground in our land.

Those who were sufficiently interested in the subject of Sir William Slingo's paper on "Technical Training in the Post Office," read before the P.O. T. and T. Society, and who was not? should also endeavour to supplement that practical lecture from a practical man by perusing the presidential address of A. P. Trotter, M.I.E.E., &c., read before the Association of Supervising Electricians. The address was entitled "Apprenticeship Systems Old and New," and dealt especially with the question of the arts and crafts' training of the modern youth. The speaker compared the conditions of to-day with those of three hundred years ago when trades were neither so many, nor so highly specialised—those good old days when the master could "administer moderate chastisement to an ill-behaved apprentice . . . but might not give him salmon more than four times a week," although this same apprentice was not obliged "to clean boots, knives, or windows, run errands or deliver parcels."

He defined "Technical Education" as "consisting in the acquisition of useful knowledge which when applied practically will assist in producing material results," but somewhat quarrelled with the term itself and substituted "Technical Training," the very keynote of Sir William's lecture title. There is little space to dwell further upon this especially interesting evening, the debate on which was all too short, and which will probably be more ably dealt with elsewhere. Many thanks however to Mr. Dalzell for his sympathetic words regarding the Telegraphs, especially welcome from one so long associated with purely telephonic matters.

That the war has not prevented telegraphic developments in certain directions is evident from the project—now in an advanced stage—of establishing a direct route between Baku and Petrograd.

The total cost is estimated at considerably over a quarter of a million pounds, of which £106,000 will be absorbed by the cost of a cable under the Caspian Sea, between Krasnovodsk and Baku.

Yet another of the belligerents shows considerable activity in telegraphic development, as witness the *Zeitschrift für Feinmechanik* of Berlin, which describes a new oscillograph, some improved apparatus for wireless telegraphy and telephony, and a Baudot sender with type-writer keyboard. Machine telegraphy still to the fore.

The French Government also appear to have taken the view that "the war has exercised a real influence on the rapidity of progress in both telegraphy and telephony during these last years. It has led the savants, whose previous labours were directed elsewhere to occupy themselves with the many problems arising out of the needs of telegraphy and telephony with or without wires."

The administration has even gone so far as to form a "Postal and Telegraphic Technical Committee" whose duty it will be to collaborate with the specialists of the scientific, technical and business world with a view to the improvement of telegraphic, telephonic and postal apparatus and tools."

M. Pomey, *ingenieur en chef* of the French Posts and Telegraphs, has been appointed *secrétaire général* of the committee.

Lest someone should shout "What is Great Britain doing in this direction?" it may comfort not a few to know that despite depleted staffs and necessarily watered labour, despite the many calls upon her engineering specialists, the British Post Office will not have need to be ashamed of her work and her development during the great war of 1914—?

"One of ours," who has recently returned from the Struma, has given some very interesting items of information regarding the telegraphic conditions in those regions. One wonders whether it would not be possible to collate the telegraphic experiences of the many "sappers" and others directly connected with the Telegraph Service, for use—after the war.

From Mesopotamia, yet another portion of our "far-flung" battle line, comes the opinion that "telegraph lines out here seem to have been specially built for the bird-life of the country, who apparently fully appreciate the thoughtfulness of the Indian Government"!

J. J. T.

"SMALL TALK" CONCERNING "TELEPHONY."*

BY M. M. HILLIER (*Telephonist, Purley Exchange*).

HAVING written this paper, I do not think it will be read by anyone without some knowledge of telephony—"operating," perhaps I should say; for telephone users, no matter how regularly they use their instruments, do not necessarily know how their calls are operated.

Business people as a rule have not the time, and a good many others have not the curiosity to enquire; so that, beyond knowing that the time taken to make connexions varies very much, they have practically no knowledge as to the method used.

Even those of our subscribers who profess to know a great deal about this subject, really know very little, in comparison with us, who, coming in contact so much with it, must necessarily know almost every detail concerning it, except, of course, engineering and those mysteries of the test room.

Perhaps to find out how much we really do know of this complicated, yet pleasant work, and how much is imagination, it would be a good plan to spend a short time with operators in turn, dealing with both outgoing and incoming calls. Let us first work with an "A" operator (who, as we learned members know, deals with outgoing calls), so that by questioning, reasoning and arguing with her we may gain sufficient knowledge to form our own more or less valued individual opinions.

We have all heard and I think agree, after lengthy arguments and discussions, that she has more difficulties and complications to contend with than the "B" operator. I do not mean to say that the work of an "A" operator is more responsible than that of a "B" operator. Most decidedly not; the "B" work is every bit as important as "A" work.

We know the "A" operator is responsible, to a certain extent, for the good opinion of our subscribers, also for the service they receive, and a good deal depends upon her quickness, pronunciation and tone. At one meeting, when the subject of "Tone" was discussed, it was mentioned that when a good tone is used subscribers more often than not respond to the repetition of numbers, and this had been proved by tests made at certain exchanges.

The effect of tone I think is more marked at exchanges dealing with business subscribers. Take, for instance, a gentleman about to ring up a certain number. As he removes his receiver his mind is set on the subject about to be discussed, and when he hears "Number please" he speaks up in a sharp businesslike manner, giving in the required number. Then he hears the operator repeating the number he has just given in and as he is used to having everything absolutely correct, answers "Yes" abruptly, as though saying "Precisely," and then waits patiently (or otherwise, if the business is pressing) until the required number answers. Other business people speak in an absent-minded manner, which quickly tells one that their minds are also centred on important matters.

Now subscribers other than those just mentioned are apt to regard a telephone as a kind of toy which can be used as and how they please. Very often they remove the receiver and, in the midst of a private conversation with a person in the room at their end of the line, give in the required number; then, disregarding the operator's repetition of the number, they continue their former conversation. This very often causes what the calling subscriber is pleased to call "delayed answers," which, when explained by us learned, may mean that when the called subscriber hears the calling subscriber already speaking, the former concludes that she is connected to an engaged line and immediately clears. This act I consider in the circumstances quite wise on her part.

Of course all this carelessness and thoughtlessness causes more work and, I fear, renders it a trifle unpleasant at times for the operator, who however, with her unflinching good humour and willingness to avoid trouble, receives it all with patience.

A "B" operator must not be, and is not, at all behind in her enduring patience. By her promptness in answering on signal

junctions, also in allotting O.W. junctions and in connecting, she can make, to a certain extent, the work of an "A" operator easier. This is, of course, what is always aimed at, so that telephony between all exchanges runs smoothly and swiftly, yet with absolute correctness.

Yet I think the calm patience of a successful "B" operator is, at times, almost heroic; for what is more annoying than to enter circuit on two or three signal junctions successively and to find them either too noisy to allow the conversation to proceed or to find that the speaking key does not cut her telephone out of circuit.

An operator in charge of both signal junctions and an order wire position experiences times of great confusion during busy hours, when an operator on the order wire persists in making her demand without troubling to listen, and consequently breaks in when the said "B" operator is taking a number from a calling signal junction. As the operator cannot possibly deal with both demands together, she says "repeat," only to hear both calling operators again making their demands together, which extracts another "repeat."

I think you will agree that the signal junction should receive the first attention, so who can blame the "B" operator when she requests the order wire operator to wait and the signal junction operator to repeat, even if she does stray a little from authorised expressions? This is bound to cause a certain amount of delay and therefore, as little time can be spared for waste in this work, one can easily observe what a great deal of time and confusion can be saved by an occasional remembrance of the green book.

Again we can speak of delays on signal junctions when the "B" operator tries in vain to gain the attention of the "trunk operator who has made the demand." After the usual endeavours have succeeded there may perhaps be "no reply" from the required subscriber. The "B" operator will by request ring them again, after which she receives the demand "Will you see me through? I can't get them."

What is the operator to do—connect to the supervisor or merely ring them again? I know the method I have used; but as it has only brought forth a caution a different method is advised.

A great deal of mystery seems to surround the worthy trunk operators, in several respects. I have often thought it very strange that no matter what the amount or manner of difficulty is experienced in connecting to the London trunk operators, all complaints meet with the answer, "Complaints regarding trunks are useless." Yet why is this? If the trouble is due to a local operator's error she seldom fails to hear of it.

Sometimes "A" operators feel just a wee bit obstinate, especially when one is allotted a junction already engaged by another operator. It is not that the second doesn't realise that the best thing to do is to withdraw her plug; but she does her best to secure the junction which really belongs to someone else. There is really no reason for this, and I think were she asked for a reason she would have some difficulty in finding one. But how often does this acting without reason occur? I am sure every operator, yes, and every supervisor too, must have acted irregularly without actual reason at some time during her career in the Telephone Service, and yet, when called over the coals, she must give a reason.

When thinking over it she argues with herself, and after a while sometimes realises how she might have avoided the trouble, and yet if the same trouble occurred again I doubt if she would think to act differently. This is not done intentionally: it is absolute thoughtlessness, and as some operators are more thoughtless than others they receive more cautions for irregularities than those who take more care.

I fear this very often causes an operator to imagine that a supervisor is inclined to be unjust, which is very seldom the case, for most supervisors do their best to encourage anyone of whom they are placed in charge.

It helps a good deal in making telephony run smoothly, for operators, with encouraging supervisors, to strive their utmost to avoid trouble with subscribers, to obey staff rules and to use authorised expressions.

* Paper read before the Croydon Telephonists' Society.

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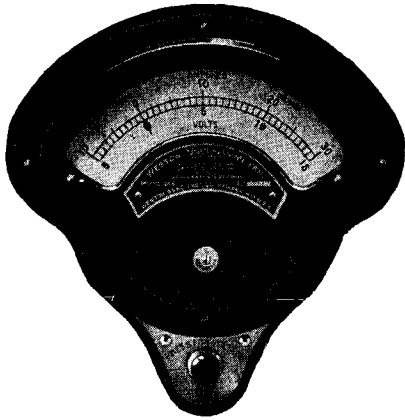
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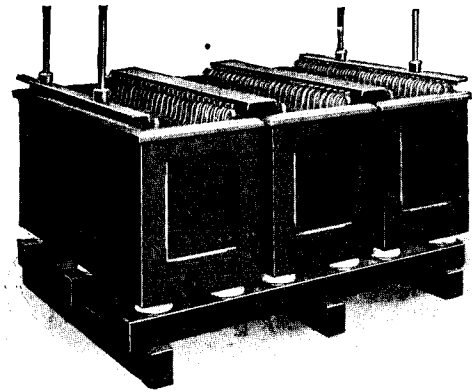
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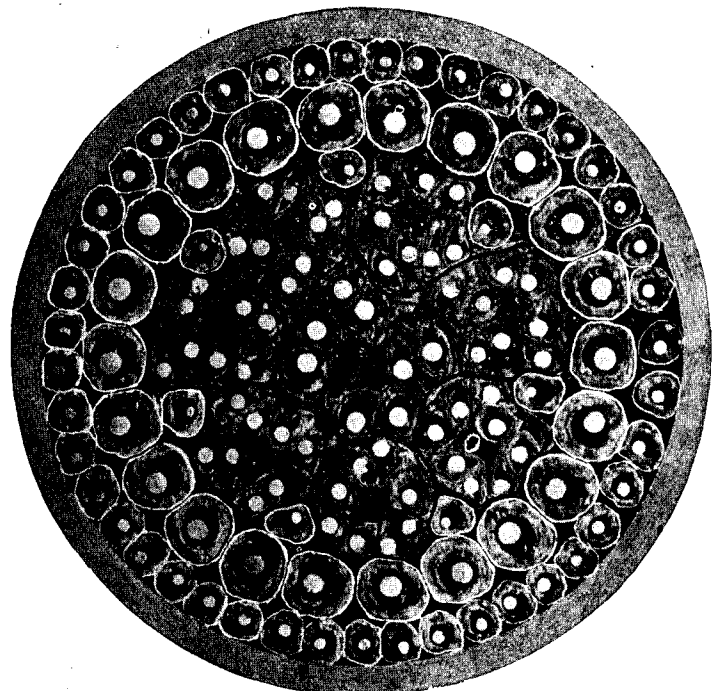
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Then of course by doing this the operators help the supervisors, for it is no pleasant task, I am sure, to reprimand those working under them. Telephonists are often apt to take cautions from supervisors either too seriously or not seriously enough. We know that supervisors are important and to a certain extent a necessity, but I think that operators are still more important; although one might imagine that, by the rules they are expected to obey so thoroughly, they are rather inferior persons.

Of course senior telephonists do not regard their positions in this manner, for they have had time to learn how necessary they are, especially at the present time when everyone is eager to do their best in helping matters to run smoothly in the Homeland.

I consider that a telephonist can always think she is aiding tremendously all and every day: for one never knows when by completing a call as quickly as possible she is having a hand in some business of perhaps vital importance. Her services are even more appreciated when they are given during the night or any time when she is usually off duty. At least most people appreciate them; but there are some (very few I hope) members of the public who are unreasonable enough to expect impossibilities from mere telephone operators.

I have heard a great many arguments regarding service tests on subscribers' lines. A good many operators see no sense in them and others think them unfair. We know there is usually a supervisor parading behind and attending to the wants of a certain number of telephonists, and she quickly draws the attention of a disengaged operator to a ringing subscriber, so I do not quite see why we need these service tests.

Tests on signal junctions I do think are within reason, also the O.W. guard signal tests, for these signals save delay, when the "B" operator quickly connects to the supervisor junctions picked up without a demand.

By these few instances one can easily understand what great demands are made on an operator's patience and how readily she responds to the appeals; but, never mind, telephonists continue to be patient, for there may come a time when, by this valued virtue, we shall have made quite a name for ourselves.

At least I consider we deserve fame, don't you?

REVIEWS.

Examples in Magnetism. 90 pages. Price \$1.10.—*Examples in Alternating Currents.* Vol. 1. 223 pages. Price \$2.40.—By Professor F. E. Austin, B.S., E.E., Box 441, Hanover, N.H., U.S.A.—It is well known by teachers of any of the physical sciences that a thorough grasp of the work is only to be obtained by the student's working many numerical examples. The application of theory to actual concrete problems has the effect of clearing away the mental mists which may have been clouding the real meaning of the facts in question, and frequently shows up weakness in knowledge which otherwise would have passed uncorrected.

The two books under review have been written with a view to providing this training. Fairly complete mathematical notes are given, which will enable the student to dispense with other books for reference purposes, and the worked examples and problems cover very fully the ground indicated by the respective titles. We are sure that a student who has carefully worked through these books will have such a real grasp of the subject that he will have no difficulty in tackling the majority of the problems with which he will meet in actual practice.

We have very little to criticise adversely in the books. On page 7 of *Examples in Magnetism*, however, the statement is made that

"Although the so-called 'trigonometrical functions,' as the sine, cosine, tangent and cotangent, are really 'ratios,' they may be represented by straight lines, since they are 'vector' quantities, having position, magnitude and direction." (The italics are ours.)

This is not correct. A ratio must, from its nature, be a mere number, and therefore cannot be a vector quantity. This, however, is such a self-evident fact that we feel sure that this statement

quoted is a slip of the author, and that no student will be misled by it.

The books are of convenient size and shape for the pocket. They are well printed on good paper, and the diagrams are very clear.

Directions for Designing, Making and Operating High-Pressure Transformers. By Professor F. E. Austin, Head of the Department of Electrical Engineering, Dartmouth College, Hanover, N.H., U.S.A. 46 pages. Price 65 cents. (To be obtained from the author, Box 441, Hanover, N.H.)—This little book has been written as a guide to the amateur electrician for making transformers suitable for wireless telegraphy, X-ray work, or other purposes for which high voltages are necessary.

After a brief theoretical introduction follow detailed instructions for building a 3-kilowatt 20,000-volt transformer.

The book is very fully illustrated, and should prove useful for the purpose for which it is intended.

In some cautionary remarks at the end of the book the author warns his readers against the danger incurred by touching the high-pressure terminals of the apparatus while the primary circuit is joined up, as the current which would be sent through the body of the experimenter would be "enough to kill a person several times." Apparently in America electricians, at least, have the felicitous gift of a multiplicity of lives not accorded to dwellers on this side of the Atlantic.

OUR RECORD OF BRAVE DEEDS.

TEMPORARY SECOND LIEUTENANT LEONARD MILLINGTON (Cheshire Regiment), who was a Clerical Assistant in the District Manager's Office, Chester, has been awarded the Military Cross.



TEMPORARY SECOND LIEUTENANT LEONARD MILLINGTON.

He showed, says the official record, the greatest determination when holding an advanced post during one night and the whole of the next day, although heavily attacked by the enemy.

OBITUARY.

WE regret to record that Miss BUCKLEY, Telephonist, Hanley Central Exchange, recently died from cancer. She entered the late National Company's service in 1887 as Operator at the Longton Exchange, and at her death was the Senior Operator (as regards length of service) in the district.

LONDON TELEPHONE SERVICE NOTES.

THE telephones societies have all now opened their autumn sessions, the P.O. T. and T. Society met for the first time on Monday, Oct. 23, when an interesting paper on "Machine Telegraphy" was read by Mr. Pendry of the C.T.O. The paper was preceded by what the advertisements described as a brief address by the Chairman, Mr. A. B. Walkley. The Chairman had promised to go on until he tired his audience, but as that was an impossible task he left off when everyone was thirsting for more. We sincerely hope that his advice to writers and readers of technical papers will be taken to heart.

The London Telephonists' Society gathered for their second meeting on Tuesday, Nov. 7, and had a most thoroughly enjoyable evening. Mr. J. Stuart Jones gave an outline of the present "Telephone Organisation" and ("publish it not in the streets of Askelon") dwelt with a delicate touch on some of its possible defects. The subsequent discussion was carried on amongst others by Colonel Ogilvie, Miss Heap, Miss Hooper, Miss Baldwin of the Trunk Exchange, and Messrs. J. Stirling, J. F. Edmonds, E. H. Prout, B. R. Mead, H. G. Townsend and John Lee. If the subsequent meetings reach a similar standard (and there is no reason why they should not) the room deserves to be packed, but these are difficult days, notwithstanding the gentle influence of the moon, in which to secure large gatherings.

The atmosphere of the London Telephone Service grows daily more military, and khaki's "the only wear," more particularly on Saturdays. So much has the recognition of the V.T.C. accomplished for us. We offer congratulations to our Chief who adds dignity to a Surrey Captain's regimentals, and to the Superintendent of Traffic who is now generally referred to by his military title of Adjutant. Those who represent the London Telephone Service in the sterner battle areas have for the most part successfully negotiated all enemy attacks, but recent Post Office circulars have included the names of a few of our men who have died for their King and Country. Amongst these are Messrs. D. E. Jones and J. Wigney, Assistant Clerks; Messrs. A. G. Cooke and B. W. Hawkins, Night Telephone Operators; and Mr. F. A. Aberdeen, Paperkeeper. We have, so far, no details of the special circumstances in which these gallants passed hence, but we hope it will be possible at a later stage for some sort of narrative to be prepared in book form giving all the information obtainable.

Our heartiest congratulations are extended to Lieut. Rathbone, of the Civil Service Rifles, who has won the Military Cross. The lieutenant is unfortunately wounded and is now in London in hospital, but we are glad to know his injuries are not serious. When he is able to come to the office he is assured of an enthusiastic welcome, for his popularity on the Accounts Branch which was always great is now very rightly on a rising scale. The contemplation of these matters reminds us that a fund is being promoted this year, as it was last, in order to secure the wherewithal to send a small Christmas gift to each of our members serving in the Naval and Military forces. A strong committee under Mr. Stirling's chairmanship has the business in hand and we are sure that all who had an opportunity of reading last year's acknowledgments will strain every effort, even in these financially stringent times, to make a generous donation for such an object. The actual task of deciding upon suitable gifts and arranging for their despatch is in the care of a sub-committee presided over by Mr. L. A. Prossor who, as everyone knows, has had uninterrupted experience since the early days of the war in the "preparation of parcels" for those in the thick of the fight. It surely is an object worth attaining that everyone of *our* men should get a Christmas gift from *us*. Then we cannot do better than repeat Wordsworth's lines quoted in this connexion in these notes last year:

"Give all thou canst; high Heaven rejects the lore
Of nicely calculated less or more."

Backed perhaps with the following misquotation from *Macbeth*:

"Stand not upon the order of your giving,
But give at once."

The Traffic Instructions of the London Telephone Service

are models, so we have been told, the world over, but they have perhaps an alarming tendency to multiply rapidly—particularly in these days of emergency entanglements, and it is not surprising therefore to know that the issue has now extended to over 300 instructions. In happier times the occasion of the launching of the threehundredth of the series might have been celebrated with a feast, but in these days food for thought is that most easily obtained, and it is possibly not surprising therefore that so far the only reference to this important event appears to have taken the form of a parody which came to light during the examination of an official wastepaper basket. It runs:—

NO CHARGE FOR THREE HUNDRED.

I.

Half a line, half a line,
Half a line onward,
Issue, nor pause for breath,
"T.I. 300."
"Number one—slightly frayed,"
"Mend it with gum!" he said,
Into a standard file
Paste the three hundred.

II.

Forward the T.I. staid,
One poor Exchange dismay'd
By lack of copy knew
Some one had blunder'd;
Their's not to reason why,
But having received reply,
Sending the lost T.I.
Into a standard file
Paste the three hundred.

III.

Instructions signed "J. F. E."
Instructions from "T. S. B."
Others just "T/NE"—
Unless t'were all the three—
Joined, but not sunder'd.
See how their numbers swell
As forth they come pell mell
Out of the mouth of — well
That it is hard to tell—
Issue three hundred.

IV.

Procedure there laid bare,
Common perhaps, or rare,
Shewing Exchanges where
To charge a subscriber
Said to be plunder'd;
Keep records, shewn as "stroke,"
Get lines repaired when broke,
Conserve the coal and coke,
Pacify every bloke
Howe'er he thunder'd
Then burn the waste, but not
Not the three hundred.

V.

When can their glory fade?
Will their tide e'er be stay'd?
We have all wonder'd.
Simply to end this rhyme
Say that "in twelve months' time
"They'll be five hundred!"

CORRESPONDENCE.

THE FIVE-UNIT ALPHABET.

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

I AM sorry to observe from J. B.'s letter in your November issue that I have not merely shattered his position but also hurt his feelings to such an extent that he has replied with Latin tags instead of plain English and has invited me to "peruse a monograph" instead of read a book. Also he says my data are "not very convincing," and he asserts that my "assertion . . . lacks confirmation," and he refers to my "bald statement." Now my good, worthy, pompous and wounded J. B., even if you will not accept my assertions, other readers of the TELEGRAPH AND TELEPHONE JOURNAL will agree with me that the worst possible form of *ignoratio elenchi* and *argumentum ad hominem* which does not contribute in the least to *De Augmentis Scientiarum* is to insinuate that your opponent's statements are not trustworthy. As J. B. declines to do me the courtesy of accepting my word and wants "chapter and verse," here they are.

I start with the Bacon reference and a preliminary word of explanation. The 32 permutations of two different things in linear groups of five are so obvious that they must have been known to mankind from the dawn of civilisation. These permutations were an easy scientific discovery. The alphabet on the other hand was an exceedingly difficult invention gradually evolved through many ages from ideographic writing. Language had first to be analysed into a small group of sounds (a most difficult task for humanity unaware of such an idea), and then these sounds had to be combined with a suitable set of symbols. It was the combination of the sounds and the symbols that constituted the invention of the alphabet. The essence of invention is the combination of two or more known ideas to produce a new idea. It was the combination of the sounds and the symbols that produced the alphabet, and it was the further combination by Bacon (or possibly some still earlier inventor) of the alphabet with a group of symbols representing the five-unit permutations that formed what we usually describe as the five-unit or Baudot alphabet. As far as I know Bacon was, if not the first inventor, at any rate the first to put this combination definitely on record, and he proposed to employ it as a cipher. He did not suggest its use for telegraphic purposes, and there would have been no invention in doing so. It is an accepted principle of patent law that you invent a thing, but not its application. If a man invents an umbrella to keep off the rain, another man cannot patent the same umbrella to keep off the sun. Such slight inventive merit as there was in the matter lay with Bacon in making the new combination, and not in its subsequent application to telegraphy.

With this preface I shall quote my "historic data which are not very convincing" to J. B. I referred in my previous letter to Bacon's *Advancement of Learning*, but following J. B.'s learned lead I shall describe it as *De Augmentis Scientiarum*. I shall also quote the passage in Latin, which of course will be no obstacle to J. B.

In Vol. VII of *The Works of Francis Bacon*, published by W. Baynes & Son in 1824, on page 287 of *De Augmentis Scientiarum*, Lib. VI, Cap. I, occur the following words:—"Primo, universae literae alphabeti in duas tantummodo literas solvantur per transpositionem earum. Nam transpositio duarum literarum per locos quique differentiis triginta duabus, multo magis viginti quatuor (qui est numerus alphabeti apud nos) sufficiet. Hujus alphabeti exemplum tale est.

Exemplum Alphabeti Biliterarii,*

A	B	C	D	E	F	G	H
aaaaa	aaaab	aaaba	aaabb	aabaa	aabab	aabba	aabbb
I	K	L	M	N	O	P	Q
abaaa	abaab	ababa	ababb	abbaa	abbab	abbba	abbbb
R	S	T	U	W	X	Y	Z
baaaa	baaab	baaba	baabb	babaa	babab	babba	babbb

It is interesting to note in the foregoing passage Bacon's words: "twenty-four (which is the number of the alphabet with us)." That is to say, in Bacon's time there were only 24 letters in the alphabet, a blessed condition that would help printing telegraph inventors nowadays by making the three-unit alphabet practicable for ocean cables, and would give inventors two more operation signals in the Baudot alphabet, J and V were the letters omitted. We need them now, but we could easily dispense with X and Q.

There is also no doubt about Wildman Whitehouse having been the source of Baudot's inspiration for the use of the five-unit alphabet and not Gauss and Weber, because in a very interesting monograph which J. B. should peruse, entitled "La Télégraphie Multiple," par M. E. Baudot, printed in the *Bulletin de la Société Internationale des Electriciens*, Tome XI, Année 1894, Baudot himself gives the credit to Whitehouse. He sets out various possible alphabets, including the five-unit alphabet, which he describes as "Code No. III (Whitehouse), 31 signaux simples et complexes." He also gives the three-unit alphabet, which he describes as "Code No. IV (Davy, Highton), 26 signaux simples ou complexes." Referring to these Codes III and IV he says at the foot of page 65: "Ces deux codes de signaux ont été proposés dès les début de la Télégraphie électrique, le premier par Whitehouse en 1855 et la second par Davy vers 1838 et Highton en 1848."

Baudot explains in a very interesting way why it was necessary for him to use the five-unit alphabet instead of the three-unit alphabet, in order to get what is described in the British Telegraph Service as double-current working. There is not one word in the whole of Baudot's paper about Gauss and Weber. Surely the authority of Baudot himself in 1894 describing his own system is better than the authority of the Controller of the Central Telegraph Office in Paris in 1907. In passing, I may say this paper by Baudot should be read by all who aspire to become printing telegraph engineers.

Mr. H. H. Harrison tells me that Whitehouse was anticipated in regard to the use of the five-unit alphabet for telegraph purposes by several other inventors; but the fact remains that the line of apostolic succession to Baudot, according to Baudot himself, came from Wildman Whitehouse and not from Gauss and Weber. Of course as J. B. casts doubt on my veracity he will, I suppose, be equally dubious about Baudot, but I think other readers of the JOURNAL will accept the chapters and verses I have submitted.

Now for a word about that "monograph" that J. B. wants me to "peruse." I don't care two snuffs about the monograph or about the wreck of the Atlantic cable by Whitehouse. That is a commonplace of telegraph history familiar to every telegrapher having a reasonable knowledge of his profession, and I don't need to "peruse a monograph" on Lord Kelvin to discover such a well-known fact. J. B. says he is sceptical about Whitehouse being "a scientist of the first class." I never said he was, and that statement by J. B. makes me sceptical about J. B. being a logician of the

first class, in spite of his criticism of my logic, because I cannot see any connexion between the scientific eminence of Whitehouse and the fact that Baudot adopted from Whitehouse the idea of the five-unit alphabet for multiplex telegraphy. If that is not an *ignoratio elenchii* or an *argumentum ad hominem*, perhaps, my dear J. B., it is the logical fallacy known as *de augmentis scientiarum*.

Now for J. B.'s second-hand authority for his contention "that the Gauss and Weber theories were the source whence Baudot got his governing principles." I do not know what connexion there is in J. B.'s intellect between "Gauss and Weber's theories" and Baudot's "governing principles." Certainly they have nothing to do with such a concrete thing as the five-unit alphabet. In any case, what the Controller of the Central Telegraph Office in Paris said in 1907 about the Baudot system can hardly be accepted in contradiction to Baudot's own written statement in 1894.

Also I have a horrid confession to make. I, Donald Murray, was certainly the chief propagator, if not the originator, of the Gauss and Weber legend, because I supplied to Mr. Vansize the material for his paper on "A New Page-Printing Telegraph," read before the American Institute of Electrical Engineers in New York in 1901, six years before the date of J. B.'s second-hand authority. (*Transactions of the American Institute of Electrical Engineers*, Vol. XVIII, May 1901). In that paper Mr. Vansize embodied information about the five-unit alphabet given by me to him as follows:—"Such an alphabet was first suggested by Gauss and Weber of Göttingen in 1833. It was revived in 1874, when Baudot and others employed it for their multiplex printing telegraph systems."

I had a vague impression that I had read the statement about Gauss and Weber somewhere, but I have not been able to discover it since. Possibly someone else can find the reference for me; but my impression now is that I "mixed these children up" and gave credit to Gauss and Weber that was not their due. When I was in Germany several years afterwards, Herr Telegraphen-Ingenieur A. Kraatz, of the Haupt-Telegraphenamnt in Berlin, and subsequently Postrat in Köln, asked me where I had seen the statement that Gauss and Weber had invented the five-unit alphabet. Kraatz was connected with the Telegraphen-Versuchsanstalt, and he told me he had searched everywhere for it and could not find any reference to Gauss and Weber's connexion with the five-unit alphabet. If a highly technical German could not find a reference connected with his own special business reflecting credit on two German professors, I take it that there is reasonable ground for supposing that the reference does not exist, and that I made a mistake in "perusing some monograph."

J. B. can further satisfy himself that Gauss and Weber had nothing to do with the five-unit alphabet by referring to Zetzsche's *Geschichte der Elektrischen Telegraphie*, forming Vol. I of his *Handbuch der Elektrischen Telegraphie*, edition of 1877, pages 80 and 81, where the unequal letter alphabet used by Gauss and Weber is given in full. Zetzsche expressly says on page 80:—

"Die Ablenkungen [of the needle or beam of light] nach rechts (r) und links (l) waren aber von Gauss und Weber so gruppiert worden, dass höchstens 4 ablenkungen oder 4 Ströme zur Bezeichnung der Buchstaben und Ziffern nöthig waren, wie das nachfolgende (aus Schellen, *Der elektromagnetische Telegraph*, 1. Aufl. S. 81 entnommene) Alphabet anschaulich macht:—†

r = A	rrr = C, K	lrl = M	lrrr = W	llrr = 4
l = E	rll = D	rl = N	rlll = Z	llr = 5
rr = I	rlr = F, V	rrrr = P	rll = O	llrl = 6
rl = O	lrr = G	rrrl = R	llr = 1	llrl = 7
lr = U	lll = H	rllr = S	lrl = 2	llll = 8
ll = B	llr = L	rllr = T	llr = 3	llll = 9

Zetzsche's historical work is most exhaustive and Germanically minute in its precision of detail and quotation of "Quellen" or sources, so it is hardly probable that he would have overlooked any use of the five-unit alphabet by Gauss and Weber. I have also verified Zetzsche's reference to Schellen. See Schellen's book, page 385 of the 1888 edition. Schellen also makes no reference to any use of the five-unit alphabet by Gauss and Weber. Indeed it would have been longer for their apparatus than the alphabet they employed. Their apparatus formed the basis of modern cable telegraphy, and for such a purpose the five-unit alphabet was just as unsuitable then as it has been up till quite recently. Their alphabet was a Morse cable alphabet several years before Morse invented his alphabet. Certainly so far as the Morse alphabet is concerned the credit due to Morse is very small.

DONALD MURRAY
(Messrs. Creed & Co., Ltd.).

Croydon, Nov. 15, 1916.

* We translate for the benefit of those readers who are not acquainted with Latin:

First, all the letters of the alphabet may be resolved into two letters only by permutation of these two. Now the permutation of two letters through five places would suffice for 32 different letters, much more so for 24 (which is the number of the alphabet with us). An example of such an alphabet is:—

Example of two-lettered alphabet.

† The deflections of the needle from left to right were however so grouped by Gauss and Weber that at the most four deflections or four currents were necessary for the designation of the letters and figures, as appears from the following alphabet (taken from Schellen's *Der Elektrische Telegraphie*, 1st Edit., p. 81).

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	}	MR. JOHN LEE.
Committee - - -		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. III.

DECEMBER, 1916.

No. 27.

"WHAT'S IN A NAME?"

"WHAT'S in a Name?" is the title of an article in the New York Telephone Review describing the somewhat elaborate process of selection pursued by the Telephone Company before the name "Cathedral" was chosen from amongst some 150 as the designation of a new telephone exchange in New York. The remainder of the quotation: "a rose by any other name would smell as sweet" immediately leaps into the memory. In truth it would. A variety of the rose may be called "Glory-to-John" by jobbing gardeners without losing in perfume; but nevertheless when public works have to be named it is desirable that their names should be at once appropriate and euphonious.

"What's in a Name?" was the identical title of a short article by Mr. W. A. Valentine, the present Deputy-Controller of the London Telephone Service, in the old *National Telephone Journal*, and the question of exchange nomenclature was there discussed in March 1909. Mr. Valentine was arguing against polysyllabic names and urging that the adoption of shorter words involved an actual saving of pounds, shillings and pence. We take it, however, that the names of exchanges in country towns must be geographical, and if a place has the misfortune—from a telephonic point of view—to be called Weston-super-Mare or Stoke-in-Teignhead the remedy is not easy to find, for there are many other Westons and Stokes in England. It is in the case of urban exchanges, where several are situated in one large city, that the problem of selection arises and our roses must needs be differentiated as "Gloire de Dijon," "La France," "Dorothy Perkins," and other fancy names. Geographical appropriateness, brevity, euphony, and avoidance of similarity between the titles of two exchanges have to be considered. The august susceptibilities

of overlapping municipal authorities must not be forgotten, nor must the equally tender social susceptibilities of the subscribers be ignored, for it is on record that the name of the Deptford Exchange was altered to New Cross; and the allocation of a number preceded by "Mayfair" must cause a thrill in many an aspiring bosom. We believe, too, that the name of one exchange in Central Liverpool had to be changed from "Park" to "Royal" because merchants and business men deprecated the non-commercial atmosphere of the former title as incompatible with their stern activities. "Et ego in Arcadia—not exactly!" they protested.

We think that the name of an ancient parish is an ideal for a standard. Kensington, Paddington, Hammersmith, &c., cannot be bettered, but many of the London exchanges serve an area consisting of several parishes and such names as East, North and City have to be employed. We are not enamoured of such vague designations as Park, Royal and Avenue, but they have the advantages of brevity and clearness, and the latter and Gerard have, considering the short history of the telephone, acquired almost a topographical character. The question of reducing the names of country exchanges to their simplest terms presents some difficulties. We need not talk of Preston-in-Amounderness or Bolton-le-Moors to distinguish the exchanges in those large towns, but we think Leighton Buzzard, Hemel Hempstead, Chester-le-Street and such like must be left to bloom in their full geographical glory—at least for the purposes of long distance traffic.

A GOOD OPENING.

THE opening meeting of the London Telegraph and Telephone Society for its third session under war conditions was a remarkable gathering. It would be an impertinence to say much in this place of Mr. Walkley's address. We give it in full and we are sure that it will be read both with interest and admiration not merely for the address itself but for the human spirit with which it is inspired. That portion of the address which suggests an improvement in the style in which technical papers are written will probably attract most attention. All of us who have had some share in writing on the technical work of telegraphs and telephones are conscious of our sins and perhaps we should show the finest appreciation of Mr. Walkley's address if we promise amendment of life.

Mr. Pendry's address, among other virtues, had two most strikingly prominent. In form it was beautifully clear; in spirit it maintained an unprejudiced balance of mind which might well be the envy of those of us who have had to examine the different types of new plant. With his prophecy of a future policy there would probably be little dispute. There is ample evidence on both sides of the Atlantic that experts are setting their faces towards automatic transmission. Probably this is looking a long way ahead, but it is good for us to be invited to take a long vision. One of the speakers was inclined to be censorious as to the absence of a policy in the past, but perhaps it is just as well that a policy was not hurriedly devised while the new machines were in a more or less immature stage.

HIC ET UBIQUE.

FROM the *Deutsche Verkehrs-Zeitung* we have obtained the following information relative to the increase in German telegraph and telephone rates:—

By the law of June 21, 1916, which came into force on Aug. 1, local telegrams up to five words inclusive cost 40 pf. (5*d.*); above five words up to ten inclusive 2 pf. additional for each word—*i.e.*, 50 pf. (6*d.*) for ten words; above ten words 5 pf. (over ½*d.*) for each word. All other telegrams outside the radius of towns cost 60 pf. (7*d.*) for five words; 2 pf. each additional word up to ten, and 7 pf. (nearly 1*d.*) a word above ten.

The flat rate for telephones in the smallest districts is 88 marks (say £4 8*s.*), and rises to 198 marks (£9 18*s.*) in systems with over 20,000 lines. The message rate charge in systems of under 1,000 lines is 66 marks, rising to 110 marks in systems with over 20,000 lines. The charge for local calls is 5½ pf. (nearly ¾*d.*) for a conversation of three minutes, and from 2½*d.* up to 2*s.* 2½*d.* for trunk calls, according to distance.

MR. WALKLEY, in his opening address at the first gathering of the Telephone and Telegraph Society of London, probably had no intention of investing with prophetic meaning his reference to *Gulliver's Travels* and the Kingdom of Laputa. Shortly afterwards, however, when some of Mr. Pendry's slides appeared on the screen sideways instead of horizontal the major portion of the audience were carrying their heads in the correct Laputan style in their endeavours to understand the pictures.

I MUST confess, says a writer in a Canadian telephone journal, agreement with Sir Herbert Tree in his remarks the other day about the telephonic American. "Americans seem to do nothing," he said, "but sit about with a telephone in their hands calling one another up. And they say, 'Hello,' a very violent, nerve-racking word, instead of the much softer and more pleasing expression, 'Are you there?' I attempted to introduce this expression, but the first time I said it over the 'phone the man at the other end replied, 'Where the — do you think I am?' They are a most peculiar people."

We must add that we don't think that the re-introduction of the phrase Sir Herbert suggests would find any more favour in this country.

We know our telegraph readers like to hear of a score over the telephone. *The Transmitter* (an American contemporary) describes "a new way to telephone."

A woman detained at a police court in an Eastern city the other day, it says, asked permission to telephone three of her friends. The police officials readily consented, but reserved the privilege of listening in. They didn't hear a great deal, however, for she rapped out the message in the Morse code, tapping upon the table upon which the instrument stood. "Thank you," she said, when she had finished her conversation. She then returned to her cell, leaving several much-chagrined officers staring at one another.

ESTIMATES OF LIFE.

(Offered to the Advertising Department of the
Civil Service Insurance Society.)

Lives of switchboards* oft remind us
That we may not reach the years
Which our fond hopes have assigned us,
Optimists like engineers.

Up then, and your lives insuring,
See you have a worth residual;
For when estimates are soaring
Know that they are apt to kid you all.

A. G. D.

* For "switchboards" substitute "line plant" or any other class of plant that fits the metre.

THE LONDON TELEPHONE AND TELEGRAPH SOCIETY.

MR. WALKLEY'S ADDRESS.

... I FIND, not for the first time, that to be appointed chairman of anything is at once a chastening and an instructive experience. It is chastening because it is a reminder, of course in a very pleasant, flattering form, that one is not so young as one was; it is instructive because it provokes you to satisfy your curiosity. You wonder to yourself "What is this society that makes so odd a choice of chairman?" and you suppose that such a society must be unique. But your inquiries soon show you that it is not unique, that there are other local societies of the kind in the Provinces, and that this is not the only society of the kind in London. After all, when you come to think of it, this is just what was to be expected. Wherever you have a centre of intellectual and practical energy, like the Post Office, you may be quite sure that energies will develop round it in the nature of such societies as ours. Let me take a figure from music. You know what is meant by a harmonic note, the secondary note which you get by drawing a bow across a fiddle string in a slightly different way from that in which you draw your bow for the primary note. It seems to me that we here are sounding the harmonics of the primary notes that we sound in our official labours.

We sound our harmonics as individuals, too. When I was in that corner of the Post Office which deals with our foreign mail services and international relations, it happened that I had frequently to cross the Channel for my own purposes, and I found I always gravitated to that end of the boat where they shoot the mail bags and parcel baskets down into the hold. I remember how every bump of bag or basket evoked a corresponding thump in my own breast, and how pained I was at the callous, heartless way in which the sailors threw the tarpaulin over the precious collection. Then and there I had no official concern in the matter; I was merely sounding my harmonic note to the Foreign and Colonial branch. When I was transferred to the Telegraph branch, my private emotions were again affected. I could not, and cannot now, go down the high road without an eye on the telegraph wires and poles. I fall to counting the arms, to wondering why the poles are near here and far apart there, and to admiring the wisdom of Providence in always placing village schools near broken insulators.

These, however, are wayward, irresponsible harmonics of mine. You of this society have the wisdom to collect and arrange your harmonics in tunes—which you call technical papers and addresses. And, if I may carry the figure a little farther, we are told by the musicians that the harmonic note is of vital importance because it determines at once the intensity and the quality of the primary note. If that be so, I think the value of this society is sufficiently vindicated.

It deals with telegraphs and telephones, and I propose to take you away for a moment from the official or inside view of these things and to ask you to look at them from the public's point of view; to consider them as what indeed they are, great instruments of human commerce—using the word commerce, if I may, in its older, more generous sense, to cover all and not merely business intercourse between man and man. Think of the advent of these instruments as forming a chapter in what I would call the spiritual history of material inventions. What do I mean by this spiritual history? Well, take the railways. When you read of the introduction of the locomotive and the railway-track you read of Stephenson and Brunel and other justly honoured names. I cannot help thinking that in the conditions of the time there must always have arisen some Stephenson and some Brunel. Railways were invented simply because human nature could not put up any longer with the stage coach and the stage coachman. The stage coach—Cobbett's "box with an air-hole in it"—was uncomfortable, expensive and slow; the stage coachman was a public nuisance. I know you will be thinking of the elder Mr. Weller, but you must remember that Dickens dealt in exceptions, and Mr. Weller, senior, was a glaring exception.

Read the sober, matter-of-fact chroniclers of that time and you will find that the stage coachman was a tyrant to his poorer passengers and a sycophant to the rich. There came a time when the world could stand it no longer, and so they invented the railways.

Now turn to the telegram. The telegram was devised as a cure for what had become a devastating plague throughout the civilised world, known as the art of letter writing. Far be it from me to speak ill of that art when an art it was. Among our artists in letter writing some of the greatest names in literature are recorded. But unfortunately the general public got hold of the art, and when the general public get hold of an art, Heaven help it! Think of the piano. I suppose the full tide of the art of letter-writing was in mid-eighteenth century when Miss Clarissa Harlowe and her friends filled eight closely printed volumes with their correspondence. Clarissa would get up at 6 o'clock in the morning to write a letter of five pages of print to Miss Howe, at 11 o'clock she wrote another, and after supper a third as long as the two others put together. Her friends said, perhaps a little mildly, that she had a "knack of letter writing."

Letters had become too wordy, too pompous, too long. Flesh and blood could no more endure it. A surfeited world said something must be done. Something was done. They invented the telegram.

Now the telegram was explained upon its invention to Sidney Smith, who said, "Oh, yes, I see. It is a means of enabling Hallam in London to contradict a friend at Birmingham." A good hit at a notorious weakness of Hallam's, but not perhaps a comprehensive description of a telegram. A telegram is, of course, as we all know, a letter. The law calls it, with strict accuracy, a post letter. For the public it is an express letter, a letter which reaches its destination as a rule more quickly than a letter in the mail bags. And it is a letter divested of all verbiage, all superfluities, a letter reduced to its quintessence.

It was not to be expected that people would remain satisfied with what was after all a mere modification of the old letter. They were soon asking for something really new. They got something really new in the telephone. Now I am, as it happens, officially wedded to the telegraphs, but I cannot help casting what I fear must be an adulterous eye on the seductive charms of the telephone. It offers you that choicest kind of human commerce, conversation. It brings people *almost* face to face. You have almost every element of conversation, the human voice, rapid question and answer, interruptions, exclamations and even the opportunity of using those imprecations which some people call unparliamentary and others the salt of intercourse. The law, to which I alluded just now, the law says that a telephone is a telegraph. Well, so it is when you are thinking of the electrical means of communication; but we are not thinking of that, we are thinking of ends—not means. For the public the telephone is a thing apart, an almost uncanny thing. But it has one drawback. Your telephone conversation lacks the element of personal presence. As we all know, the personal element in conversation—gesture, facial expression, the glance of the eye—is often more important than the words themselves. I fancy, however, there is nothing at all absurd in assuming that in the course of time our electrical inventors will supply us with the means of transmitting by wire those missing elements of personal presence. I will even go further than that and look forward to a day when electricity will transmit our thoughts and moods without the tiresome encumbrance of words. When that happens this society will once more have to expand its title and will become the Telephone, Telegraph and Telepath Society of London.

I have spoken of human commerce, and what else but human commerce is the object of the papers that we read here and the discussions that are held upon them? The question, then, has naturally arisen in my mind—what is the best way of attaining a perfect commerce through papers of this kind, in other words, what is the appropriate style for a technical subject-matter? My question is of course absolutely general and implies not even a side-glance at any individual. It is, I think, an important question that our scientific men, immersed in science as they are, and our practical men, "driving at practice," are too prone to neglect.

Now I said—"What is the proper style?" and I daresay some of you may wonder at my use of that word. You may think that "style" is a word applicable to pure literature, to a poem or a romance, or a history, or an essay, but not to a scientific or a practical disquisition. If you do think that it will probably be because you are under the dominion of a very general error about style. So many people think of style as a kind of external ornament, as something stuck on. You will remember the story of the American who said he had finished building his house and was getting a man down from New York next week to put on the architecture. Style, whether in pure literature or in science, is not something "put on."

No one, I find, discourses about style without introducing a certain quotation from Swift. Referring to the Deist controversialists of his day, he spoke of "that quality of their voluminous writings which the poverty of the English language compe's me to call their style." That is good Swiftian sarcasm, but as a matter of fact, if the English language were tenfold as rich as it is we should still have to call every man's individual manner of expressing himself his style. So soon as you sit down to *express* anything, however scientific, however practical, at that moment you cannot help beginning to have a style.

A man's style being a part of his individuality cannot of course be prescribed for him any more than the shape of his nose or the colour of his eyes. It is the outcome of his temperament, his character, his intellectual life history, his taste and I know not what else. But this individual style of his will have to work within certain boundaries and under certain conditions imposed by the nature of the subject-matter on which he is engaged. "The style is the man," yes; but the man must suit his behaviour to the occasion. There is a story of a priggish young recruit in the old India House, who said to a director, "Pray, sir, what style is preferred for official correspondence?" The director answered: "Young man, the style as we prefers is the humdrum." It would be indiscreet of me to suggest the speculation whether or no that director established a tradition in our public offices; I merely give the story as an instance of putting a perfectly legitimate question, the question of appropriateness of style to its subject-matter.

Our subject-matter here is technical. What is the speaker's or writer's object in that particular case? To transfer knowledge of certain facts and thoughts about those facts, without damage in transit, without travel stains, from his own head to other people's. His main object, then, is lucid exposition. Lucidity, I need hardly say, is a prime requisite of every style; but in expounding a technical, scientific, practical subject I am not sure that lucidity is not the first and the next and the last requisite. We must see, of course, what this requisite of lucidity covers. Obviously there must be no *useless* ornament. I will give you an example in a minute of ornament that is by no means useless. There must be no surplusage of phrase and there must be strict economy (which, of course, means not parsimony but *nice* adjustment of means to ends), not merely in the language but also in the structure of our exposition. I fancy there are two especial pitfalls, obstacles, let me call them, to a perfect attainment of human commerce, which beset us as writers of technical papers. The first is a result of the writer's deep immersion in his subject, and of his failure to put himself imaginatively in the place of other people not so deeply immersed. He forgets that "with such a being as man, in such a world as the present one," it is a point of wisdom to take as little as possible for granted. He becomes too complacently scientific. You will remember that the third book of *Gulliver's Travels*, in which Gulliver visited the island of Laputa, is one long satire upon scientific excess. A tailor in Laputa who measured Gulliver for a suit of clothes did it by trigonometrical survey. And so it is apt to be with the writer upon a scientific or technical subject. He has a tendency to explain complicated things in too meagre a way and simple things in too complicated a way, with the consequence that he flies over his reader's or his hearer's head. You know what they said to Monsieur Jourdain in Molière's comedy. "Do you understand Latin?" "Oh, yes," he answered, "but please go on as though I did not." And we, I think, are

entitled to say to the writer of a technical paper, "Of course we understand all the ins and outs of your subject, but please go on as though we did not."

The second pitfall is very near the other. It is the defect of technicalism: the abuse of technical words and technical abbreviations. The chemist's assistant who said that "Life is not a bed of *rose fol.*" was guilty of technicalism. Technicalism, ostensibly an enrichment of our vocabulary, is in reality an impoverishment of our language. It debases the King's English into jargon. If I make special mention of abbreviations it is because these seem to be the darling sin of societies. You remember the man who was described as P.V.P.M.P.C.—explained in a footnote as "Perpetual Vice-President and Member of the Pickwick Club." I prefer an example from fiction, because examples from actual fact are legion and any choice might seem invidious.

Technicalism is, notably, among the indiscretions of youth. I suppose the younger members of societies—younger writers generally—are more prone to exude technicalities because they have so recently been filled up with them. They remind one of the infant in a well-known verse of Boileau's:

Sentant encor le lait dont elle fut nourrie.

There is also, perhaps, some vague idea of freemasonry in this addiction to technical language. It seems to be often used as a kind of shibboleth to separate the people inside the pale, who understand, from the people outside who do not. If that be so it is clearly in deliberate opposition to what we have been seeking, the attainment of a perfect human commerce. Anyhow, I suggest we shall be justified in saying to the technical writer in Shakespeare's phrase, "Prythee, deliver thyself like a man of this world."

And now let me conclude with just three examples of what I think may be regarded as supreme success in the handling of technical subjects.

My first is an example from Astronomy. There is a book called *Entretiens sur la pluralité des Mondes*, by Fontenelle. I daresay not everybody here has read Fontenelle. But, believe me, I have no idea of teasing you with recondite names. These Conversations of Fontenelle's, or at any rate copious Extracts, are included in Dent's Shilling French Classics, and so are accessible to all of us. Fontenelle, I may just mention, lived to within a few months of a hundred years, a circumstance of high encouragement to the readers of technical papers in this society, and this little book of his was published in the early sixteen-eighties. It was characteristic not only of the man but, as a matter of course, of the age. If you ask yourself what were the chief social currents of that period I think you will find that they were gallantry and scientific curiosity. For the gallantry, you have Sir Peter Lely's pictures of the Court beauties at Hampton Court; for the scientific curiosity, you have the foundation of the Royal Society. You will find both currents running strong and side by side in Pepys' Diary. You may think of them as meeting in Charles's Palace at Whitehall, with the reigning sultana in one wing and his chemical phia's and retorts in the other.

Fontenelle wanted to explain the main facts of astronomy to the people of his day. How did he set about it? He imagined himself on a clear starlight night in the garden of an old chateau, talking to a beautiful marquise. In such a scene and in such company his thoughts inevitably tend to gallantry, but the lady, with the tact and grace of her sex, switches him off to the other current. "No," she says, "tell me about the moon." And he tells her about the moon and, when again giving signs of relapsing into tenderness, is desired to tell her about the earth and the sun and so forth. You must not be surprised that an accomplished marquise of those days needed instruction about the movement of the earth round the sun. Only a few years earlier Pascal himself, the great Pascal, laid it down that the sun went round the earth, and more than half a century later, if you have read your *Tristram Shandy* carefully, you will remember that Mrs. Shandy went to her grave without knowing for certain whether the sun went round the earth or the earth round the sun. Mr. Shandy had told her a thousand times; but she always forgot. She could never have forgotten if she had been told with the delightful art of Fontenelle. He catches you on your romantic side, lures you with the expectation

of a smooth tale of dalliance, and lo! you find you have mastered the whole Copernican system of Astronomy. This was the example I had in mind when I said that ornament in technical exposition is not always useless. But before you indulge in it you had better make sure you are a Fontenelle.

I take my second example from one of the most highly technical of subjects: Currency. You know how dry and disgusting the average political economist continues to make that subject; but turn to Swift's *Drapier's Letters to the People of Ireland on Wood's Halfpence*—an appeal to the Irish to boycott certain base copper coinage imported from England. You will find the subject of currency so clearly and forcibly (and, let me add by way of caution, now and then sophistically) explained in this pamphlet that it is a sheer joy to read it. Of course Swift was not writing merely to explain but also to persuade, and he ever and again breaks out into fierce gusts of passion and indignation, but he never forgets his main business of lucid exposition, never uses a word or an argument or an illustration beyond the understanding of the plain man. Indeed, Swift always scrupulously delivered himself like a man of this world. Though we cannot hope to write like Swift, we can all try to follow him in that.

My last example is from the Differential and Integral Calculus, which I daresay a good many of us here remember as having been made a kind of mumbo-jumbo mystery to us in our youth. Well, only the other day I came quite casually upon a little shilling book, published by Macmillans, called *The Calculus made Easy*, by F. R. S., and the book does absolutely answer to its title. I was astonished at the ease with which one took in what had been made so mysterious, so obscure, so repulsive with "insipidated gloom," in the old days. This is done largely by just substituting ordinary language for technical signs and technical terms. At the same time there is a pleasant vein of jest in the book at the expense of the mystery-mongers whom the writer desires to supersede. It reminds me of a famous saying by a woman with a very good head and a very bad reputation, Ninon de l'Enclos—"La joie de l'esprit en marque la force." Joyousness of the mind is the mark of its strength. So it is. The best proof you have really mastered your subject is to show yourself able to play with it. . . .

TRAFFIC AND PRACTICAL NOTES OF MACHINE TELEGRAPHY.*

BY H. W. PENDRY (*Central Telegraph Office.*)

INTRODUCTION.

THE term "machine telegraphy" employed in the title of this paper perhaps needs an explanation, since it is intended to confine its reference to the more important of the existing high capacity systems which produce printed copies of telegrams. Brief notices will be taken of the "Murray," "Creed," "Baudot," "Siemens" and "Western Electric." The order selected is that in which the writer became acquainted with them, but this also almost exactly corresponds to the sequence of their development in the British Telegraph Service. About thirteen years ago I had the advantage of being included in the staff selected to direct the course of the Murray "automatic" between London and Edinburgh.

The interesting possibilities of this epoch-making system supplied us with certain enthusiasm and no doubt helped us to surmount the many difficulties encountered in dealing with traffic upon a novel set of instruments.

There were of course interruptions and breakdowns due to the imperfections in the experimental apparatus, but some remarkably fine results were attained. It was clearly proved that the inventor was working on right lines in his attempt to reach the telegraph goal of a page-printed message at the delivering stage, secured from the manipulation of a typewriter keyboard at the originating station.

Perhaps it is here permissible for me to digress for a moment. Inventors as a class appear to be obsessed with the fear of antagonism to labour-saving devices. Quite recently one of them quoted this in a pamphlet, "even to-day the machine is looked upon with suspicion by the workman, as something designed to filch his living from him."

Now I can most emphatically assert from inside knowledge that, notwithstanding the lamentable history of labour's contentions with machinery, the development of the various printing telegraph systems in the British Post Office has encountered no adverse treatment at the hands of the operating staffs. Instead, there exists, what is perhaps an unusual spirit of co-operation,

* Paper read before the Telephone and Telegraph Society of London on Oct. 23, 1916.

and each one of the systems here discussed owes very very much to the generous assistance rendered by the mechanics, operators and other officers. The inventor is generally destitute of practical traffic experience and the staff supply his lack by bringing with them their wealth of a lifelong training in the most efficient telegraph service in the world. As a consequence causes of hindrance have been studied, and successful remedies proposed, by those merely concerned in handling the traffic over the systems.

For the encouragement of inventors and to banish for ever their anxiety, let me refer them to Mr. Newland's address to this society on Nov. 24, 1913, wherein he said "the selected staff have given evidence of rare devotion to duty in grappling not only with the technical aspects of each new invention, but in the endeavour to get the utmost possible out of them."

Now to return to the Murray *automatic* system. At each station the complete installation consisted of four main pieces of apparatus—(1) keyboard perforator, (2) transmitter, (3) perforating recorder, (4) translating printer.

The tape at first had holes on both sides of the centre feed, and thus resembled the well-known Wheatstone slip. Afterwards it was prepared with the five-unit signals punched in a single row of holes—each letter occupying a half-inch of tape. The perforated tape was passed through the transmitter whose function was to convert them into the line signals of the real Baudot alphabet.

A phonic-wheel motor controlled by a vibrating reed gave a remarkably uniform speed to the transmitter. At the receiving station the main line signals passed through an ordinary polarised relay, and by means of local relays the punching recorder reproduced a perforated tape. This could in case of need be passed into another transmitter and supply the messages to other stations. When required for delivery the tape was fed into an adapted typewriter which translated the perforations into Roman type, printed direct on to the message forms.

After several months steady progress the daily totals grew, until one afternoon, amidst much enthusiasm, it was made known that 1,000 had been reached. Needless to add, this and higher totals became frequent, but the output of that installation of the Murray automatic did not satisfy the exacting demands of the "average per operator" criterion, and for the time being it was withdrawn.

Thus passed the first installation. It had served well to demonstrate some of the requisites for the ultimate state of printing telegraphs—namely, a type-keyboard at the initial stage producing a printed form for delivery to the public.

Mr. Murray's next development was in the direction of multiplex working, which ultimately enabled him to reduce the operations at the receiving station. The line signals themselves control the translation and printing of the message without the intermediate perforated slip.

Another experiment was that of dispensing with the keyboard perforated tape and using what is termed a "cadence keyboard." This device, whereby the operator depresses each key in unison with a warning signal, has not proved a success. Strange as it may appear, the operator tires more quickly in attempting to maintain only one movement in synchronism with the cadence beat than when forming combinations or varying groups of keys in the same time as is done in Baudot manipulation.

Perhaps it is the rigid monotony of the single operation that may account for this peculiar result.

There will be many references to "multiplex" form of telegraphy, and some present would doubtless appreciate an outline of this arrangement, which undoubtedly supplies the very best form of telegraphy when a continuously heavy traffic load is experienced.

A group of, say four, operators (A, B, C and D) at each end of a telegraph line are placed in direct communication, one with the other, by means of synchronised distributors. These may be imagined as two clocks with rapidly rotating hands which are maintained in precise agreement of speed and position so that corresponding sectors of the clock-faces harmonise. In practice this results in A working continually to A, B to B, &c. The rate of rotation is determined chiefly by the operators' speed of manipulation.

By duplexing multiplex printing systems, as was done by Major Booth, the carrying capacity of the line is doubled and A, B, C and D each have partners who receive while they are sending.

In the Murray multiplex the idea is to give the transmitting operator control of all the actions of the distant printer, and there is no doubt but that the inventor can now say "Eureka."

Certain modifications and improvements are bound to come as a natural development, and in the concluding paragraphs of this paper some of the advantages and disadvantages are outlined. I have often regretted that when Mr. Murray chose the Baudot code he did not retain the same designation of the combinations. I know it is argued that the operators need not learn the alphabet as the keyboard is lettered according to standard arrangement. In practice, however, it is often necessary to check the slip, &c., and faults cannot be properly diagnosed unless this is done. It will greatly help the work of the *dirigeurs* and mechanics if the "Murray," "Siemens" and "Western," who all use the Baudot code, would revert to the same assignment of the combinations. This is urged also on the ground that being an *equal* letter alphabet, it is unnecessarily capricious to change its order.

THE CREED SYSTEM.

Leaving the Murray I became associated with the late Mr. J. Martin in the experimental trials of "systematic" Wheatstone working. In these the value of keyboard perforators was clearly evident, and the Kotyra and Gell enabled the speed of slip preparation to be doubled.

For a time in the C.T.O. we gummed the received Wheatstone slip on

to forms instead of transcribing the messages, but certain disadvantages accrued and it was finally abandoned in London. About this time, fortunately, Mr. Creed's printer assumed more or less its present form and was put on the receiving side of the systematic Wheatstone, working between London and Edinburgh.

The Creed system is valuable as an adjunct of the Wheatstone, as it supplies an automatic high-speed printer actuated by the Morse code.

Beginning with a device for reproducing the Wheatstone slip at the receiving station, Mr. Creed, following suggestions of the Post Office engineers, began to use this tape in a printer of the early Murray pattern. This was abandoned and the evolution of the successful pneumatic type bar printer ensued.

The original proposal was for the apparatus to be utilised for news or Press work, and in that connexion, owing to the exclusive use of Wheatstone and Morse code, it is at present unrivalled.

In outline, the Creed system is as follows. At the sending station a Wheatstone perforated slip is prepared and passed through an ordinary transmitter. A facsimile of the perforated slip is produced by the Creed receiver at the distant station. This like the Murray slip can be used for retransmission or passed into the printer for translation. The message issues from the printer with the letters and other characters impressed in large type upon a tape.

A gumming board for the forms and a *decentreur* are placed near the Creed printer and the slip, gummed on its underside, is affixed to the forms.

Between 200 and 300 messages can be treated in an hour by expert gummers.

The importance of thus substituting a slip printed in capital Roman type for one with Morse characters is very evident, and a considerable saving of labour and time is obtained. Manual transcription has always been the severest handicap in the use of the Wheatstone system.

In addition to the circuits successfully using Creed for Press traffic, a number of ordinary commercial lines have been equipped with Creed apparatus, but the working thereon is not an unqualified success.

This result, however, is not the fault of the Creed, but due to failures on the part of the auxiliary apparatus.

It is well known that although "stick" punching has given way to perforating keyboards, it is not possible for the operators to maintain a check on their slips, and uncorrected mistakes are more frequent. The employment of typists with little or no telegraph experience is also responsible for the preparation of faulty slips, sometimes of course caused by undetected mechanical defects of the perforators. To these drawbacks there are additional disturbances introduced by the attempts to maintain maximum speed of working.

In my opinion a speed of 120 words per minute should represent the highest, and an average working of between 100-120 words per minute will much more satisfactorily fill such circuits.

These speeds, besides providing a good margin for relay adjustments (a vital feature), enable the transmitter to be more closely fed and one printer to keep up with the output. Speed increases always mean idle periods, or, what is worse, idle reversals from line, which multiply the work of the receiving perforator. A moderate rate assists in numberless ways in promoting efficient speedful treatment and certainly aids the early detection of faults.

For Wheatstone-Creed commercial work an additional circuit is always set apart for RQs—the bugbear of high-speed systems—but even then the treatment of corrections is frequently a matter of grave concern. Obviously, then, every factor that produces an RQ should be eliminated wherever possible. There is no doubt that a serial number facilitates search, and in its absence corrections would be expedited if with the RQ the time of running could be supplied, as most of the delay occurs in tracing the messages. How this arises it is easy to discover. A temporary stoppage or hindrance at any one point may cause a loss of sequence to a message perhaps to the extent of 50 or 100, and a lengthy search follows. Not infrequently the preamble of a message is imperfect, and the absence of these essential particulars retards the correction of this and other messages. It is consequently necessary to augment the RQ staff; even then the service compares unfavourably with the expeditive treatment of the direct multiplex operations.

THE BAUDOT SYSTEM.

This has proved in many respects the most successful of all the systems we have yet used. On inland lines, aerial and underground, it is always worked duplex, and the incidence of traffic is satisfied with the greatest ease by opening and closing the "arms" in either direction immediately they are required. The whole of the apparatus is proved during the early morning preliminaries and each part remains ready for instant use. An expansion from two to eight channels or a traffic capacity of from 100 to 400 or more messages per hour is therefore always available.

At present the early method of manipulation is in general use, and the operator sends by depressing the five keys according to the well-known code. The movement of these combinations is timed by the "cadence" furnishing a maximum rate of 30 words per minute per channel.

A record of the message is printed on a slip at the sending station and enables the signalling telegraphist to check its accuracy. Almost simultaneously the signals are printing the message on a gummed tape at the distant office. The receiving operator passes this slip over a roller revolving in a simple water pot. This arrangement provides a very clean and economical adhesive. There is an entire absence of delay in these operations, and it is undoubtedly its simple straightforward character that has placed the Baudot in the premier position.

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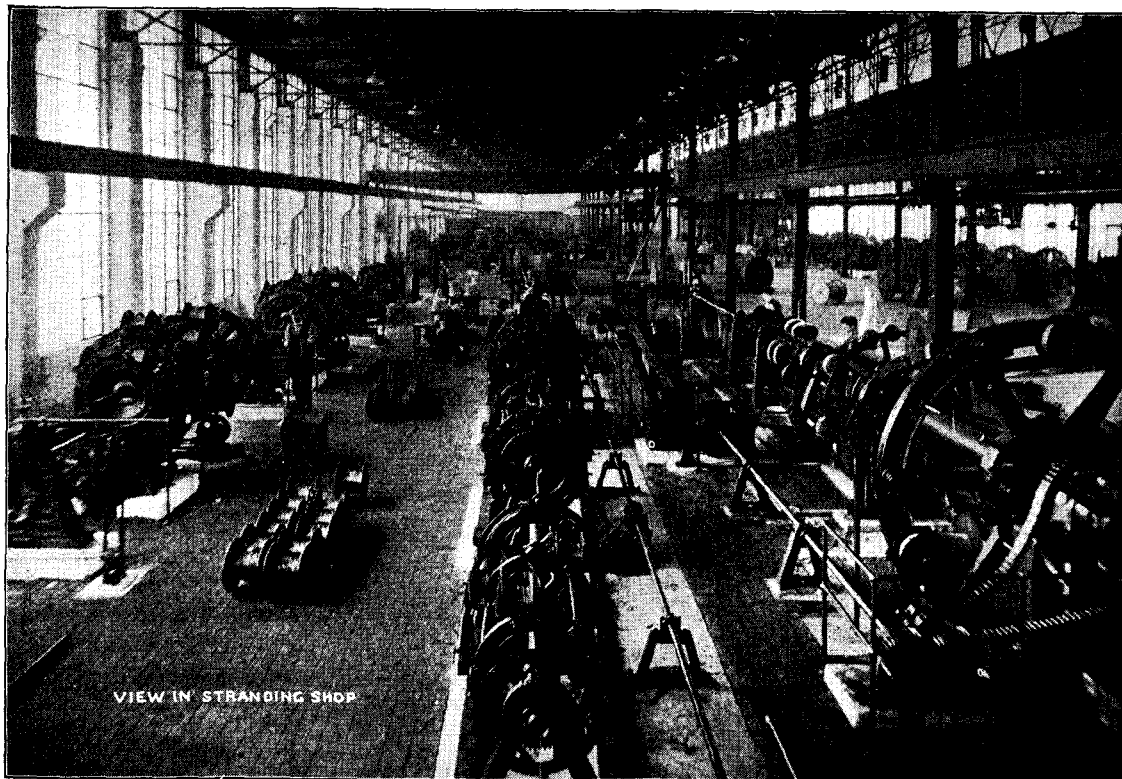
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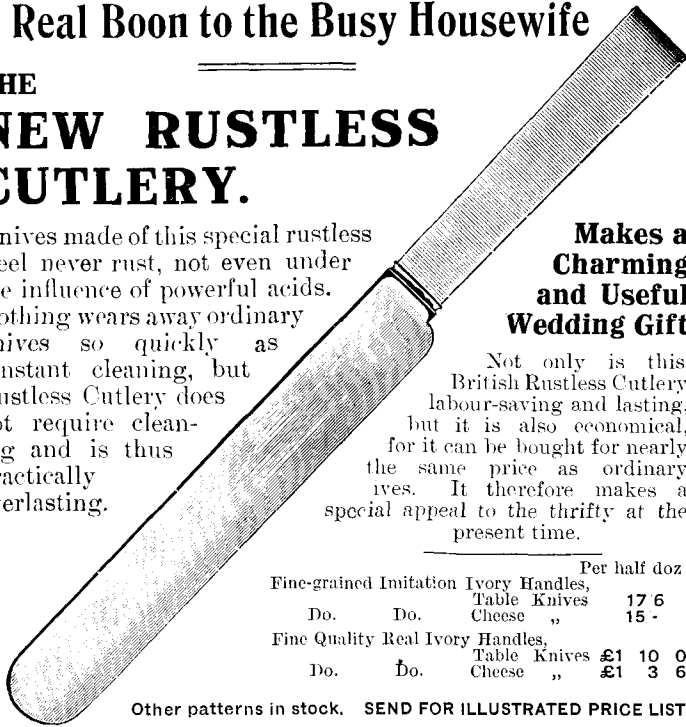
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for the division of line-time determined for that particular installation. We have for TS-BM two 32-segment sextuples, TS-BS a 27-segment quintuple and a number of 22-segment quadruplex serving London to Glasgow, Liverpool, and Brighton.

It was thought an advantage would be obtained by using two separate distributors at each station, one for sending and the other for reception, thus, in the event of a breakdown, one group of channels, in or out, would be maintained and the loss occasioned by the stoppage of a distributor reduced by half. Experience shows, however, that line and local synchronising difficulties are greatly increased—checks that exist with single distributors and facilitate detection of faults are absent, and the net result is a negative gain.

The Baudot distribution is singularly successful and, with competent handling, the sets run many days, sometimes weeks, with but one or two distributor stoppages of two or three minutes for speed adjustment.

For some time operators have been encouraged to work without their tape record, and a considerable economy is forthcoming if it be found prudent to remove this check altogether. In India none of their duplex circuits were fitted with the "home record," and, I believe, they still continue without them. Some risk is involved and one morning the Ceylon traffic manager showed me a mutilated message that had passed over the Madras-Colombo Baudot duplex. Examination disclosed the fact that a fault had existed in the keyboard which would have been detected and removed had the tape check been used. Its employment has no doubt contributed to the exemplary correctness of the system. Other and later methods have no such safeguard. If the Baudot comes into line with them it means a wonderfully cheap installation by nearly halving the first cost and maintenance.

The Baudot receiver (*tracteur*) is an exceedingly efficient piece of mechanism and of so robust a constitution that we have some in the galleries working as well now as when obtained nineteen years ago. Their cost for repairs is very small.

One of them has been working on a circuit for several months at about 42 or 43 words per minute and responds perfectly. This has revived the question of increasing the rate of distribution all round. As a rule, however, the present rate for the average operator represents the safe maximum, and recourse must be made to the keyboard and tape transmission if 40 words per minute are desired; but is it worth while? The peak load of traffic seldom lasts for more than two hours per day, and as now used the Baudot outsteps all rivals in regard to accuracy and freedom from RQs. A change of speed will reduce the working margin, increase cost and difficulty of maintenance. Experience with the indirect tape transmission shows that it is less free from delay and corrections.

There is also another feature of output to be considered—namely, that the receiving operator, besides gumming, checking and signing, has now to fill in the particulars of the message upon the attached counterfoil, and 60 or 70 messages per hour generally represents the maximum. If, therefore, the speed is raised by tape transmission and 80 to 100 messages per hour are signalled, additional staff will be required, and on a quadruplex this will be at least five instead of four receiving operators. Of course the handicap of gumming is removed on the page printer and the receiver's output correspondingly increased, but even then other duties occupy an appreciable time and when faulty printing occurs assistance must be given to avoid congestion and delay.

THE SIEMENS SYSTEM.

This is a high-speed tape printing system of the automatic group. Its apparatus corresponds to that of the Wheatstone-Creed in having keyboard perforators, a transmitter and a receiver. It differs from the Creed in using five-unit code and in the provision of synchronous distributors. The perforated slip is very wide—almost double that of the Murray multiplex, and in both the holes are punched in rows across the tape as was done by the Carpentier perforator in 1887. The fundamental requirement—that the moving brushes of the transmitter shall synchronise with those of the distant receiver—is accomplished by an ingenious automatic control of the motor speed.

The typewriter revolves generally at a speed producing 140-150 words per minute, and the impression is secured upon a tape by the printing magnet becoming energised by a rapid condenser discharge. The time of contact is remarkably brief and its adjustment is a matter requiring considerable care. A *dextrineur* is employed for the received tape as with the Creed. Some very good results have been achieved on the TS-LV Siemens, as many as 634 messages having been passed over it in one hour. The general experience is that it suffers from all the drawbacks of the automatic systems—namely, that the average delay to traffic tends to increase and RQs heap up. Moreover, the type impression compares unfavourably with the Creed and Baudot being often so indistinct that messages are referred back for this cause alone.

THE WESTERN ELECTRIC MULTIPLEX.

In this system we come to the latest development of what has been termed—not inaptly—"press the button telegraphy." Its general make-up is, Baudot distribution, the five-unit alphabet, keyboard perforators, transmitters with automatic control switches and page printers. The distributor motor is of the phonic wheel pattern controlled by an electrically driven tuning fork at a speed of about 240 revolutions per minute. This gives to the four transmitters a speed of 40 words per minute, and the typist, being cadence free, exceeds this rate and easily provides for a maximum supply of line signals.

Synchronism is obtained from the working signals and correction of

speed furnished by a rubber-tipped rod striking the vibrating fork at the slower station.

The perforator has three rows of keys arranged according to standard typewriter usage, and the change from letters to figures, &c., is made by shift keys. Special signals are provided to procure the other printers' movements of line, column, and page.

Following the Baudot precedent the printer is only actuated with "marking" signals, these being received from line and repeated by a Post Office standard relay. There is the special provision however of joining the arms alternately to + and - for "marking" which assists in maintaining synchronism when no operator is transmitting to line.

In front of each printer is a box containing the selecting relays which, acting through electro-magnets placed within the printer case, cause the revolving type-wheel to be stopped so as to ensure the printing of the required character. As soon as the typewriter is stopped the paper is thrust against its periphery by a blow from a printing magnet, and the paper is then moved along for the next character. The paper is supplied to the machine from a continuous roll and is torn off at a cutting edge provided for this purpose just above the window of the printer.

It has been mentioned that to obtain the different movements required for page printing it is necessary to transmit many extra signals over the line, and this has been a heavy burden. As a result of examination and careful tests, it was found that, for a time, these averaged 30 per cent. of the transmitted signals. One slip, taken at random, contained 21 messages, 10 RQs, 1 RD, 1 BQ, and 1 repeat, included 631 such extra signals. This waste has however been considerably reduced by devices introduced by one of our own mechanics, and when these are completely fitted nearly four-fifths of these signals will be saved.

The weak point is the use of a small typewriter and the impression sometimes leaves much to be desired. But here again attempts are being made to secure improvement and during the last few days the mechanic has been able to effect some advance in this direction.

The traffic output of the Western Electric is very high, and individual operator totals easily pass above anything we have yet tried. At present, however, the printers require a great amount of attention and restrict somewhat the general traffic capacity of a system capable of supreme achievements.

CONCLUSION.

Operators' averages are not always satisfactorily comparable. They must depend very largely upon the character of the messages dealt with; in some cases 25 messages are of greater difficulty and length than 50 ordinary telegrams.

The amount of traffic passing over the various installations mentioned ranges between 3,000 and 5,000 telegrams daily. The Western quadruplex during the week ending April 8, 1916, totalled 31,587. This very fine work was possible owing to the abnormal pressure of traffic consequent upon the storm breakdown of last March. Beginning at 11 a.m. on April 3, the daily totals were:

Monday	...	...	...	...	...	...	4,469
Tuesday	...	...	...	...	...	...	5,628
Wednesday	...	...	...	...	...	...	6,052
Thursday	...	...	...	...	...	...	5,480
Friday	...	...	...	...	...	...	5,565
Saturday	...	...	...	...	...	...	4,393

These and other equally good results with the multiplex systems are only obtainable with the cohesion and enthusiasm of team working. The success of the high-speed printing telegraphs, depends upon the hearty and skilled co-operation of the members employed on the system. Since the traffic carried is heavy, slight stoppages and hindrances are magnified and become more serious than upon the hand-worked Morse circuits.

It has been thought that the art of the skilled telegraphist is no longer a requisite, as the extensive adoption of systems in which the automatic element prevails destroys the need of him. Judgment and intelligence are however required to properly utilise these automatisms, and the former qualities which produced a good telegraphist are still indispensable.

It must not be overlooked that the raising of the speed per channel from 30 to 40 reduces the number of arms possible on certain lines, and that the Western working at 30 w.p.m. would give less output than the Baudot.

In contrasting the two keyboards—the Baudot five-key sender and the typewriter—it is found the former is very easily learned and the operators appear to work in ignorance of the cadence, much in the same way as we forget the ticking of a clock, unless it changes in rate or stops. Both keyboards are learned by the average operator in about 100 hours. When dealing with code and figure messages the Baudot keyboard and control check is preferred.

To show more strikingly the advantages of multiplex over automatic systems when the traffic is continuously heavy, the following brief facts are adduced:—

Multiplex.—Provides steady even flow of the work which aids the circulation and transmission elsewhere.

Automatic.—At times there is unavoidable congestion and consequent dislocation and delay at the other points served.

Multiplex.—A breakdown of the receiving apparatus only stops a fraction of the traffic in that direction.

Automatic.—A breakdown of the receiver intercepts all inward work.



S. SIMPSON. MISSES MORRISON, ROACH (Assistant Supervisor), HIRST, DYSON (Assistant Supervisor), C. DYSON and PEARSON.

GROUP OF TELEPHONISTS AND MEMBER OF ENGINEERING STAFF ON DUTY AT AN EXCHANGE DURING AN EXPLOSION AT A MUNITIONS FACTORY IN THE TOWN. (See October issue, page 9.)

Typewheel v. Typebar.—The greater frequency of certain letters causes them to wear. Replacement cheaply and easily done on typebar but generally means the expense of a new wheel in the other method. There are also greater difficulties in the way of obtaining a good impression with the typewheel than with the typebar, especially in page printing.

Tape printing possesses several advantages. It can be secured with simpler, stronger mechanism; fewer line signals; and corrections do not appear. Whereas, with direct printing on the forms, the pencilled alterations cast doubt upon the rest of a message, besides spoiling its appearance.

Morse of five-unit code?—There are two good reasons for the adoption of the latter in high speed systems:

- (1) Certain experiments show that twice the speed is obtainable over the lines.
- (2) The translating or printing apparatus is simpler, cheaper and more durable.

As regards future developments, an advantage of the multiplex over the automatic is that the former can easily be broken up to provide inter-connexion between three, four or five centres. It seems most probable, however, that the best arrangement will be to establish zone centres fitted with Murray, Baudot or Western for the connecting trunk lines and fed by machines of smaller capacity serving the local area. Traffic from these could be dovetailed with the main lines by means of re-perforated tapes which would save labour and delay at the zone centres.

If the tariff could be revised and distance charges arranged, instead of the present high universal rate, the much-abused telegraphs would become more than self-supporting.

My thanks are due to Messrs. Murray, Creed and the Institution of Post Office Electrical Engineers for the loan of slides and photographs which have illustrated the paper.

An interesting discussion followed Mr. Pendry's paper, but owing to the late hour it was necessary to bring it to a conclusion before the founts of oratory were exhausted. Mr. Dalzell, Mr. Lewis, Mr. Kennedy, Mr. Steed and Mr. Dunford expressed their views. Mr. Dalzell thought that more spare parts should be provided so that faulty apparatus could be repaired and brought into use with the minimum of lost time and that the main aim for the future was to standardise, so that a perforated tape could be used for transmission purposes on any transmitting instrument. Mr. Lewis explained that the difficulty as regards spare parts was due to the fact that they were generally used to make up additional working sets. Mr. Kennedy expressed the hope that a scientific tariff would be adopted for telegraphs on the distance basis. Mr. Steed is apparently in favour of drastic measures at the C.T.O. He suggested amongst other things that the official automatic exchange should be converted into a telegraph exchange for London and that the intercommunication switch in the telegraph gallery should be used for all circuits to places within 50 miles of London. Mr. Dunford pointed out that at present the Baudot was not adapted for use with typewriter perforators, and that at the present time, when so much unskilled labour was being employed in the C.T.O., that fact militated against its use. He wished to emphasise the fact that with typewriter perforators it was possible to dispose of much traffic which otherwise could only be dealt with by skilled telegraphists.

Unfortunately Mr. Newlands, Mr. Murray and Mr. Lee among others were unable owing to the lateness of the hour to contribute their views to the meeting.

PERSONALIA.

NEWS OF THE STAFF.

LONDON TRAFFIC STAFF.

Marriages—

Miss RUBY E. COX, Assistant Supervisor, Class II, of the London Wall Exchange, has resigned in view of her approaching marriage. She was presented with a case of fish-servers and knives and forks, and with a rose-bowl and cruet.

Miss F. B. RUFFY, of Victoria Exchange, has resigned to be married, and has been presented with a case of fish knives and forks and other useful presents.

Miss EMMELINE DYALL, of Mayfair Exchange, who has resigned on account of marriage, was presented by her colleagues with a silver cake basket, fish knives and forks, and other gifts.

Miss B. R. BETTESWORTH has resigned in view of her approaching marriage, and was the recipient of several useful gifts (including a tea service) from her colleagues at Dalston Exchange.

Miss E. MARSHALL, of Paddington Exchange, on resigning to be married, was presented with a tea service, clock and many other useful gifts.

Miss D. CATT, of Kensington Exchange, resigned in August, and was presented with a silver cake basket and several other useful gifts.

Miss FAIRBAIRN, a telephonist at the Woolwich Arsenal, has resigned in view of her approaching marriage, and was presented by the staff with a breakfast service. Her old colleagues at the London Wall Exchange presented her with a silver cake basket.

Miss G. CLIFFORD, of Regent Exchange, who has resigned in view of her marriage, was presented by her colleagues with a case of silver spoons and sugar tongs, a silver vase and other useful gifts.

Transfers—

Mr. P. J. MANTLE, Exchange Manager, of London Wall Exchange, was presented with a canteen of cutlery by the staff, on the occasion of his transfer to the London Trunk Exchange in place of Mr. W. J. White.

Miss KEMPE, Assistant Supervisor, Class II, has been transferred from Western Exchange to Mayfair.

Miss B. A. HULBERT, of Hop Exchange, has been transferred to the Trunk Exchange.

Miss R. M. DRISPAIN, of the Hop Exchange, has been transferred to Trunks.

Miss M. A. D. CONNELL, of the Hop Exchange, has been transferred to Woolwich Arsenal.

Miss C. E. PEATLING, of Hop Exchange, has been transferred to the Money Order Department.

Miss R. DE NICOLAS has been transferred from Regent to North Exchange.

Miss D. MASLIN has been transferred from Regent to Hop Exchange.

OBITUARY.

We regret to announce the death of Miss MAGGS which took place on Oct. 31. She was a Telephonist on the staff of the Western Exchange until the 23rd ultimo, and the sad news of her death was received with great sorrow by all her colleagues.

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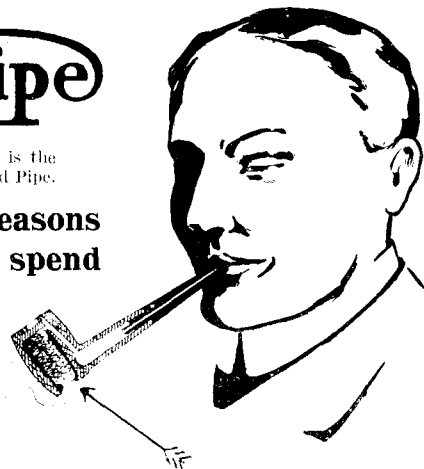
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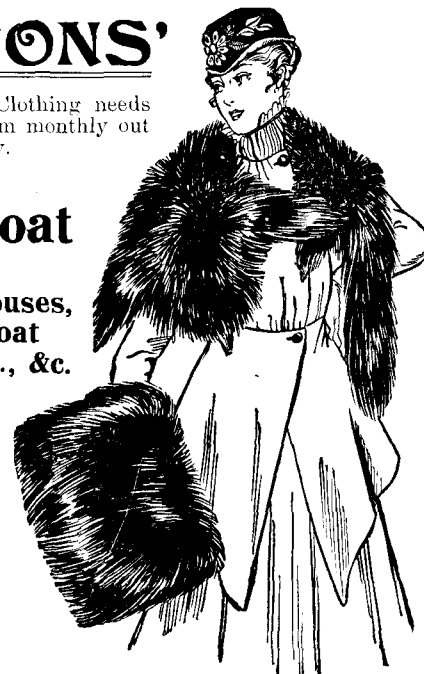
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THE Telegraph and Telephone Journal.

VOL. III.

JANUARY, 1917.

No. 28.

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THE NEW POSTMASTER-GENERAL: THE RIGHT HON. ALBERT H. ILLINGWORTH.



(Illustration kindly lent by the Yorkshire Observer.)

A MESSAGE FROM THE POSTMASTER-GENERAL.

As yet I have little knowledge from within of the Telegraph and Telephone Services; but I know how important is their work and how well done in spite of inevitable difficulties.

I am sure "The Telegraph and Telephone Journal" is most useful, as well as interesting, to all members of these Services and I wish it every success.

Dec. 20, 1916.

ALBERT H. ILLINGWORTH.

SOME APPREHENSIONS AND A MORAL.—III.

BY JOHN LEE.

THE theologians always condemn schism, but not usually on the best grounds. They keep their eyes upon the fact of separation; they do not quite appreciate the loss to the main body of those who separate themselves. For it happens in most cases that those who separate are sturdy thinkers who find that their process of thought is out of parallel with the process of thought of the main body. While minorities must suffer it is still the case that to minorities is often given the privilege of affecting the main body, and this privilege they surrender by separation. One of the advantages of the much-abused party system lies in the fact that it preserves some systematised influence for the considerable minority, though for smaller minorities it is probably less effective than the group system. In our own realm we often see men tempted, on this or that ground, to leave their main representative body, and it is commonly the case that those men, if they remained, would exercise a strong influence upon that body. At any rate to whatever extent separation enters to that extent representation is impaired.

I should be inclined to think that those persons are wrong who say that "there is too much democracy nowadays," and on the contrary I should be inclined to urge that there is too little. It is quite possible that there is good reason to suppose that organisms which set out to express the opinions of large bodies of men and women do not always express those opinions, but that is not because the articulation itself is not justly representative but because those whose views run counter to the views expressed are either separated from the articulate section or are merely quiescently attached. It may be true that the trade society of curates is too wildly socialistic, but I would not on that account assign the responsibility to those earnest men who guide the society so much as to the other men who refrain from having anything to do with the society and quiescently permit it to represent the class as a whole. There is nothing easier than to permit other people to direct policies and then to criticise them for the policies which they establish, and for the theories which may be presumed to lie behind those policies. It is rather akin to the American theory of ten years ago which presumed that there was something short of the respectable in political machinery, that democratic impulse always meant assaults by certain classes on certain other classes, that the representation of great masses of the population meant the vociferation of the demagogue.

Against these tendencies, I think, the time is ripe to make a protest. There is no reason why the representative process should not be constructive, but it is not likely to be constructive if it meets the disdain of those who think that there should not be representation at all. It is not likely to feel its responsibility if the only duty assigned to it is the duty of assault. It is not likely to look at the rights and the needs of all men if from the outset it is regarded only as obtaining the rights and as satisfying the needs of certain classes and at the point of the sword. There is surely a scope for industrial as distinguished from political democracy. The whole story of English democracy from the times of the French Revolution represents a process which, with surprising modesty of claim, aimed at such a gradual modification of conditions as brought it under the heading rather of constructive than of destructive criticism. Industrial democracy is only beginning. We are seeing it, so to speak, on the horizon. It might be possible to learn from the past, from the errors and follies of the handling of political democracy; to go and meet it more than half-way; to regard it as an inevitable stage in social evolution with which it is wiser to co-operate than to do battle. In short it might be wiser to look for fellowship which only can be fellowship worth the name if it excludes, by its direct will, no single soul from the scope of its co-operative ideal.

Quite naturally I am met with the criticism that I am blind to the faults of the democratic process. To that I do not reply, but if I did reply it would be to hint that the faults may be ascrib-

able to a partial democracy which does not base itself on a sufficiently wide basis and also to a somewhat shortsighted method of resisting the claims of this partial democracy by detaching from the main body those whom it ought to represent. I imagine that these somewhat vague reflections are applicable to our own sphere. At least it is in some direction as this that I would look for an explanation of some of the present difficulties and for a solution of those future difficulties which give rise, not unreasonably, to apprehensions. I look for strength in representation not in the form of strong vociferation or of bitter vocabulary, but in the all-inclusiveness of that representation.

CONTROL BY STATISTICS.

BY E. HARE.

A FEW months ago Mr. Lloyd George, speaking in the House of Commons and referring to the absence from Woolwich Arsenal of its chief, Sir Frederick Donaldson, said "The engineer of the North-Eastern Railway Company was placed at our disposal, and he is in temporary control and the services which he has rendered have been conspicuous. . . . One of the things he initiated was a statistical record of the output. That is having, and will continue to have, a potent effect not only upon the output but upon the cost of the output. As an illustration of the use to which such figures can be put, I will mention that where the output of a certain shop or section of a shop is noted, on the following morning it is possible for the superintendent or the works manager immediately to put his finger upon the fact that perhaps the flow of raw material fails, or that owing to the congestion of the Arsenal railways the output cannot be got rid of, and the cause of the inefficiency of the machinery can be checked. Such hitches in the daily work of a factory can only be avoided and minimised by a most complete system of statistical control, and that has been instituted at Woolwich."

These remarks, in my view, bristle with noteworthy points which concretely epitomise the value of statistics as an accessory to—not, of course, in substitution of—personal supervision and control; and a very important accessory too, for, by it, the foreman or whoever the officer in control may be, is able to concentrate more attention on quality, leaving quantity to the automatic precision of tabulated results.

Now Woolwich Arsenal is not in an ordinary or in a narrow sense a business and profit-making institution; but at this extraordinary epoch, time—or man-hours—has become an overwhelming factor, and as in all work of practical utility time cannot be separated from money, this engineer-manager, fresh from a concern which combines a public utility with the financial interests of a private and limited proprietorship, is naturally prompted to inaugurate methods which have no doubt successfully achieved a dual object—time-saving and money-saving—elsewhere; the far-reaching effects of the innovation being, probably, beyond computation. The resultant sequence being, that in securing the primary object—the output of iron and steel and furnace—there is not an undue melting of gold and silver coin of the realm.

The bearing that an adequate or inadequate output has upon cost—i.e., whether the medium is working to its full capacity or not—is too obvious to need demonstration; the real problem lies first in discovering the standard of adequacy and in conforming to it when discovered. Mr. Lloyd George tells us, in effect, that the means employed at Woolwich for securing a satisfactory output at an appropriate cost and for avoiding and minimising hitches in the daily work, is a complete system of statistical control; and, further, he mentions specifically two essential factors in the scheme, viz., that note is made of each shop or section of a shop, and that the information is available on the following morning. These two points might almost be regarded as a summing-up of the mission of and the reason for statistics in their modern and scientific application to the needs of business and manufacture. Statistics are tools in the hands of good management for keeping a living organisation in a sound and orderly state, not for digging

up the dry bones of departed errors and shortcomings—to be re-interred after a fruitless investigation based upon faulty memories or hypothetical surmise. And it is this futile and unpractical handling that has laid the very word "statistics" under a ban of suspicion and distrust, as representing a means in ingenious hands of twisting and distorting plain facts into fanciful shapes which otherwise they would never honestly assume. Statistics need only to be used once for the purposes of concealment or to create false and exaggerated impressions—easily accomplished by an unfair or misleading unit—and the mischief is done: confidence in them has rightly or wrongly vanished for evermore.

I have read somewhere that the old French police were quick at detection but faulty in prevention, and the same may be said of that old style of belated statistics which tell us, for example, that the proportion of paupers to population, last year, was only so much or so little, at which gratifying intelligence we beam with satisfaction and hope for a diminution in the poor rate. Whether the paupers themselves are equally gratified in having such notice taken of them, and to what use the figures are put to effect an improvement *this* year is another story.

Dickens, in his quaint philosophy, gives us an amusing illustration in *Hard Times* of an incomplete and inconclusive mode of posing statistics. A schoolmaster puts this problem: "This schoolroom is an immense town, and in it there are a million of inhabitants, and only five and twenty are starved to death in the course of a year, what is your remark on that proportion?" And the remark of the hopeful pupil to whom the problem was propounded was that "it was just as hard upon those who were starved, whether the others were a million, or a million million."

The pith of the anecdote lies, of course, in the stupidity of the schoolmaster and in its context with the story; but the answer, ludicrous though it appears, was as accurate as any other, because, as no inhabitant had any business to die of starvation the question of proportion was senseless. This fictional incident is only germane as typifying the ridiculous uses to which statistics have in bygone times been put and have consequently acquired a bad name.

To revert to Woolwich Arsenal, we are told that a system of statistical control has been introduced, that one shop or machine is pitted against another and that the information is available next morning; but the sequel is not unfolded. That is to say, in what manner are the results made known to those concerned and what steps are taken in the light of the knowledge obtained to secure the desired improvement? We may be sure in any case that the records whether in figures or diagrams are not merely scrutinised and pigeon-holed, but in some form are made known timely to those whom they may concern, for practical purposes.

How this is to be done is always a difficult and sometimes a delicate problem; for in dealing with quantity of output we always come in the end to the personal element. All things being equal in the efficiency of the machinery, it follows that variations in results must be attributable either to those who actually work the machine or to differing views as to what the machine is capable of producing or should be expected to produce.

Without comparative figures, without knowing what is being accomplished elsewhere, any honest worker may be satisfied that his output or the output of his machine is the utmost that it can accomplish; and I use the word "machine" generally, as meaning every medium of labour: spades, hammers, screwdrivers, typewriters, pens, ledgers, switchboards and, even, brains.

From childhood upward no one likes to be, and everyone resents being, driven and except to the bully, goad-wielding is always distasteful; but, without data, and with nothing more than an uneasy feeling that there are loose screws somewhere, how is it possible to keep the business instrument tuned up otherwise than by perpetual urging and worrying? Or, to employ a common metaphor, by endeavouring to make a horse drink by coercion? A process which usually engenders little else than sullen obstinacy on the one side and helpless exasperation on the other.

But whereas sheer driving force usually fails where human activity is in question, there remain other means of instilling and maintaining an atmosphere of zeal and energy, and in the absence of payment by results, or conversely, the abolition of equal pay for

unequal work, there is perhaps none better than the encouragement of a spirit of emulation and competition—these being easily recognised as two of the most potent factors in influencing the ways of men and women in the walk of life which they have chosen or which has been thrust upon them. Mere statements by word of mouth do not however always convey conviction, no matter how frequently they be reiterated, and an oft-told tale will not allay scepticism; but a photograph cannot lie, and statistics may be regarded as the photograph of what we actually did yesterday, and not what we thought we did or what our masters were expected or were hoped to believe we did. It is therefore futile merely to say to a man: "This is what so-and-so did and what you did yesterday," because his reply will be "Yes, but what did he do the day before and what is he doing to-day?" A sustained record is the only reliable indication of efficient work; gusts and spasms of industry being the prerogatives of those who are answerable only to themselves for the quantity and quality of their output and the making or marring of their fortunes. Positive proof of the accomplishment of this or that section or machine or individual is only forthcoming when an accumulative day to day or month to month record in a simple and graphic form has been kept, clearly showing the actual production per unit. And the cost of such records is amply repaid if put to practical use by making them known to all concerned.

As an illustration of how this may be done I will cite two examples from my own knowledge and experience of the methods adopted by a certain undertaking, which although it is dead and buried, I will not name. Two unsatisfactory items figured in their accounts; one was the heavy total of outstanding debts and the other was the ever-increasing value of tools in use and in stock. Whether, in the aggregate, the figures were disproportionate to the magnitude and growth of the whole business it was difficult to discover, but as the whole business was split up into sections a means of judging was available. Monthly tables of comparison were instituted showing the percentage of outstandings to the total revenue in each section, ranged in order of merit; and needless to say the variations were astonishing—not only in themselves but to those sectional managers whose preconceived notions of a satisfactory position in this respect were proved to be unsound. Not that they could be deemed to have been consciously lax, but that hitherto they had not been supplied with any standard or data by which the situation might have been corrected. Anyhow, they forthwith proceeded to share their astonishment with the *clientele*, for the following edition of the list evidenced an unmistakable application of the debt-collecting screw.

The same method was adopted in regard to stocks of tools; although, of course, remedial measures could not be so easily nor so readily applied, for considerations of area and the extent of work in hand had to be reckoned with. Nevertheless, though no doubt, the scrap heap was appreciably augmented in the process, there soon resulted a steady reduction in this floating balance with a contemporaneous diminution in the tools bill.

So far as my knowledge went and recollection serves, no resentment by those upon whom responsibility rested was manifested or felt at the publication of these figures. Instinctively it was, no doubt, recognised that the management—for statistics of this nature are purely a matter of management—had likewise their responsibilities to those who had advanced money for the development of the business, and were not only justified in taking such action as in their wisdom they thought would put right what they knew to be faulty, but in fairness and honesty were bound to do so. While, on the other hand, the management were animated by no desire to pillory the apparent delinquents, but merely to arrive at and set up a standard for all to see, and which they hoped would invite emulation, and they were neither mistaken nor disappointed.

In effect, the management reasoned thus: Hitherto we have mysteriously and jealously guarded information afforded by multitudinous returns compiled with much labour and at considerable expense; elaborated it, commented upon it and tucked it away in drawers and pigeon-holes. Let us henceforth change this secretive system; boldly take our managers and engineers

into our confidence: let one section know what the other is doing; invite competition and co-operation, and who knows but that haply we may achieve something: that we may have, in fact, alighted on the solution of a problem that has been staring us in the face for years.

And the experiment succeeded so well that tables of comparison became a settled institution, and the management in general and its statistical branch in particular, preened themselves on their happy discovery.

TELEGRAPHIC MEMORABILIA.

ONE hears and reads so much of what our sister Service, the Telephones, has done in the direction of war work during these two and half a years that it is only an overwhelming sense of the duty of secrecy that keeps many a telegraph tongue silent and many a telegraph pen still. One admires the courage of the telephone operators who brave the dangers of the streets during Zeppelin raids in order to reach their duty-posts and their coolness in passing calls with the boom of exploding bombs in their tense ears. Telegraphists also have had their hours of excitement and strain, and could tell of a thousand secrets, little and big, which at times struggle hard to escape. Heroism this of a quieter and self-suppressive kind! It was *mere man* who said that "no woman could keep a secret," but if ever this myth were exploded, surely during this war time the telegraph offices of the United Kingdom have been witnesses to the final shattering. Take, for example, the C.T.O. where not less than 1,200 men have been withdrawn for Military Service, their places being filled by operators &c. of the opposite sex. No one claims that the work has been dealt with without difficulty; no one claims that there have not been hitches during the change over: it would indeed be no disgrace if it were even admitted that the former standard of excellence has in many cases not been reached, but that excellent work has been done by the combination of the residue of the male staff and the permanent and temporary female staffs cannot be contested.

This result could not have been obtained without much thoughtful organisation involving the devolution of certain duties previously considered impossible to the female force, and let it not be forgotten, nor without the co-operation of that portion of the male staff still left behind to keep the home fires burning! Men too who had previously been considered "too senior" to acquire a knowledge of new apparatus have come up well to the front and are even now plugging away at typewriter keyboards, strenuously endeavouring to disappoint the Jeremiahs of failure.

Something more precise than rumour declares that there is likely to be an extension of Baudot working from the C.T.O. early in the present year, Cardiff, Hull, Newcastle-on-Tyne and Southampton being mentioned as the next offices to be introduced to this type of printing telegraphs. It is even hinted that twice this number of sets have been ordered in addition to the four just mentioned, in which case the tribute to the Baudot system is nothing less than remarkable. The comparatively small maintenance cost of this apparatus added to the facilities afforded by an easily handled multiple channelled system for speedily dealing with inquiries and corrections have doubtless weighed very heavily in the decision to still further extend Baudot working. In a system where each pair of "arms" is able to liquidate its R'Qs independently of a special RQ wire and without hampering the remaining traffic channels, the delay not infrequently accruing to telegrams waiting correction is reduced to minutes instead of mounting up to hours. But the most remarkable feature of the whole business is that these developments are taking place in war time.

The front page of the TELEGRAPH AND TELEPHONE JOURNAL has doubtless caught the eye of every telegraph reader interested in the Creed system, who must have read with more than ordinary interest the strong combination of talent which is to devote itself particularly to machine and other telegraphy. The purchase by Creed & Co. Ltd. of the patents of the Indo-European Telegraph Company and the Galletti Wireless Telegraph Company, joined

to the apparently exclusive services of Mr. H. H. Harrison as Technical Chief of Staff, and doubtless the active interest of Mr. Stratford-Andrews, Managing Director of the Indo-European Telegraph Company, should certainly prove a strong telegraph combine. It is certain that one would have to search far and wide for a stronger group of more practical telegraph inventors and collaborators than the above-mentioned names represent, to which should be added the name of Mr. Donald Murray, whose business and patents have also been acquired by the same group.

Curious causes of the stoppage of telegraph circuits come to light from time to time, some of a very simple type and others revealing something of the unique conditions obtaining in connexion with telegraphy. To the latter category belongs an interesting item in connexion with the London—Rome Baudot circuit which passes into Italy *via* Mont Cenis and the famous tunnel. Asked as to the cause of an interruption, the information was supplied that the line was temporarily affected by the Mont Cenis high-voltage traction circuit but would be restored very shortly. Imagination carries one's eye along that thousand odd miles of wire from the capital of the British Empire to the white coasts of our shores, then its dive under mine-strewn seas, its reappearance on the other side of the Manche, out on to the French roads, through Paris, Lyons and up into and through the rocky barriers of Italy down into the valley of the Tiber and the pontifical and sacred city itself.

Now and again our Parisian allies give vent to their feelings over the international lines regarding certain successes achieved by one or other of the allied combatants. None was more sincere or more spontaneous than the exhilarating burst which followed the announcement of yet another two Zeppelins brought down by British airmen and guns. Tripping across the cable with the lilt of a more familiar song came the words:—

"Encore un Zep' lin d'casse
Voilà l'aéro qui passe
Encore deux Zep' lins d'cassés
Voilà l'aéro passé."

The structural modifications of certain portions of the C.T.O. since the war, on account of Censor and kindred demands, have scarcely added to the interior beauty of the building, although they have afforded sufficient opportunity for the local humorists who soon christened the temporary erections. "The White City" and the "Cinema" were quickly recognised and the latest addition has already received the more stately name of "My Lady's Chapel." One glance at the pseudo-Gothic windows gives the clue.

Some justifiable stir has lately been made regarding the out-of-date lists of technical books which have been supplied for the benefit of telegraphy and other electrical students by certain organisations who should surely have known better, and *Electricity* has made a special feature of attempting to remedy this very gross defect. It is hoped that after the war our system of technical education will be thoroughly overhauled so that at least the eager student should not be discouraged by waste of time in studying obsolete literature and waste of money in buying it.

J. J. T.

ENTERTAINMENT TO WOUNDED SOLDIERS, LEEDS.

On Oct. 7, 1916, the clerical staff of the district manager's office, Leeds, for the second time entertained a number of wounded soldiers at St. Wilfrid's Hall, Harehills. Although invitations were issued to 100 soldiers, only 70 were able to come, but these soon made themselves at home among the many hostesses, and settled down to a few hours' enjoyment. Games and competitions for which prizes were awarded passed the afternoon away. The hat trimming, cigarette lighting, and the balloon races (in which the ladies also took part) were the most popular competitions, as those whose wounds prevented them from taking active part in the proceedings testified to by their hearty laughter.

The guests did ample justice to the good things provided by their hostesses. Tea being over, the programme chiefly consisted of songs, recitations, a solo dance and choruses which the soldiers, when they were not talking, smoking or eating, joined in appreciatively. An unexpected turn was given by Corporal Jones, who as a whistler and elocutionist was highly appreciated. The old-fashioned game of musical chairs, followed by singing "Auld Lang Syne" concluded the party and after giving three good hearty cheers the wounded soldiers departed, some with parcels of cakes and other things for their more unfortunate comrades who had to remain in hospital.

RED CROSS BUREAU: A SUGGESTION.

RECENTLY an inquiry was addressed to me from another district for particulars concerning an officer of theirs who had joined the Colours but had fallen out of the ranks and was in hospital here in this town. As there must be many such cases in the country I suggest that every district should form its own "Bureau of Inquiry," such as already exist outside the Department, which should deal with matters of this kind. Arrangements could be made through its agency to pay friendly visits where possible to sick and wounded soldiers of any district, and information as regards injury or sickness would be obtained which would be much appreciated by wives and relatives who in my experience often find it most difficult to obtain definite news of this kind. Through its kind offices each district would be in a position to keep in touch with its own staff, and I feel sure that such attention would be welcomed by the men themselves. Intimation of the arrival of a sick or wounded soldier would be conveyed as early as possible to the bureau of the district in which the hospital was.

In this district, shortly after the outbreak of war, the clerical staff on their own initiative instituted a local Red Cross Fund which has already been of considerable service. Christmas presents have been sent to our own staff serving with the Colours, small gifts have been made to those in hospital, and the Fund has been the means of making good a small deficit balance in connexion with a recent tea and entertainment given by the district office staff to about 120 wounded soldiers (a similar entertainment had previously been given by the operating staff). Our balance in hand, some £14 or so, has been built up of very small weekly contributions of 1*d.* or so. Such a contribution would I think not require to be exceeded by any district. The primary objects of the fund are to enable these friendly staff visits to be paid, where necessary to defray the cost of a visit to hospital of a soldier's relation from a more distant town, and to give such small presents as funds would permit.

Bristol.

B.

LONDON TELEPHONE SERVICE NOTES.

THE appeal for the Christmas parcel fund met with an excellent response and over £150 was contributed. This allowed of a "satisfying" parcel being sent off to each of our men or women who are overseas and a greeting to those who remain within our shores. It is certain that we wish them all a safe Christmastide and our earnest hope is that events shall be so shaped that we may before another year is gone greet them on their return to the more even if less exciting round of duties to be performed in the L.T.S.

It is a great pleasure to record that honour has been bestowed on one of our most popular absentees, Frank Gray, of the Service Section of the Traffic Branch. A knowledge of his qualities in the office prepared those who worked with him here for the record of golden opinions which has been expressed by all who have come in contact with him since the beginning of his military life. Every "Civil Servant," that is, every member of the 15th County of London Regiment, can and will tell you of Sergeant Gray and his exploits, and the recital is always one to engender pride in the fact that one can claim friendship with such a soldier. Here's to Sergeant Gray—may he be spared to grow the grayest of us all and gain further honours to bear company with his Military Medal.

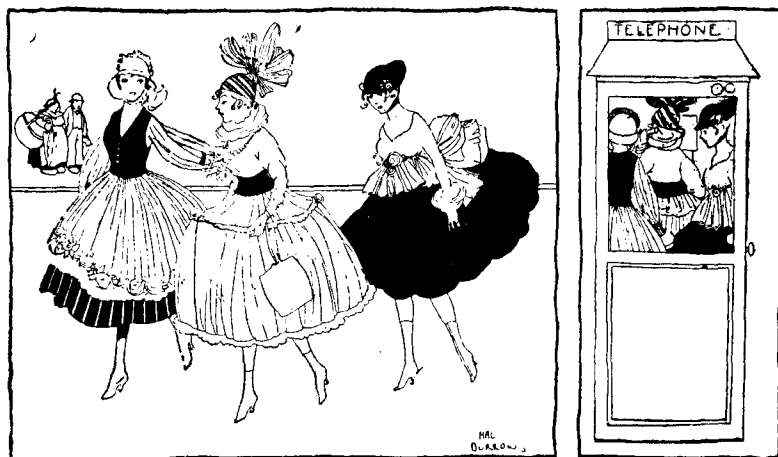
The foregoing note reminds us that another bearer of a similar honour in the same regiment, Corporal Rapps (of the Installation Section, Accounts Branch) was recently paying a visit to the office. He was wounded in the face but we are glad to say that he is now practically recovered. We trust he also will long be spared to display the Military Medal so gallantly earned.

It is not only abroad, however, that dangers are to be met in the military profession. We little thought when making a brief reference last month to the P.O. Engineers' Volunteer Training

Corps that we were within a few weeks of a tragic termination to the association between some of its members and the corps, yet that is the sad story which has now to be recorded. On Sunday, Dec. 3, while a party of the P.O.E.V.T.C. were on their way to carry out some signalling operations, the wagon in which they were travelling overturned accidentally and two of them, William Lynn and James Dew, were killed, whilst a number were injured, two seriously. The men who were killed belonged to the L.P.S. and P.O. Stores respectively and we offer our most sincere sympathy to the relatives and the comrades of these two men, who were doing all in their power—no doubt at considerable personal sacrifice—to fit themselves for effective military service. If there is one thing more than another which inspires a regiment it is its traditions and its tale of heroes, and it is not often given to a Volunteer Regiment to have such a record of sacrifice so early in its history. We sincerely trust the highest military authorities will see their way to recognise the services of these men by securing to their dependents some measure of financial support. We know that if they do not so do it will not be because of any failure on the part of the corps officers.

The November meeting of the Telephone and Telegraph Society was occupied with a discussion on technical training, following an address by Sir William Slingo. It was certainly a great pleasure to listen to a lecture every word of which could be heard without effort, but those of us who do not entirely enjoy examinations felt perhaps just a little glad that we were not engineers. But let us not rejoice too soon, epidemics have a habit of spreading.

At the December meeting of the Telephonists' Society two debates were submitted. In one, Miss West and Mr. Townsend discussed the merits and demerits of a centralised Inquiry Bureau, while in the other Mr. C. G. Jones and Mr. Dive presented the case for the staffing of the London phonogram room by telegraphists and telephonists respectively. It was unfortunate that considerations of time did not permit all those who wished to take part in the debate, and it is no less than a misfortune to the Telephonists' Society that Mr. Newlands was amongst those thus deprived of an opportunity of contributing to the discussion. Wherever the ultimate decision may lie it is a fact that a keen supporter of the telephonists' case having occasion shortly after to ring up the C.T.O. in order to dictate a telegram, was answered by a lady whose manner and method of receiving the message can only be described as perfect. Venturing on a complimentary comment a guess was hazarded that the lady was a telephonist, but the suggestion was disclaimed with a vehemence that left the dictator nonplussed at the moment, although on reflection he pleads that the merits of the performance warranted the assumption. Still it shows the danger of assumptions.



How is it that these girls who take up so much room in the street can stuff themselves into a telephone call box of this size?—Puck.

CORRESPONDENCE.

PHONOGRAMS AND TELEPHONE-TELEGRAMS: TIME VALUES AND LOADS.

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

IT is generally agreed that phonogram traffic is growing rapidly, and there is every reason to believe that this growth will be accelerated in the near future. The writer, however, has scanned the columns of the JOURNAL for some time past without finding any useful data on the above phase of the subject. Some particulars recently obtained are therefore given below in the hope that those who may possess similar information will share it with their colleagues through the medium of the JOURNAL. A long-felt want would, I feel sure, be met in this way.

As time did not permit of a comprehensive investigation, a short inquiry only was made. It is thought, however, that the results may interest those who desire to see phonogram rooms staffed on the same systematic basis as exchanges.

I found that although the phonogram telephonists were nearly all very young, the majority having had only about twelve months' experience, they were all able to take full loads in a highly satisfactory manner.

The average number of words per message was 20, and the average time taken to dispose of each message was 2 minutes 10 seconds. These averages include extremes of a 13-word message completed in 45 seconds, and a 54-word message completed in 5 minutes 7 seconds. The figures include the preparation of tickets No. 130 for originated phograms and the repetition (without analogy) of all messages. Messages originated locally were fewer than those received from other offices.

One telephonist has been known to dispose of 30 messages in an hour, but this was, of course, exceptional. As many as 23 messages (of an average length of 20 words) per telephonist per hour were recorded, and 22 messages per hour is considered to be a fair average load which might even be exceeded somewhat in an emergency. This load allows for 12 minutes unavoidable waste time per telephonist per hour.

In a few cases phonogram telephonists had to re-write messages on "C" forms owing to "B" forms having been used in the instrument room in the first instance. Such errors cannot always be avoided, but as they represent only about 2 per cent. of the total messages they can no doubt be neglected when fixing loads.

It took 2½ hours to sort and check 483 messages and to despatch confirmatory copies, where necessary.

The ratio of day to busy hour was approximately the same as that of ordinary telephone traffic.

Phonogram staffing problems are often complicated by a factor which telephone exchanges are happily almost free from, i.e., the inconstancy of the busy hour. One day it is 11 a.m. to 12 a.m., the next it is 6 p.m. to 7 p.m. and so on. Further difficulty is introduced by the hourly volume of traffic fluctuating considerably from day to day. This varies to such an extent that it is occasionally three times greater than that of the corresponding period of the previous day. If there is a law which governs these fluctuations its discovery would result in a welcome addition to the traffic man's box of tricks, as also would some more information on the lines indicated above.

G. D. BATEMAN
(Assistant Traffic Superintendent).

Plymouth, Dec. 4, 1916.

BELGIAN POSTAL RELIEF FUND.

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

I WROTE some months ago asking our subscribers to the Belgian Fund to be good enough to wind up their accounts because we were fortunate enough to have enough money with which to go on. Most of them did so but a few apparently did not notice my letter and this is just to ask any who may now be continuing collections to cease doing so and let me have the final amounts.

We are still, I am happy to say, in a position of having enough money for any calls which we can foresee.

G. H. STUART BUNNING.

Parliament Mansions, Victoria Street,
London, E.C.

TRAFFIC AND PRACTICAL NOTES ON MACHINE TELEGRAPHY.

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

AS I did not get an opportunity of taking part in the discussion on Mr. Pendry's very interesting paper on "Traffic and Practical Notes on Machine Telegraphy," I shall be glad if you will let me make one or two hurried notes now.

The excellence of Mr. Pendry's paper lies in its presentation of the subject from the practical side, and it is for practical reasons that it is impossible to adopt Mr. Pendry's suggestion to adhere to the Baudot allotment of the letters in the five-unit alphabet. We know now that page-printing saves considerable labour, and for page-printing invisible correction of errors is a necessity. That can be achieved only by using the Baudot P signal as the "erase" signal. It is also necessary to re-arrange the numerals to correspond with the modern standard typewriter keyboard. To secure minimum work in punching and maximum strength of tape it is desirable to use the fewest holes to represent the most frequently used letters. It is therefore not practicable to adhere to the Baudot arrangement. The Western Union has adopted the Murray arrangement of the five-unit alphabet,

based on the foregoing requirements, and it is now in use all over the United States. There is no difficulty in applying it to Baudot circuits, as the only change necessary is a new typewheel and slight alteration in the inversion mechanism. The Post Office has already made this alteration on a Baudot printer with satisfactory results.

Mr. Pendry asks whether an increase of speed on the Baudot is worth while. It is, if saving of labour and increased output on the line are worth while. It is true, as Mr. Pendry points out, that increased speed with keyboard perforators and tape transmission renders it necessary to employ five instead of four operators, when tape printing is used, but the better operator average with the five operators and the increased output on the line will justify the increase of speed. I am told the Western Union is now working the multiplex at 50 words a minute per channel (eight channels on one wire) between New York and Chicago, 1,000 miles, and I do not see any reason why the Baudot with tape transmission should not run up to at least 45 words a minute. Thirty words a minute on the Baudot will never enable us to pay off the war debt. We have to buck up and raise our productive output at least 50 per cent., and speeding up the Baudot is one of the steps in this direction.

Mr. Pendry points out that raising the speed reduces the number of channels possible on certain lines. I do not see that this matters very much. The output in such cases remains the same and labour is saved. In any case the Gultstad relay and other modern contraptions seem capable of giving us all the channels we need on the great majority of British lines, and I do not see why we should go slow on all lines because we must go slow or reduce the number of channels on a few lines.

Mr. Pendry touches on a very important practical point when he refers to what I think we should call the "message burden," that is to say, the extra signals necessary to transmit a message on a printing telegraph. Mr. John Lee obtained some very interesting figures for me on this subject, and the Editor of the JOURNAL will perhaps allow me to fill a column on this subject in a future issue.

I am glad Mr. Pendry points out the necessity for highly skilled and intelligent operators on printing telegraph installations. That is the proper line to take—high skill, high speed, high output and high wages. By-and-bye no doubt the Post Office will encourage the marriage of exceptionally gifted girl typists with exceptionally rapid men typists, and then the Post Office will in time have at its disposal a race of super-girl typists able to transmit 200 messages an hour all day long without a single error. That is only 70 words a minute and we should reach that output in a couple of generations.

During the discussion on Mr. Pendry's paper, some miserable troglodyte, I did not catch his name, recommended the Post Office to adhere to the Baudot system as it was free from patents, that is to say, free from improvements. In order to encourage improvements and so benefit the nation and humanity the Government grants patents to inventors so that they can make money out of their inventions, and the suggestion of the cave-man at the meeting was that the inventors should be deprived of their wages by the Government waiting till their patents expire. If we are to be deprived of our pay in this way we will not make any improvements, and then there would not even have been a Baudot system or a British Telegraph Service or anything, not even a stone-axe for the cave-man.

DONALD MURRAY.

THE GERMAN TELEGRAPHIC BLUFF.

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

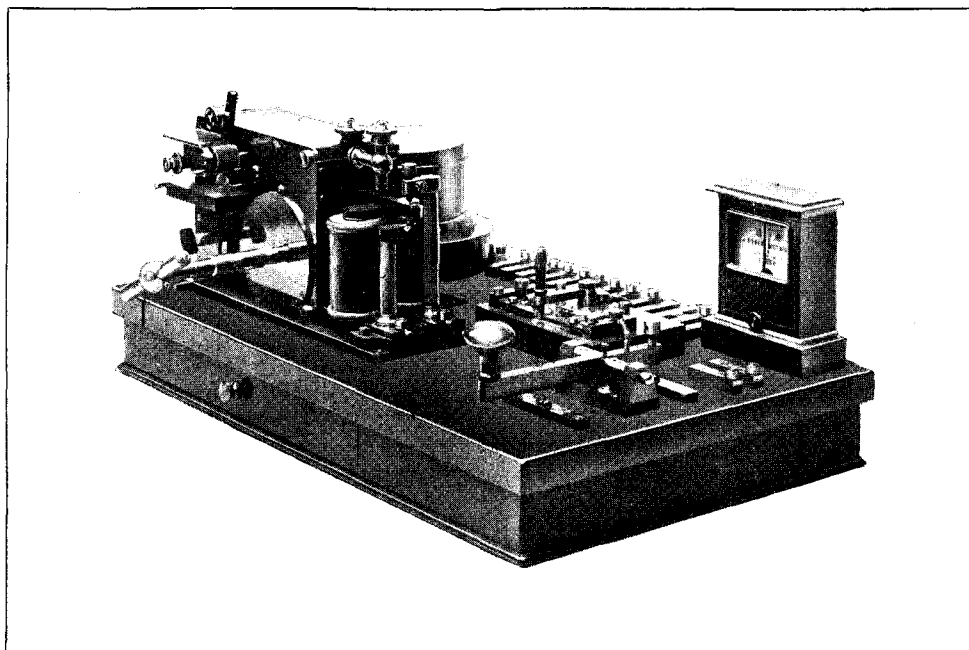
Sir.—The discussion of the inventorship of the five-unit theory bids fair to assume large proportions, judging by the length of Mr. Murray's last letter. If I may say so, it is abundantly clear that your correspondent is more scientific than logical in his handling of the controversy. It will be remembered that in his first letter Mr. Murray was very vehement in his denunciation of obsessions in favour of German scientists, and he was charitable enough to class me with the Boches generally because, in following the lead of one whom I have always regarded as an authority on the subject, I quoted a statement which, being apparently of French origin, contradicted M. Fournier's assertion that the Germans had been guilty of technical plagiarism. The trend of Mr. Murray's remarks agrees with mine in so far as it shows that the five-unit theory did not originate in a Frenchman's brain. In order to keep this letter within reasonable limits I will, with your permission, briefly refer to the Bacon-Whitehouse development. I do not consider it unreasonable to require an opponent to back up definite statements with the facts. Mr. Murray has now produced information which, I admit, throws much light upon the achievements of Francis Bacon and of Whitehouse, his later disciple, who was clever enough to utilise the earlier mathematical discoveries for the purpose of telegraph invention. If Mr. Murray had directed his efforts in his first letter to the bringing out of the details which he gives in his second letter much of the puerility of phrase and display of loose thinking would have been avoided. However, I feel that others along with myself have profited by the correspondence and if that be so, it will not have altogether failed to serve a useful purpose.

J. B.

[This correspondence must now close.—ED., "T. & T. J."]

We have received from Messrs. ABDULLA & Co. a handsome almanac for 1917, containing excellent reproductions of drawings and paintings by fourteen well-known Allied and British artists. 20,000 copies have been given by the firm for sale for the benefit of the funds of the British Red Cross Society, and it is hoped that at least £1,000 will be realised for those funds. They can be obtained for 1s. 4d. each from the principal tobacconists.

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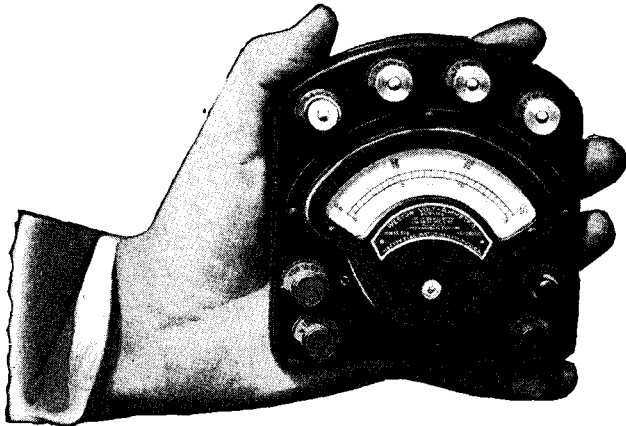
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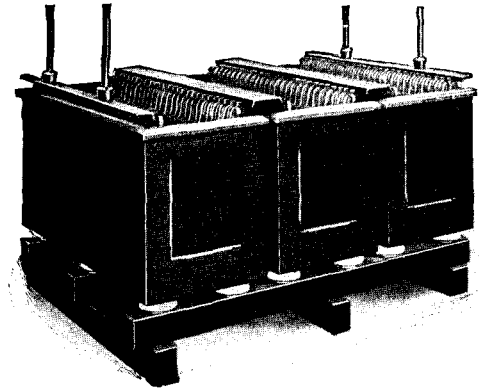
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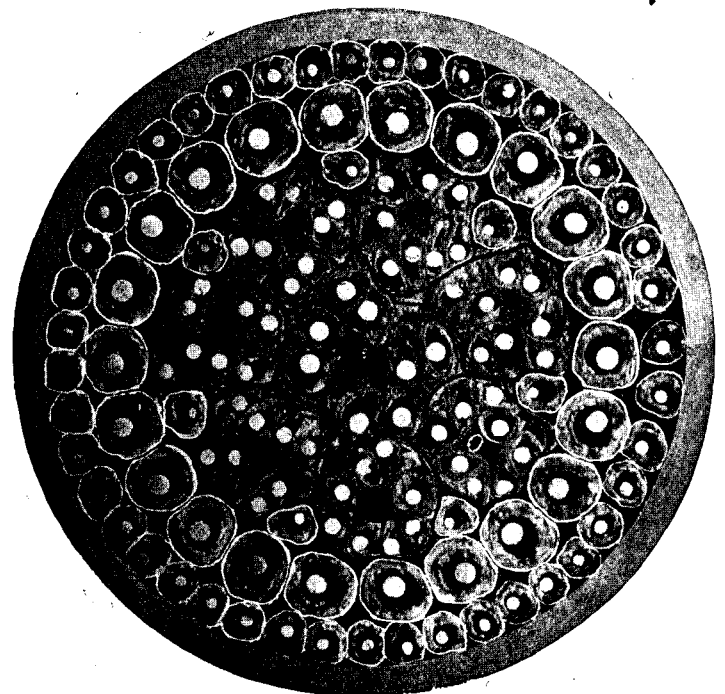
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PERSONALIA.

NEWS OF THE STAFF.

LONDON TRAFFIC STAFF.

Transfers—

Miss A. HOOD, of Regent Exchange, has been transferred to Mayfair as Assistant Supervisor, Class II, on probation.

Miss D. M. WAITEMAN, of Dalston Exchange, has been transferred to Victoria.

Miss E. E. FRY, of Hop Exchange, has been transferred to Victoria.

Miss A. BROWN, of Regent Exchange, has been transferred to Victoria.

Marriages—

Miss S. M. HUGHES, Assistant Supervisor, Class II, of East Exchange, has resigned on account of her approaching marriage. She was the recipient of several gifts from various sections of the staff, including a dinner service from the East and District Exchanges, and two silver and glass *cergues* and a testimonial from the clerical staff.

Miss HANNAH E. GILBERT, Telephonist, of London Wall Exchange, was presented with a dinner service by the staff on the occasion of her resignation to be married.

Miss E. M. PERRY, of East Ham, has resigned in view of her approaching marriage and was presented with a set of meat and poultry carvers, and a silver and glass sugar sifter.

Miss B. M. THOMPSON, of Hop Exchange, has resigned on account of her approaching marriage and was presented by her colleagues with tea knives and an *entree* dish.

Miss L. JUDGE, of Victoria Exchange, was presented with a travelling rug and a butter dish, by her colleagues, on leaving to be married.

Miss H. A. MOFFREY, of Victoria Exchange, has resigned on account of her approaching marriage.

Miss WINIFRED DA' PACKHAM, of the Trunk Exchange, has resigned on account of marriage and was presented with a silver tea service among other useful gifts.

Miss HELEN S. JAY, of the Trunk Exchange, resigned in view of her approaching marriage and was presented with a dinner service and numerous other gifts.

Miss B. LOFFLER, of Paddington Exchange, has resigned on account of marriage and was presented with a tea service and many other useful gifts.

PROVINCIAL STAFF.

On the occasion of the transfer of Mr. A. MACLEAN, District Manager, Plymouth, to the Canterbury District, he was presented by the staff with a pair of binoculars, in case, together with a sardine dish. Mr. Maclean had been in charge of the Plymouth District since April 1914. During that comparatively short period he had ingratiated himself with all he came in contact with, and takes his departure to the scene of his new labours accompanied with sincere expressions of goodwill and regret.

On the occasion of her resignation, after three years' service with the Department as typist and shorthand writer, Miss A. L. COOKE was presented by the staff of the District Manager's Office, Canterbury, with a gold pendant and chain.

On resigning the Service after three and a half years as Female Clerical Assistant in the Fees Section of the District Manager's Office, Canterbury, Miss M. L. BUCKLAND was presented by the staff with a brown suede handbag.

POST OFFICE RELIEF FUND: BELFAST COMMITTEE.

A concert in aid of the Fund organised by the local committee, on which the telephone staff is ably represented by Mr. Archer Smith, the District Manager, was given in the Ulster Hall on Oct. 30. A huge audience assembled and were delighted with the programme given by the following distinguished artistes:—Miss Dorothy Silk (Birmingham) soprano, Miss Dora Buckeridge (Glasgow) contralto, Mr. Horace Stevens (Melbourne) baritone; and from London were brought Mr. Robert Radford, bass; Mr. Albert Sammons, violinist; and Mr. Leslie Harris who gave humorous sketches at the piano. The accompaniments, which were a feature of the evening, were played by two talented local pianists, Mrs. Herbert Warnock and Mr. A. F. Parker, the Postal Superintendent.

The telephone staff, particularly Miss Ritchie and Misses Bowler, Donnelly, Forrest, Lockhart, McCartney, Speers, Wallis and Mr. E. Jones, gave great and very substantial assistance to the concert committee by disposing of £31 4s. worth of tickets. Mr. William Finlay, Traffic Manager, with an officer from the Postal Branch, took charge of the stewards at the hall.

The exact amount of money which will be available to hand to the Relief Fund as a result of the concert is not yet known, but the telephone staff have generously decided to add to it the proceeds of their whist drive and dance which took place on the 17th. There was an attendance of over 200 at this function, at which Mr. S. G. Forsythe, Postmaster, and Mr. and Mrs. Archer Smith were present. The first whist prize was won by Miss Turner (ladies') and Mr. Gibson (gentlemen's).

It is hoped full financial particulars will be ready for our next issue.

PROFESSOR FLEMING ON LONG-DISTANCE TELEPHONY.

PROF. J. A. FLEMING commenced his fifth lecture at the University College, London, on "Long-Distance Telephony" with a demonstration of the effect of loading upon the current sent into a 14-mile 44-lb. cable, and the current received at the far end. Artificial cables were employed, and it was shown that on switching over from an unloaded to a loaded cable, the current at the sending end diminished, but the received current very greatly increased. The high-frequency alternator used for the experiment did not yield a pure sine wave, but Prof. Fleming showed that the undesired components of the wave could be "filtered out" by connecting resonating circuits in shunt to the terminals, each such circuit containing a capacity and an inductance in series, such that the frequency with which it would resonate equalled $\frac{1}{2} \pi \sqrt{LC}$. By winding coils upon the inductance coils, as in a transformer, pure sinusoidal currents corresponding to the resonating harmonics could be obtained, having, for instance, frequencies of 1,000, 3,000, or 5,000 cycles per second respectively. For the study of these high-frequency waves the Duddell oscillograph was not suitable, as its natural frequency of vibration was not sufficiently great—it should be 10 times that of the wave under examination. The Braun kathode-ray oscillograph was free from this objection, but the trace obtained was not sharp enough. However, a rough practical test could be made with a condenser, voltmeter and ammeter; connecting these with the alternator, if no harmonics were present, the current i would be $= 2 \pi n v c \times 10^{-6}$, or $10^6 \frac{i}{n v c} = 2 \pi = 6.28$; if, however, harmonics were present, the latter ratio would always be greater than 6.28, possibly two or three times as great. For a true sine wave it was best to use a special machine, such as that designed by Mr. Duddell.

The measurement of the small alternating currents employed in telephony necessitated the construction of special instruments, usually dependent upon thermal effects. Methods of measuring small capacities were also explained. Remarking, in connexion with the measurement of s/c , that the Post Office engineers had discovered that gutta-percha conducted alternating currents better than direct current, Prof. Fleming described a special capacity bridge which he and his late assistant, Mr. G. B. Dyke (killed on active service), had developed for the investigation of this effect, and showed the importance of the phenomenon in the cases of dry manila paper, gutta-percha, and vulcanised rubber, all of which varied widely in conductivity for high-frequency alternating currents with the frequency and the temperature. For ordinary g.p. $s/c = 100$ or 120 ; for Siemens special g.p. $s/c = 20$ or 12 . The value of R/L could be measured with the Hughes bridge, which the lecturer explained in detail.—*Electrical Review*.

TELEPHONE SYSTEM IN BELFAST.

At a meeting of the Belfast Rotary Club on Oct. 23 an interesting address on the telephone system was delivered by Mr. Archer W. Smith, the District Manager of Post Office telephones. In giving a short account of the development of the telephone system in Belfast, he pointed out that between the years 1877 and 1880 there were two rival telephone systems in operation, but in 1881 the National Telephone Company was formed, and bought out its opponents. In 1893 the first cross-channel cable was laid, and the late Lord Kelvin was present at the opening ceremony, and about the same time the Belfast and Dublin telephone trunk was inaugurated. In 1896 the telephone trunk lines were bought up by the Government, and in 1912 the National Telephone Company's business and plant passed to the State. Mr. Smith went in detail into the operation of the system locally, and explained how the 62 operators worked, showing how each operator would complete a calling sitting at her own place. As indicating the enormous number of transactions passing through a busy centre like Belfast, he said the average number of calls per day was 52,300, or over fifteen millions yearly. The Belfast area was served by the Central Exchange, and exchanges at Malone, Knock, and Fortwilliam, and there were in all between 7,000 and 8,000 stations, of which 6,400 were worked from the Central Exchange. One great advantage which would shortly, he hoped, be in operation and was now nearing completion was a system of underground cables to Bangor, Dunmurry, Lisburn and Lurgan, which would also carry Portadown junctions. That scheme had been so far advanced before the war that the Department had made an exception, and had decided to complete the laying of the cables.

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	{	MR. JOHN LEE.
Committee - - -		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. III.

JANUARY, 1917.

No. 28.

IN THE TIME OF PEACE AND GOODWILL.

THESE few words which are penned in the season of Peace and Goodwill will probably not be in our readers' hands until we are launched upon another New Year, big perhaps with the most momentous decisions of the greatest of all wars. It is a strange thought that at this season of the year the hallowed word "Peace" itself is suspect, but the time has been selected by our enemies to talk of Peace where there can be no Peace, and one must handle the word with infinite delicacy for fear of being numbered amongst the premature pacifists. Goodwill on earth at the present moment seems a mockery with so many nations armed to the teeth and engaged in a death-struggle.

Nevertheless, at the opening of 1917, we take the occasion to wish our readers Godspeed in the coming year. To those who are bereaved we offer our deepest sympathy: to those who have an arduous campaign before them we wish good luck and a happy issue. It is not within our province to forecast military events, but in common with the rest of the nation we await the immediate future with confidence. We hope that we may be less pre-occupied with labours ancillary to war, that many of our ideals may be in a fair way to be accomplished before next Christmas, and that we may then exchange the customary greetings with their older and fuller significance.

TEACHERS AND THE TAUGHT.

IN the present issue we print the text of Sir William Slingo's paper before the Telephone and Telegraph Society of London on "Technical Training in the Post Office," together with a full report of the subsequent discussion. This paper is of great interest

for two unique reasons. It presents for the first time a history of the Post Office educational system in the past, and Sir William Slingo is not only historian but prime actor in an history which he presented. Power is not given to many men to impart knowledge and to practise it with equal success. There must be some truth in the popular estimate of teachers, lecturers and pedagogues generally, which is so ably satirised by Pope in the words:

"A bookwise pedant deeply read
With loads of learned lumber in his head."

Sir William besides being the source of knowledge to many of the leading lights in the Post Office engineering staff has by his capable and well-balanced exposition of his own theories won for himself the position of head of that staff, and such double attainment is in itself unique. In the discussion which followed Sir William's paper, tribute was paid by several speakers to their indebtedness to the author. He was referred to in glowing terms as guide, philosopher and friend, and what more can a teacher or an engineer-in-chief desire, and what is better suited to the requirements of the taught!

HIC ET UBIQUE.

AMONGST those who received honours after the last Zeppelin raid was Flight Lieutenant Edward L. Pulling who was awarded the D.S.O. in recognition of his distinguished services on the occasion of the destruction of an airship off the Norfolk Coast in the early morning of Nov. 28. Flight Lieutenant Pulling was a telegraphist at Red Hill before joining the service, and is, we believe, the first Post Office man to receive an honour in this connexion.

Kaiser (making trunk telephone call): "Peace, 1917."

Telephonist: "Number engaged. Shall I call you?"

THE following interesting paragraph is taken from *The Times* of Dec. 1:—

Of the failure of office life to affect the nerves let another story speak. In a certain signal section a little robin of a man lives and has his being; he is middle-aged, and before the war had passed more years inside the walls of the Post Office than most soldiers can boast at all. For over twenty years he lived a life of entirely regular and uneventful routine. The war came, and the telegraphist became a signaller and continued to "buzz" messages of orders as placidly as he had sent messages of business and pleasure. During a certain battle this little man, who had hitherto been employed well behind the line, was picked as one of the most efficient operators to serve an important advanced signal station. It was a temporary station for the purposes of the single action, and had, therefore, not been rendered impervious to shell-fire; it was, in fact, merely a room in an already shattered house. He went, and as he sat "buzzing" a shell struck the upper part of the house, passed through without exploding, and, after an interesting skate-dance, came to rest in the road not many yards away. There it remained, and there the operator "buzzed." The writer overheard his account afterwards: it was the first time he had been under fire, and he found it full of interest; he had picked up a trophy to send home to his wife, and was simply beaming as he related how he had kept an eye on the "dud" all day. At the close of the action an officer intimated a desire that it should be removed; "I didn't offer to do it," naively ended the little man amidst the laughter and chaff of his friends.

By the new development of Messrs. Creed & Co. various enterprises are now focussed in the one great industry at Croydon. Mr. Donald Murray has sold his patents and his business to the new firm and joins the board, so that the Murray-multiplex and the Creed instruments will be members of the one family. Mr. H. H. Harrison brings with him that rich store of telegraph knowledge and wide range of historical knowledge which have been the envy of his friends. Mr. Creed will be the technical adviser, and he will be assisted by experts in wireless and general research. The Indo-European Telegraph Company has subscribed for a large number of shares in the new company and two of the directors join the new board, Sir Wm. Brooke, formerly Director-General of Telegraphs in India, and and Mr. T. W. Stratford Andrews, Managing Director of the Indo Company who becomes the Managing Director of the new firm.

The patents in wireless telegraphy of the Indo-European Telegraph Company and of the Galletti Wireless Telegraph & Telephone Company become the property of Messrs. Creed and Company, and one of its first achievements will be the completion of the standardisation of the low-power wireless sets which had been developed by the Indo-European Company. It is the intention of the company to establish showrooms where specimens of all the apparatus which is produced at the factory will be exhibited under working conditions. The new arrangement marks a new epoch in the history of the British manufacture of telegraph apparatus, and there will be widespread interest in the future of a manufacturing firm which already has done so much for the development of telegraphy.

ACCORDING to the *Evening News*, a little crowd was waiting its turn at one of the telephone call boxes at the Agricultural Hall while the owner of one of the oldest names in the peerage could not get through, loudly protesting that he would most decidedly not put in another penny.

"I'm Lord —," he stormed. "I want to speak to the manager. I will certainly not pay fourpence!"

The conflict got hotter and hotter, till at last the operator gave way.

It was my turn next. And as I put my first coin in the slot I found the peer's third penny still there. *He had not turned the handle!*

A CALLER recently entered the silence cabinet at a Post Office in a well-known North Wales seaside resort the other day and asked for a number in LI— for which a junction fee of threepence is charged. When asked by the operator, in the usual way, for three pennies, the caller remarked that she had only two and dropped them into the coin box. The operator naturally demanded the third penny and to her astonishment the caller replied, "I'm sorry I have only two pennies, can I have two pennyworth?"

As there is no instruction in the "green book" which explains how to measure twopennyworth of a threepenny junction fee, the telephonist was unable to accede to the caller's request.

NORTH EXCHANGE: SALE IN AID OF QUEEN MARY'S NEEDLEWORK GUILD.

In order to raise funds to support the work of the "Queen Mary's Needlework Guild," a sale, which had been postponed from Nov. 28 in view of possible calls for air raid duty, was arranged in the sitting-room at North Exchange.

The postponement apparently increased the enthusiasm of the staff, the results being most successful, the total receipts amounting to twelve guineas. As donors and purchasers were entirely confined to the North staff it is felt that this was very creditable. This is the second time the North Exchange philanthropic efforts have coincided with Zeppelin raids, the staff being recalled from entertaining wounded soldiers at a tea and concert on Sept. 23 to take up air raid duty.

On the next occasion full respect and consideration will be given to the position of the moon.

TECHNICAL TRAINING IN THE POST OFFICE.*

BY SIR WM. SLINGO (*Engineer-in-Chief*).

IN assigning a title to this paper I have refrained from using the word "education" because it is such a very convenient peg for all sorts of specialists, qualified or otherwise, upon which to hang controversial topics which in many cases have no value. I am, therefore, assuming that education means for the purpose of this discussion such standards as are required for the several grades of service by the Civil Service Commissioners. My purpose is to deal with the training of officers after they have become part and parcel of our organisation.

There are broadly two classes of officers in the Service, comprised under the generic heads of

- (a) the Commercial or Traffic branch;
- (b) the Engineering branch.

As is pretty generally known the first and larger portion of my service was in the former branch, and it is to that branch I will first refer. Here I may be permitted to be somewhat historical in my remarks. It was in 1872 that I was struck with the evident lack of acquaintance on the part of the staff with the intricacies of the apparatus with which they were dealing. Obviously I found this out in the inquiries which I made as to the why and the wherefore of things in general. After pondering things over I came to the conclusion that there was a field for organising some sort of definite instruction as to the meaning of the apparatus and the laws upon which it was constructed and worked. As there were then no schools, and consequently no teachers, I decided to qualify myself as a teacher and to open a school. The great problem was to learn enough myself in order that I might presume to offer to teach others. That was in the days of Mechanics' Institutes, and long anterior to the establishment of the so-called Polytechnics, about which I shall have a word or two to say later. There were, however, the Royal School of Mines in Jermyn Street and the College of Science at South Kensington. I attended courses in various subjects at both these places and attended courses of lectures in other places on physics, chemistry, mechanics, geology and such like subjects, but my best work was done in the excellent library at South Kensington Museum. By these means I gained a large number of certificates in various scientific subjects and in drawing of various kinds. I also became an active member of an excellent debating society (another relic of the past) in order to acquire sufficient confidence in speaking and the requisite amount of facility in expressing my thoughts. In two years' time I was able to act as substitute for lecturers who were unable to complete their engagements, and after a year of that class of work I blossomed out in various parts of the Metropolis as a science teacher. With the experience thus gained I was so far emboldened as to open the Telegraphists' School of Science in 1876, commencing operations in a rented schoolroom in Aldersgate Street, and transferring the work shortly afterwards to the Central Telegraph Office. I began with five students, and it is just a matter of interest that when the school closed down in 1898 there were 846 students in attendance, and that during the 22 years of its existence upwards of 2,000 students were enrolled.

About the time that the school was being started, there was a serious agitation, largely fostered by the Society of Arts, for the development of technical education, and the efforts made by that society resulted in a number of the City Guilds agreeing to participate in a scheme to commence real work by instituting a series of examinations and encouraging Mechanics' Institutes and others to make serious efforts to organise classes and prepare students for these examinations. It should be noted that by this time the system of apprenticeship was moribund, and there was nothing to take its place and to keep the British workmen abreast of his Continental and American competitors. The work was therefore largely directed to supplement the work of factories and workshops. As a result of the strenuous efforts made by Mr. Le Neve Foster, the then secretary of the Society of Arts the City and Guilds of London Technical Institute was formed, and I was frequently consulted as to the methods to be adopted in working out the scheme. It was fortunate that it was seen at a very early stage that something more than a mere knowledge of the methods adopted in the various branches of industry was essential, and the granting of technical certificates was made contingent upon the candidate obtaining certificates in two cognate science subjects. I was happy in being able to secure the admission of Telegraphy as one of the technical subjects, and the first examination in that subject was held in 1878. The scheme had a good send off, and resulted in the formation of a number of so-called polytechnic institutes, but unfortunately those institutes lost sight of the primary object of the scheme, viz., to impart to those engaged in, or about to take up, a particular industry a knowledge of the scientific principles involved and of the methods adopted for their practical application. The result was in many cases ludicrous. Bootmakers were admitted to carpentry classes and taught how to make pigeon houses or rabbit hutches, and carpenters were taught how to mend their children's boots. It can easily be seen that much money and many efforts were thus wasted, while the antagonism of trades unions was in due course made manifest. Fortunately none of these institutions attempted to teach telegraph manipulation, although they would doubtless have essayed to do so had the policy of trade teaching been allowed to get the upper hand. It

* Paper read before the Telephone and Telegraph Society of London on Nov. 20, 1916.

is very gratifying to find that the evil was realised in good time, and in recent years trade classes have given way very largely to the much more desirable object of instruction in the fundamentals of industry, leaving the student to acquire his trade practice in the workshop and factories, or in special schools provided in the works or in close proximity to them.

So far as my own work is concerned there are certain questions which naturally arise—first from what classes did the students come, secondly what was the good of all the work done, and thirdly what benefits did the school confer upon the students and upon the Department.

Before attempting to answer these questions it is pertinent for me to observe that the cost to the Department was almost negligible, and that the school was practically self-supporting so far as the Post Office was concerned, apart from the fact that no rent was charged for the use of the rooms in which the lectures were delivered, but these rooms were generally in use during the daytime for other purposes. I also had, more particularly in later years, authority to use such spare lines and apparatus which I might find available.

Dealing with the first of my queries—the students in the early years were derived exclusively from telegraphists on the staff of the C.T.O., but as time went on, members of the Engineering force, and from what is now known as the London postal district were admitted. It was therefore essentially a Service school, a trade technical school in the best sense of the word, where teachers and students were all striving to one common end, the diffusion of a scientific knowledge of the principles underlying their daily work. The second point—the utility of the instruction given is therefore almost self-evident. Its first object was to give the staff an intelligent knowledge of the equipment which they had to utilise, to enable them to intelligently adjust their apparatus, remove small defects, and determine the cause of interruptions. Incidentally this relieved the supervising officers of a certain amount of work, but it also acted as an incentive to those officers to keep themselves abreast of the requirements and ahead of their subordinates.

Those who are old enough to remember the good old days, or as some would have it the bad old days, will not forget that when signals were imperfect, it was the practice to twist the relay screws first one way and then the other, and if that failed to rectify matters to give the instrument a bang and say something unkind to the beastly thing. The late Sir Henry Fischer, who will always be remembered as one of the severest disciplinarians, and at the same time as one of the best disposed chiefs a large staff ever had to work under, told me more than once that he valued the school because it made the men better officers by keeping them in the lecture-room for one or more evenings a week and giving them something to read and think about on the other evenings. The school was from his point of view a mentally and morally elevating institution. He marvelled that without any authority of any kind over the students who were drawn from all sections of the staff, young and old, we were able to maintain discipline, and to keep to the work in hand; but I was able to demonstrate to him that there was no great difficulty in that respect. Students and teachers were so anxious to make real progress that if any disturbing influences manifested themselves, a little suasion was exercised which always had the desired effect, and the work proceeded cheerfully.

My primary object was to make the school a professionally elevating organisation, and I think I may justly claim that the school helped materially in both directions, and this brings me to one very important item of utility, viz., the provision of officers suitable for the Engineering Department. When I look down the lists of officers in the Engineering and the Stores Departments and notice the great proportion of men who passed through the school, I experience one of the most refreshing tonics, for I find these men holding many of the best positions and giving the greatest satisfaction. In fact in my own Department much of the best brains in the Service are old students of the school. The success of the school of course found many imitators in the Provinces, and some of them undoubtedly did very good work, but my object always was to get the students to exercise that rare commodity misnamed common sense in applying scientific knowledge to practice, and to extend their studies to as many cognate subjects as possible instead of confining them simply to electricity and telegraphy. I particularly impressed upon them the importance of such subjects as mathematics, mechanics, sound, light, heat, chemistry and mechanical drawing, and classes were whenever possible formed in all these subjects. This was one of the essential differences between the telegraphists' school and the classes which were formed elsewhere.

With these remarks there is little left to be said upon the third point—the benefits conferred upon the students and the Department. Concerning the students, they were given opportunities for obtaining and showing greater interest in their work, they were able to respond to the requirements as more efficient systems of telegraphy were introduced, such as duplex, quadruplex and multiplex working; they were therefore able to get higher grades of telegraphists appointed, such as the senior class, they were able to qualify for technical increments, and they were able to get appointments in higher branches of the Service.

Concerning the technical increment which was introduced in 1897, it is pretty generally known that I was largely instrumental in formulating the scheme. The original idea was that a Departmental Examining Authority should be set up under the control of the Engineer-in-Chief. It was referred to me for my opinion and I was bold enough to condemn it on all grounds, for I showed that it hadn't a decent leg to stand on. There were already examining bodies in existence, they issued certificates which were recognised as free from any suspicion of favour or bias, the candidates were unknown even by name to the examiners, the students had every confidence in the examining authorities, viz., the Science and Art Department and the City and Guilds Institute, the certificates had a definite value in the scientific world, and the expense was infinitesimal as compared with the cost

which the Post Office would have been put to if it set up its own examinations. As you know I was able to make good my contentions. I had of course made a great study of examiners and their methods, and of the way in which students could best be prepared to face the examinations, and although no one will I am sure ever charge me with any attempt at the pernicious system of cramming, a process largely dependent upon the ability of candidates to memorise freely. I was able to predict how many candidates would satisfactorily undergo the ordeal. When the scheme was fairly launched I was asked what the cost would be and I was able to give an estimate so far as London was concerned, which afterwards proved to be within about 5 per cent. of the actual cost. I did not form any estimate for the Provinces, but I heard afterwards that this estimate was only 5 per cent. true, that is that it was about 95 per cent. wrong, although on the safe side.

The benefits conferred upon the Department were no less pronounced than were those derived by the staff. A staff was gradually trained to look after the apparatus and to keep it in adjustment, a supervising staff was built up which made the different sections of the office independent of technical assistance, an expert testing staff was formed without any cost to the Department, and good candidates were provided for positions in the higher branches at a time of great expansion. The large number of officers thus withdrawn from the staff of the C.T.O. to some extent improved the flow of promotion there.

Having thus indicated the lines which were followed in the past the question arises as to the lines which should be followed in the future. I would like to lay it down as the irreducible minimum, that every supervising officer should be able to take full technical control of his office, or, in the case of a large office, of his section. That every telegraphist should be able to take full technical charge of his particular set of apparatus, and that every telephonist should be able to take technical charge of his or her "position." If these objects were attained, it would rarely be necessary for a supervising officer to be called to a circuit or to a switchboard unless there is a line fault, a defect in the apparatus in the distant office, or a home fault of an intricate nature. Similarly the supervising officer should never require the assistance of a test officer and very rarely of a mechanic, and the presence of a lineman in an instrument room should never be needed for the purpose of removing faults. The problem is to so provide for the training of the staff as to attain these desirable ends. So far as the Central Telegraph Office is concerned we were within view of such a desideratum when the school was closed, but some few years prior to that event I had put forward a scheme under which the school was to be taken over by the Post Office, and made the nucleus of a systematic arrangement for providing all the large centres with teaching staff and equipment. The scheme was very comprehensive and certainly economical, but it did not commend itself, and now there is nothing to adequately supply the need, and any scheme which may be adopted will certainly be, by comparison, costly. I propose to make my suggestions a little later when dealing with other branches of the Service.

When we come to consider the history of the technical training in the Engineering Department, we are confronted with the fact that in the early days no efforts of any kind were made to raise up a staff of either workmen or supervisors, and as a consequence rule-of-thumb methods very largely prevailed, except for the effect resulting from the directive efforts of a select few expert officers at Headquarters. There was very noticeable a decided tendency on the part of a great many officers to keep to themselves such knowledge or information as they had been able to glean. With individual secretion of this kind there was only likely to result the minimum of development, for secretion of knowledge is always baneful, because it stultifies one's outlook and retards progress, and this is the very evil which underlies all patent laws. It is an evil so prolific in bad results that I have always done my best to discourage and thwart it, and it is because of this that I have set my face as far as I have been able, against efforts on the part of Post Office servants to secure patents for devices which are the outcome of their work and experience in the Department. I have no wish whatever to deprive genius of its just reward, but that reward should not be in such a form as to impair progress. A man may get an idea, more or less crude, and spend months and even years in working out some minor detail in order that he may secure the patent rights; possibly he will never succeed and the fundamental idea which might by co-operation have been speedily worked to fruition is lost, or as often happens the originator may be anticipated by someone else, even someone outside the Service altogether. The man who freely distributes knowledge and allows others to see the results of his experience must by so doing acquire information and thereby add to his own store. Questions arise in discussion which show a man where he is weak and in what directions he should turn for improvement. It follows that the scope of a man's studies should cover as wide a range as possible and that capacity to learn and the time at his disposal should be the only limiting factors, and I venture to assert that it is the first and most important duty of every man at the outset to carefully consider the limitations he must by force of circumstances impose upon the scope of his studies in order that he may make the most of his life and get the maximum out of it. Let me lay down as a maxim, that no man whatever his walk in life can ever know too much, or even enough, concerning the principles underlying his daily practice. Every industry is so linked up with others that no man can ever say he has learned all that is necessary, and it is difficult to imagine that any branch of learning can be regarded as useless or inapplicable to a man's daily work.

Bearing in mind the absence of any effort to train engineers or to encourage officers to become engineers in the early years of the Service, it is a remarkable fact that the British Telegraph Department has held throughout a very prominent position among the administrations of the

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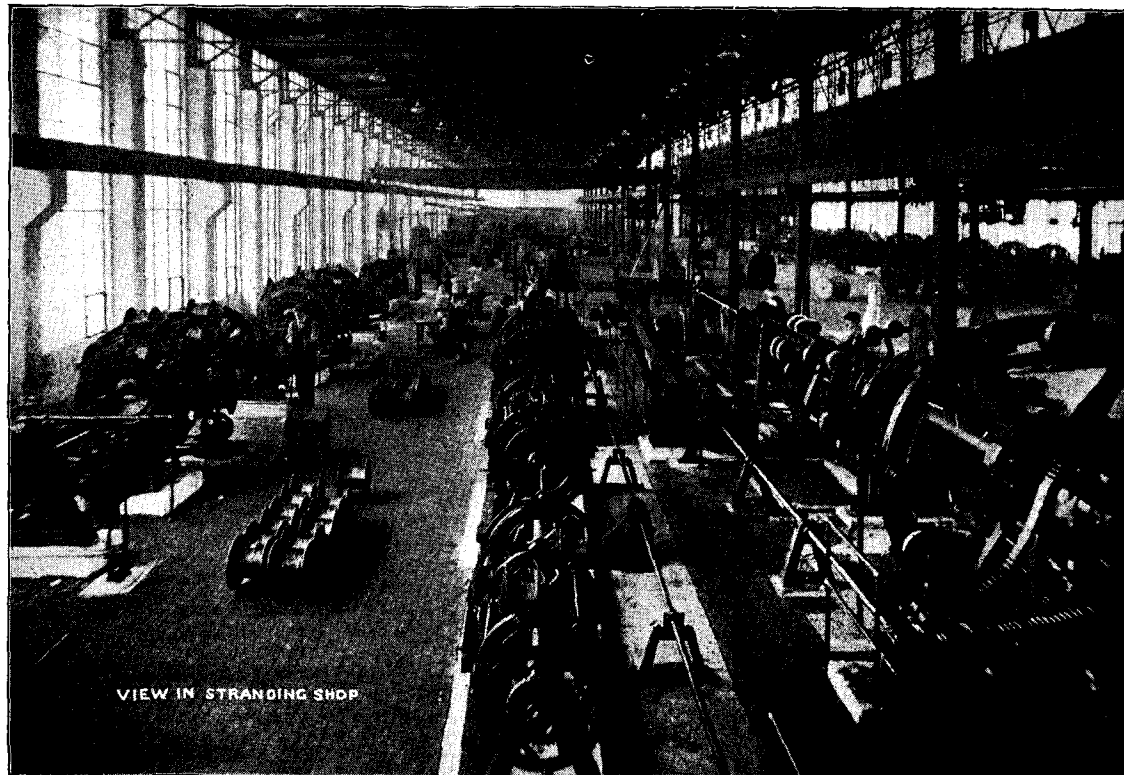
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world. Of course in the very early days, that is to say in the pre-Post Office days, there were several competing companies in existence, and in order to continue their struggles for supremacy, each company had to employ the best experts available, but those experts were few in number and each had a comparatively small quantity of plant to control. I doubt whether I am far from the truth in saying that the average present-day sectional engineer has as much plant and as numerous a staff to control as the average engineer-in-chief of the several companies. Accepting this point of view, it requires no further argument to demonstrate that the sectional engineer of to-day should be a man of general and high scientific attainments, with adequate ability to apply those qualifications. In addition he must have good business instincts and be a really capable organiser and controller of labour. It is so very easy either by negligence or indifference to be extravagant both in labour and in material that it is very difficult to overrate the importance of what I have called business instincts and their faithful and assiduous application. And if this is true of the sectional engineer, it becomes still more so in the case of superintending engineers and other higher officers.

I have tried without much success to find a definition of an engineer. If we search the dictionaries we find that he is usually described as a man who looks after engines. But, incidentally, what is an engine? The lay mind is often at a loss to see any difference between say a member of the Amalgamated Society of Engineers and a member of the Institution of Civil Engineers. I have tried to devise some sort of a definition of an engineer, and perhaps it will generally be admitted that an engineer is a man who brings the forces of nature into subservience for the service of man with intelligent foreknowledge and economy. This definition cuts out the man who accidentally drops across a discovery which he was not looking for or preparing for. It also excludes the man who produces a device or scheme which is extravagant and wasteful, and I venture to claim that every scheme to be a success must justify itself on the basis of economy. If, for example, gas were proved to be an illuminant equal in every respect to electricity and also cheaper there would be no room for the electric light engineer. It is just because the electric light in the early days had certain definite advantages over gas, but was more costly than gas, that its use was a luxury limited to the few. It was not until it was also cheapened that it became generally applicable, and the dreams of the scientists became the success of the engineer. I may perhaps mention another case. Some twelve or thirteen years ago a secondary battery system was devised applicable to offices which had a minimum of 400 primary cells in use. The scheme was devised with a view to dispensing with the use of a separate generating plant, the reduction of the reserve of secondary cells, the more equable charging and discharging of the cells, and the saving of labour and economy all round. It is an interesting fact that without any trial or any experimental equipment being set up, fifteen complete equipments costing several thousands of pounds were ordered and brought into service, without the need arising for a single change in any one detail. Many other similar equipments have been installed in this country and in other parts of the world. This I claim to be an engineering achievement within the terms of my definition. The definition may of course be read in its widest sense to embrace not only the design and production of a scheme or system but also its reproduction and maintenance.

Engineering is thus a very wide field, and it is not given to any one man to cover it in its entirety. Thus we have mechanical engineers, railway engineers, water engineers, civil engineers, telegraph engineers, electric light engineers and a host of other grades which I need not specify. But it is imperative that while every engineer should be expert in his own domain, he should have a general knowledge of many other branches in which he does not specialise, and in order to comply with this requirement his scientific attainments should be as diffuse as possible. No man is properly qualified as a telegraph engineer whose scientific knowledge is confined to the rudiments of electricity and their application to telegraphy. He should have a very comprehensive knowledge of electrical science and should be well acquainted with the laws of mechanics, mathematics, chemistry, sound, heat and light, and should be able to read with facility mechanical and architectural drawings. Without these attainments he is inadequately prepared for the tasks which lay before him. It may perhaps be urged that I am setting too high a standard, but for a young man who has his heart in the right place, it is really easy of attainment, even in fact, for a man who has already commenced his life's work. A man who has done an ordinary day's work, especially with the modern ideas as to the limitation of a day's work, has ample time and opportunity for extending his acquirements. While it may be true that all work makes Jack a dull boy, I would certainly limit the axiom to those cases in which the work is all of one kind, when monotony becomes a serious and prejudicial factor. I would like to emphasise the equally potent dictum that change of occupation is recreation. In order to secure recreation there is no more need to go and kick a ball about than there is to go up in a balloon, and I would strongly recommend one who has such ideas to try his hand after working hard, and the harder the better, for the few allotted hours in a day say at a perforator or in the testing of a cable, to try the effect of an hour or two say in a chemical laboratory, or in working a lathe. He will find that the change will divert his mind from the immediate past and he will enter into the new occupation with quite as much zest as if he were looking at pictures or watching a trial of skill in any one of the several fields of athletic exercise.

The technical training of the manipulative staff had in the course of a few years a natural effect upon the engineering force, for the manipulative staff was beginning to get ahead of the engineers. New entrants into the Engineering staff were therefore required to produce certain technical certificates, but it must be confessed that those certificates were of too low an order, and were too limited in their

scope. Embryo engineers were compelled to graduate through the repeating stations and the superintending engineers' offices, and this led later on to a somewhat unfortunate state of affairs and to quite unnecessary and uncalled-for antagonism between the clerical and technical forces. I imagine no worse evil can befall a staff which is thus divided against itself, where each section entered into a struggle for supremacy instead of uniting for the general progress and advancement of the Service. In a large service like ours there is room for one and all, and there is scope sufficient to bring out all that is good in a man provided that he is willing to submit to the process and to properly and systematically develop his latent powers. But it means work, often without prospect of immediate reward. Often as not he is brought into the world without any prospect beyond that of bare existence, and if he has succeeded in getting so far as he has done without a prospect, what I ask is there to deter him from making further progress and creating his own prospect. It is mainly a question of perseverance.

It was by perseverance that a large number of telegraphists qualified for engineerships in the '90's and subsequently developed into really good officers, but about the beginning of the present century there was a serious drop in the number of promising candidates for engineering appointments, and in the face of the growing complexity of the requirements and the needs of the then very young Telephone Service it was decided to tap the outside world for engineers. Efforts were first made by calling for young men who had had two years' experience in engineering workshops. This did not prove very helpful. The next attempt was to ask the Universities to select suitable candidates who were first submitted to the ordeal by interview and those who satisfied the interviewers were then subjected to an examination among themselves. This also resulted in failure to get the right class of man. I should indeed have been greatly surprised had any other result followed. In the first place the prizes offered were insufficient to attract the ambitious and persevering men, and in the second place there is strong objection to asking men in the academic walks of life to select suitable candidates for a commercial and professional industry like that of the Post Office Engineering Department. A few good men were undoubtedly obtained, but with a little meal we had to take a quantity of husks. The latest scheme was on more correct lines, viz., to revert to the system of open competition, the only limitation being that the candidates should have had previous technical education and practical training. The examinations held on this basis have yielded a larger proportion of really promising material. I am of opinion, however, that amongst the manipulative staff we ought to be able to find enough men of sufficient general education and possessing the necessary qualifications to meet a fairly large proportion of our needs, but the means for selecting and training these men are lacking. It is certain that a man who has gone through the mill in a telegraph office, has learned what discipline means and how much it counts for, and has made himself acquainted with the requirements of the Service, has decided advantages over an entrant without these qualifications and, other things being equal, he should make the better officer. The best telegraph and telephone engineers, in the districts and at Headquarters, have qualified after service in the traffic branch, and I could easily name a number who could hold their own against the world. It was for this reason that I urged that, while it was undoubtedly desirable to open the Service to really good and useful outsiders, it was inexpedient that the Post Office should limit its area of selection by saying that in future no one on the manipulative side should be permitted to enter the higher ranks of the Engineering Department. The outcome was that the Holt Committee decided that the competitive examination should be open to officers already in the Service, and further that officers of certain ranks should in exceptional cases be eligible for selection and appointment without going through the competition. Unfortunately, owing to the war, no examinations under this scheme have yet been held and for similar reasons there has been no opportunity to appoint any one directly. Let me, however, emphasise the fact that the road is open, and it rests only with the staff to find a way along it. The road may be narrow but it is straight.

Concerning the lower ranks in the Engineering Department, considerable efforts have been made to induce the workmen to acquire technical knowledge and to widen their experience. Arrangements have been made in the technical institutions in London and many other centres for the formation of classes for the benefit of the men, and the Department pays the fees in the case of those who gain certificates and those who, while they do not gain certificates, attend at least four-fifths of the class meetings during the session. In addition, operative classes are formed and directed by engineering officers, in which the students are instructed in the various kinds of work. In this way a man may become more expert in his own work, and may also learn other branches. I attach considerable importance to these classes, as opening the way to men who enter as labourers to qualify for skilled workmen's positions and for promotion to the establishment. Incidentally I hope that by this time the minor staff realise what a really great benefit was conferred upon them when the scheme was promulgated which gave 50 per cent. of them establishment, and which abolished the old rule, which, by the way, was frequently and irregularly broken, that before a man could be given one of the few established appointments then open to him he had to qualify in all branches of the work. He can now get establishment even if his abilities are limited to a single branch.

The increase already referred to in the complexity of the work and the growth in volume has resulted in the appointment of a large class of inspectors, and in order to secure the right class of man it was deemed essential as far back as 1910 that certificates in electricity, telegraphy and telephony should be produced by each new entrant. Many of the men resented this requirement but they did so in opposition to their own interests, for there can be no doubt that the higher the qualifications demanded in any walk of life the

greater must be the reward. Of course such a scheme may appear objectionable to some, but it should be hailed by the progressive and industrious, especially as the certificates required are all of an elementary nature and are not in any way competitive. They are only qualifying. I am sanguine enough to think that before long the scheme will be so regarded, and even at the present time there are good indications of general concurrence.

Having now indicated in general outline the requirements and the steps which have been taken to meet them, I would like to give expression to my views as to the way in which I think those requirements should be met in the future, but must premise these remarks with the statement that they are purely personal and do not pledge the Post Office in any shape or form.

Dealing first with the manipulative staff, I am extremely sorry to notice one very baneful consequence of the introduction of the technical increment, viz., that the great bulk of the telegraphists and telephonists who qualify for this extra payment appear to think that they have reached their goal, and that there is nothing further for them to do or learn. As a consequence advanced students are very few and far between. So long as this feeling prevails there is little chance of further progress or advancement.

It is too late in the day to revive my scheme for the formation of a specialised school associated with every large office and under Departmental control, but I think that in every such centre the local technical institutes should be requested to form classes of real service to Post Office servants, that the fees of those who attend should be paid or refunded by the Post Office, that new entrants into the Service should be compelled to qualify before their appointments are confirmed, that in the classes special attention should be given to the object, design, construction and adjustment of the several pieces of telegraph and telephone apparatus, that special diplomas should be given to those who attend and qualify in advanced courses, and in courses on general physics, chemistry and mechanics, and that in every case where advanced classes are formed, one or two wires should be led from the class room to the instrument room so that actual lines when disengaged may be placed at the disposal of the students. I attach considerable importance to the last item, because I have come across engineers who when I found them in difficulties with testing instruments, and unable to manipulate them under working conditions, said they had used them in a school laboratory where, of course, the coils or other things they were testing had a fixed value and none of the varying factors which enter into everyday practice were introduced. Armchair study would have been almost as efficacious.

Examinations should be frequent and searching, and every session should be wound up with an examination by an external authority, and I would greatly prefer that the same authority should be the examining body in every case in order to ensure uniformity of standard and expert methods of examination. Students should, except in the case of the new entrants into the Service, attend in their own time and travel at their own expense, for I hold strongly that as the benefits are mutual to the staff and to the Department, both should share in the cost. I have an old saying which I am convinced is generally applicable, viz., that that which costs nothing is worth nothing. If the student were to have his fees paid, his books presented and his time paid for, the inducement to make true progress would be at a discount and there would be a considerable amount of inefficient or unproductive work done.

Concerning engineering workmen, the fees should also be paid or refunded under similar conditions to those suggested for operators. The teachers should where possible be officers of the Department, recommended to the school authorities and paid out of school funds.

The advantages to labourers have already been indicated. They would be qualified for skilled workmen and would soon be classed and paid as such. Unestablished skilled workmen would improve their claims for established positions and established men would get the benefit of promotion earlier than otherwise.

Many institutions object, however, to the provision of work or trade classes as being outside their scope as technical institutions. I think this is a mistake so long as the class is confined to men already engaged in the industry, but so long as this attitude is maintained we must continue our present practice of holding such classes on Post Office premises, and keep the control in our own hands, in the hope that the day will come, sooner or later, when the educational authorities will recognise that they must meet the apprentice question in the proper and to my mind the only practicable way.

So far as Engineers are concerned, the case is not so simple, Engineers however extensive their experience, must realise that there is a wide field before them. They have their subsidised Institution of Post Office Electrical Engineers, with its branches in the several districts, where they can meet and discuss the innumerable questions of professional interest, but there are many fields which that institution cannot touch. One of my greatest difficulties at the present day is to find suitable expert officers for the telegraph section in my own headquarters. This may sound strange some 60 years after the inauguration of the public telegraph, but it is a sober fact. I can get men with good all-round scientific knowledge, and I can get other men with a good practical knowledge of telegraph apparatus, but I cannot get men with both attributes. The Universities cannot produce them, technical institutes cannot produce them, neither are they to be found in telegraph offices. They must be made. The best field for them in embryo is the repeater station, but most repeater stations are remote from facilities for acquiring scientific training. The solution has not been found either in Germany or in France. In both these countries they have State schools, but the students are either not telegraph men, or when they are, they are not kept long enough to specialise, and specialisation is the basis of all expert engineering.

I have shown in this room, but before another body, that the science

of telegraphy owes practically nothing to Germany, and France, although she has produced a few good things such as the Baudot, has done so rather in spite of her want of a proper system.

My solution would be to form a high school of telegraphy in affiliation with one of our best institutions in London, such as University College, to which selected engineers and the new grade of probationary engineers would be sent to undergo a systematic course of training in the higher branches of telegraphic and telephonic science, and in those branches of allied science which I hold to be essential. It is an interesting fact that, notwithstanding our absolute dependence upon the laws governing the generation, propagation and reception of sound, that in the efforts to determine a course through which probationary engineers should pass before admission to the Service, there is not a single institution which will admit "Sound" as a specific subject, so hidebound and inelastic are our scholastic arrangements.

In the case of students attending the engineering courses referred to, I think the whole cost, except perhaps books and travelling, should fall upon the Post Office, that is to say, the students should be freed from their official duties so long as they are in attendance, but there should be frequent examinations by the professors and teachers in order to ensure that good progress is being made and to weed out the unpromising ones.

One last word on examinations—I know it is the fashion nowadays to deery this method of ascertaining the student's progress and the teacher's efficiency, but the outcry against examinations comes mostly from the teachers. Unless it be to hide inefficiency and as a cloak for indifference or incompetence, I cannot for the life of me see what objection can be raised to periodical and independent tests. If we are buying apparatus or cables or poles or any other of our thousand and one commodities, we invariably impose a test by an authority independent of the manufacturer. Why I ask should we not proceed similarly with the one intangible commodity, training.

DISCUSSION.

Mr. WALKLEY said he was glad to see present so many brilliantly successful "old boys" from the Slingo Academy; and, perhaps, by way of contrast, it would refresh them to see an even more distinguished, because much rarer, character, one of Sir William's failures. He liked to believe that he was entitled to claim that distinction for himself. At any rate he was one of a crowd of "young hopefuls" of the Secretary's office nearly two score years ago whose minds it was somehow supposed would be improved by a dip into the rudiments of telegraphy. And so for an evening or two he sat under the official professor—with luck, none other than Sir William, though possibly also a mere understudy—facing something that looked like a clock with one hand and ultimately getting as far in the Morse code as the letter "c"—which, he understood now, was an "easy one." There his technical studies, he was totally unable to remember why, abruptly terminated. It was abundantly clear, however, that he must be somebody's failure. And he cherished the fancy—he sincerely trusted that it was not an illusion—that the somebody was Sir William Slingo.

Mr. G. F. ARCHIBALD said:—

Telegraphists all over the country would be pleased to know that Sir William Slingo considered the commercial branch capable of supplying a fairly large proportion of the Engineering staff, and, if a hint to the Editor of the TELEGRAPH AND TELEPHONE JOURNAL was permissible, he would suggest that the fact be published in block type.

Telegraphists had few avenues of promotion in these days and few rewards were offered for that perseverance which the author found so scarce. He did not think the men were entirely to blame; the Post Office had some responsibility in the matter. After all the struggle to obtain something more than a bare existence under a monopoly was only possible when the monopoly was prepared to find openings and he ventured to think that for every telegraphist who had been fortunate enough to obtain some measure of success there were dozens whose hopes and aspirations had been blasted by the scale payment system which placed every one on the same dead level.

The introduction of technical allowances did something to create a dividing line between the tier and the non-tier, but where was the use in saying to a man: "You may pass your examinations when you are 20 or 21 if you choose, but your industry cannot be rewarded until you reach your 25th birthday." Similarly it was not very encouraging to tell a man he might obtain a departmental certificate after passing the efficiency bar, but that he must not expect to be rewarded until he had been twelve months at the maximum of his class—a matter of nine years later. It was because of such regulations as these that telegraphists—to use the author's words—thought they had attained their goal and that advanced students were few and far between. As a matter of fact telegraphists usually avoided technical studies until they approached the age at which they might claim the technical allowance, the result being a large amount of cramming and a feeling of thankfulness when it was all over. It was a waste of time to moralise for the benefit of a telegraphist, talk to him in terms of pounds, shillings and pence—as witness the number of men who had obtained the allowances—and he would understand and act accordingly.

Training to become a first rate technical officer should commence at a fairly early age. They must look in the future for improvement and there seemed no good reason why learners should not receive some elementary instruction in telegraph schools. All must agree that the present system was too casual for a progressive service. One must sympathise with the author's proposal to make technical qualifications a condition of permanent employment. He would like to point out what appeared to be a contradiction. About half way through the paper the author suggested that Technical Institutes should be asked to form classes of real benefit to Post Office servants

and that the fees of those who joined should either be paid or refunded by the Department. This was done already in some cases, but telegraphists did not participate in the concession. Further on the author qualified that statement by proposing that the fees of new entrants should be paid and that they should attend the classes in official time, but that those already in the Service should pay their own fees and attend the classes in their own. In his judgment the proposal should be reversed or at least modified for if they brought up their learners on the theory—he was quoting the author—that that which cost nothing was worth nothing, they would not improve matters very much. It would be unreasonable to expect men to devote their time and money to commercially unprofitable study, and he would suggest that the first technical allowance be paid at 21, that a second allowance be offered together with the prospect of an appointment in the Engineering Department to men who produced advanced certificates, and in addition the payment of the allowance for the departmental certificate as soon as a man had qualified for it. In this way telegraphists would be encouraged to strive to become Sir William Slingo's ideal telegraphist and supervising officer.

He was afraid those ideal officers would not be obtainable at the present rates of pay. To be able to do without the services of engineers, inspectors, linemen and boy mechanics appealed strongly to the commercial branch mind, and if such ideal officers were ultimately at the call of the Department as a result of the new method of training he could see a period of prosperity for the telegraphist and a big reduction in the cost of running the Engineering Branch.

Mr. DALZELL considered that the society was under a special debt of gratitude to Sir William for making time to prepare and read this paper when he was so extremely busy with other important works, but this itself was a subject of national importance. Sir William had frankly stated, and there was no better judge, that the necessary material for recruitment was to be found in the Service, among the ranks of telegraphists and others. In his tours through the provinces he had been greatly struck with the good quality of this material, but it was doubtful if they were going to use it—the pathway seemed too narrow. If they did not make use of the available material they deprived the Engineering side of some of the best recruits and lowered the class of telegraphists owing to their circumscribed outlook, a serious matter in view of the increase in machine telegraphs. He (Mr. Dalzell) would ask Sir William if with his experience he considered that a telegraphist working for his daily bread and working irregular hours night and day, was in a position to compete favourably with a man who was giving his whole time to technical study. Was it not possible to open to the telegraphists the same entrance as that reserved for inspectors and chief inspectors who, upon the presentation of certain certificates referred to in the committee's report, might be transferred to the Engineering side without further examination, and might not a certain proportion of the appointments to be made from examinations be reserved for the best men from inside the Service. By this means through examinations they would get the best men from outside together with the best men from inside; these latter would, however, be in competition with their fellow workers alone. It seemed also that some changes must be made in the method of selecting men for technical duties. The best technically qualified men only should be given test and relay duties—which form an excellent training ground for Engineers. In this way the work would be done with greater efficiency and interest, otherwise it appeared that the duties must become proper to the Engineering staff, as efficiency was essential.

Colonel OGILVIE congratulated the society on the paper read by Sir William Slingo dealing chiefly with the Telegraph School which he had founded and conducted with so much success. The school had done much to increase the efficiency of the Telegraph Service and had also given many valuable recruits to the Engineering staff. It was perhaps a matter of regret that the school had not been continued and extended. As a matter of policy, the teaching work in connexion with the technical certificates of the Telegraph Service had been left to Technical Institutes. It was doubtful, however, whether the training thus obtained had as stimulating and as beneficial an effect as training in the Post Office School. The technical qualifications required to obtain certificates seemed to have a limited effect on the working of the Service and when once the technical increment had been obtained there was little encouragement for the staff to continue their studies. So far as the Telegraph Service was concerned, it seemed unfortunate that positions on the Engineering staff were no longer open to telegraphists whose experience in the practical working of instruments gave them a qualification for higher engineering work on apparatus which it was difficult to obtain in any other way.

Sir William Slingo had divided the Telegraph and Telephone Services into two branches—the commercial, or traffic branch, and the engineering branch. It was a question, however, whether we could not with advantage adopt the American view which limited the title of "engineers" to those who studied general principles and withheld it from those classes whose duties it was to carry out routine work of construction and maintenance on standard lines. In America there were traffic engineers and there were commercial engineers in the Telephone Service who had to do the thinking and the co-ordinating required to secure increased efficiency. The staff employed in practical working had a most responsible and honourable position, but the qualities required for good work of this kind were not necessarily the same as those required for engineering work, properly so-called, and in our scheme of technical training in the future it would be necessary to keep in view the different kind of training necessary for the practical and engineering classes.

Mr. NEWLANDS, Controller, C.T.O., said that the Engineer-in-Chief's paper was one of great importance. The first portion was historical while the latter portion was eminently practical and even in many respects autobiographical. It deserved to be seriously discussed in the various Service papers in order that the staff might reap the full advantages which ought to accrue when such an officer as Sir William Slingo who had such a lengthy and varied experience of the Telegraph Service had taken the trouble to place on record his matured views. While it was quite true that the present Engineer-in-Chief was a pioneer as regards technical training and that he held aloft the "torch" in London, the heart and citadel of the Telegraph Service, where he could always find a numerous body of earnest technical students, it must not be lost sight of that in the provinces there were other able teachers, who although they may only have carried "lamps" were, nevertheless, almost equally eager in their endeavour to spread abroad a knowledge of technical subjects. Mr. Eden, of Edinburgh, was one of these teachers and the speaker was one of his students as far back as 1874. It was evident that Sir Wm. Slingo had always held a high opinion regarding the technical capacity of the telegraphists of the C.T.O., and of their ability to achieve success either inside the Service or in the Engineering Department as well as in the outside world. While it was quite true that he could legitimately claim that "much of the best brains in the Service" were old students of his school, it was proper to point out that even in his own Department quite a number of those who occupied high positions were men who originally hailed from the provinces. Through being located at Headquarters it naturally fell largely to the Engineer-in-Chief to play a leading part regarding the "technical increment" and the Departmental technical examination, but here also others could claim a share, and as early as February 1894 the speaker had officially advocated the introduction both of "double increments" and a definite "technical examination" of telegraphists prior to promotion. Mr. Newlands ventured to assert that the C.T.O. still produced officers possessed of as high technical qualifications as in former years, men whose services ought to be made use of by the Department. It was also worth pointing out to the members of this society that the Department for nearly 50 years had produced from within the ranks of the Telegraph Service all its engineers-in-chief, with one solitary exception, also all its controllers and chief superintendents, &c. This was a remarkable fact and one to ponder over. Colonel Ogilvie had remarked that the Department had not been altogether free from mistakes. Well, no Department that ever existed and no large business of any other kind could possibly avoid making occasional mistakes, but the practical closure of the Engineering Department to the class of telegraphists was undoubtedly a mistake of that kind, for which, in the speaker's most serious opinion, the Department ought to find a definite and early remedy. If a clear prospect of promotion is placed before a large body of men there will always be found some who will qualify themselves to climb such a ladder, but if the prospect be removed then the effort is almost certain to be reduced. It was somewhat singular that the drop in the number of promising candidates for Engineering appointments and the closure of this very excellent line of advancement for the best brains of the Telegraph Service should have synchronised with the advent of that particular Engineer-in-Chief who was not drawn from the ranks of the Service.

As regards the question of reward for higher qualifications, Mr. Newlands pointed to the fact that he had persistently advocated for some years past that the relatively small body of "Dirigeurs" should receive an allowance in respect of their special duties, and he sincerely hoped that the Department would ere long see its way to grant this extra emolument. In the outside world to-day whether in Muniton Works, or in any form of "controlled establishment," it was the generally recognised practice to pay at a specially enhanced rate for such skilled knowledge.

The Engineer-in-Chief had rendered a conspicuous service by writing this paper. There was much valuable material in it that should be thoroughly discussed in the best interests both of the Service and of the staff.

Mr. McEWAN said he noted that Mr. Moir remarked that it was a pity and to be regretted that there was no written record of the history of Sir William Slingo's Telegraphists' School of Science. All that was known was, so to speak, "behind the veil!" That remark had raised the curtain of memory as regards himself (Mr. McEwan) and encouraged him to take up their time for a few minutes. He was glad to see a few others there who like himself, had witnessed the Alpha and Omega of Sir William Slingo's distinguished career. It was a coincidence that his service began at the time of the terrible war between France and Germany, and was humanly speaking, terminating with the present horrible cataclysm which was convulsing civilised nations. A sad coincidence and a sorrowful reflection! Sir William as a youth—and we remembered him so well—usually carried various science primers in the pocket on one side of his jacket and a store of good apples in the pocket on the other. "Nourishment," he would remark, "for mind and brain!" Human, natural, chummy and sociable he enjoyed the laugh, the joke and the quiet fun which were to be found in the C.T.O. in the old days and even yet! He possessed in a marked degree the great faculty of being able to assimilate from scientific and technical works in the briefest possible time sufficient of their essentials to enable him to come triumphantly through many examinations. That was a rare gift.

Their chairman that night was a well-known literary man, and it might interest him to know that he (the speaker) had in his possession two numbers of the old *St. Martin's Manuscript Magazine*, dated 1874, to which Wm. Slingo was then contributing science articles under the *nom de plume* "Discipulus Obscurus." That magazine was run by literary "young bloods" of the C.T.O., Wm. Slingo being of the number. Telegraph men present would know what was meant when he said Sir Wm. was a "real good man" at his business in all its departments. They were many in the C.T.O. That

was the highest form of praise which, as far as his (the speaker's) experience went, one top weight telegraph man paid to another! No fast sender could "run him down," for Wm. Slingo had a very neat, fluent and facile pencil.

Sir William planted seed of his school in 1876 and in due course it flourished. Were he (the speaker) asked what was the most memorable event in his 45 years' service, he would say the initiation, advent and development of the "Telegraphists' School of Science."

It was accepted with enthusiasm by all with a mind to learn. Its success was extraordinary. William Slingo developed teachers of distinction from his own student material. Many of them are now distinguished officials. These teachers in a marvellous way inherited the traditions of their own mentor for kindness, consideration, painstaking and camaraderie.

As a teacher of Elementary Science, Wm. Slingo was second to none and, if anything, developed the natural kindness and tact which were characteristic of the man. He had a splendid professional bedside manner with the patient who failed, as some of them did, to assimilate as promptly as others the scientific physic he had to imbibe! The dose was deftly watered down so that the patient got some good from his lesson and found a rare good friend in Professor William Slingo!

To those who after the professor's science sermon waited, as many did, to come to a further knowledge of the truth!—scientific truth—they ever found a guide, philosopher and friend in their genial principal!

If, on occasions he applied the term "fathead!" to the slower souls on whom the "truth" dawned, he did it with such a friendly blink in his eye that one almost wished he had been called something stronger!

The spirit of brotherhood was a remarkable feature throughout the career of the school. Its great success evidenced the marked ability of its teachers and the amount of real hard work done by all concerned. As a token of the spirit of the students, the speaker mentioned that he had congratulated many prize winners, medallists and scholarship winners on their success, and the common note struck was that they were pleased because it was another honour for their good old Science School and their kind and able teachers.

He was sure his friend Mr. Mansbridge—sitting in front—had nothing but the happiest memories of his own days in the school in which he was distinguished both as student and teacher.

They were proud to hear Sir Wm.'s address that evening. It merited their serious consideration for it was the outcome of a rare experience.

In commemoration of the banquet given to Sir Wm. Slingo some years ago, on his accession to the position of Engineer-in-Chief, by his old students, the speaker had written some verses and the hopes expressed therein were now in part fulfilled. The last two lines were as follows:—

"And still a greater glory may all here live to see

May we hail him yet Sir William with honours K.C.B.!"

The title had been achieved and in conclusion he could assure their genial chairman that he (the speaker) with many others was still awaiting the realisation for Sir William Slingo of the richly merited honour of K.C.B.

Mr. Morr said that the society's new method of deciding upon the subjects to be discussed at the meetings first, and choosing the lecturers afterwards had much to commend it, and he considered that they were fortunate in having secured Sir William Slingo to address them upon technical training in the Post Office. There was no greater authority.

The first half of the paper dealt with the author's own immediate connexion with technical training in the Post Office in London, and as such it contained much information which was new to many of the members. It formed a straightforward historical narrative which could not fail to be of general interest. Mr. Morr thought that the students belonging to Sir William Slingo's classes were not difficult to identify because of the hall mark which they carried, but in case of doubt it would be found that they were always willing and always proud to make manifestation of the faith that was in them.

Mr. Morr stated that the paragraph which interested him most in the latter half of the paper was that which dealt with the training of engineering workmen. Difficulties had apparently been experienced with the educational authorities elsewhere, but in London quite the reverse was the case. The London County Council, hearing of the efforts which the Post Office was making to give technical training to its workmen by means of evening classes conducted on Post Office premises, intervened and claimed that as the educational authority in London, such work should fall to them.

Conferences were subsequently arranged with the Board of Education, London County Council, and the Principals of the Technical Colleges at which the Post Office was represented by his Senior Assistant and himself. After a number of meetings the syllabus acceptable to the Post Office was at length arranged for, and the scheme of evening classes under the new conditions was launched in the autumn of 1913. The result was extremely satisfactory. The number of students attending the classes jumped up from 271 to 1,042—(Cheers)—and so large was the number of attending certain of the colleges that arrangements had to be made for opening an increased number of centres in the following year.

With regard to the examinations it was insisted that they should be conducted by the educational authorities themselves, but in order to secure co-ordination throughout the London district, it was agreed that the questions set by each of the colleges should be submitted to the Superintendent Engineer, and that samples of examination papers should also be forwarded for comparison before the result of examinations were finally announced. It was found that this method of dealing with the examination problem worked with great smoothness and was apparently satisfactory all round.

Mr. J. J. TYRRELL said he hoped Colonel Ogilvie would forgive him for not accepting what appeared to be his very pessimistic view regarding the technical increment and the practical results of the same. From personal observations over a number of years, he could confidently state that the Department had derived very considerable benefits from many of the staff who had obtained the necessary certificates. There was admittedly a proportion of men who, once having passed the necessary examinations, troubled themselves very little thereafter concerning the subject, but on the other hand the Department was frequently very splendidly, if most ostentatiously, served by quite a considerable band of devotees of the science of Slingo. This was particularly so in all parts of the C.T.O., and there was no doubt but that other offices could show equally good records.

Sir William paid a magnificent and ungrudging tribute to the Commercial Branch when he estimated—and rightly so—that they were capable of running an office like the C.T.O. all but unaided by the Engineering side. The branch accepted the tribute with due modesty and looked forward longingly to some of the emoluments.

Speaking with some fair knowledge as a student, and with a smaller knowledge as a teacher, he would like to endorse the spirit of what had been said regarding the necessity for technical training. He would like to emphasise that no person was qualified to teach the technical side of telegraphy who had not had a thorough grueling of the manipulative and traffic side. The matter of technical training of the staff, however, needed careful overhauling. If he might be permitted to tender advice or suggestion it would be this:—To the Department, call together the qualified teachers, and even the one or two amateurs within your gates. Out of this combined wisdom it should be possible to create a system worthy of the British Post Office. To the staff, he would say overhaul your ideas regarding the necessity of promotion by mere seniority and see if the wider viewed policy of "Efficiency First," with the necessary safeguards, be not the most practical ideal.

ENTERTAINMENT TO WOUNDED SOLDIERS AT BRISTOL.

On Saturday afternoon, Nov. 11, the clerical staff of the Bristol District Manager, provided an entertainment at the Y.M.C.A. Hall for 120 wounded soldiers from the Beaufort Hospital, Bristol. The gathering, which was entirely of a social nature, opened with a musical programme under the direction of Mr. A. T. Mass, the various items being contributed by Mr. and Mrs. F. Southby, Miss Blanche Davis (comedienne), Miss Norah Wills (cello), Messrs. F. A. Wilshire and Fred Hunt giving humorous selections. Mr. F. Southby ably presided at the piano. Interest was added to the meeting by the presence of the District Manager who, in a brief speech, welcomed the "boys," expressing the hope that they might thoroughly enjoy themselves, and judging by the continued applause which greeted the efforts of the artists, there was no doubt on this score. The musical



Bristol P.O. Telephone.
Entertaining Wounded Soldiers
Y.M.C.A. Nov. 11, 1916

portion was divided so that the men might partake of refreshments of which a liberal supply was provided, and after the guests had sufficiently regaled themselves, an extremely hearty vote of thanks was voiced by Mr. Larcombe, and suitably responded to by Mr. Bates (District Manager).

Before the soldiers dispersed, a flashlight photograph was taken of the whole of those who had taken part.

In passing, special mention must be made of the very able way in which the ladies present endeavoured to make their guests feel thoroughly at home, and that they succeeded was evidenced by the fact that the "boys" seemed loath to leave. The National Anthem concluded what had turned out to be in every direction a most enjoyable time. It may be stated that arrangements for another entertainment as a New Year's party are being proceeded with.

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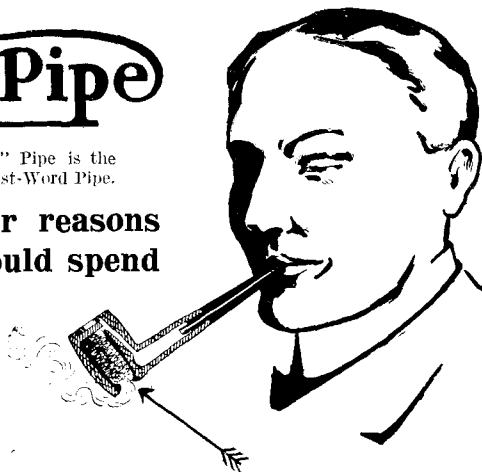
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SOME APPREHENSIONS AND A MORAL.—IV.

BY JOHN LEE.

PROFESSOR ARNOLD of Bangor has published a little book containing addresses which he gave last year at meetings of the Workers' Educational Association. One of these addresses contains an account of Guild Socialism. It is a brief account, written in non-technical language, but it contrives to bring into the foreground one or two aspects of this new theory which bear upon the reconstruction which will be necessary so soon as the war is over. It shows the possibility of administration including two legislative bodies, roughly corresponding to the two Houses of Parliament. One of these bodies would represent what we call the administration and would include managers, directors and heads of departments; the other would represent those whom we call the workers. Both bodies would consider every change in working methods, and they would aim at some correlation of interests in a way not altogether unlike the original theory of the House of Lords and the House of Commons. We can get similar light from Mr. Branford's book on reconstruction published under the title, "Janus and Vesta." Mr. Branford looks to a bicameral system of legislation which would include a representative house based upon the geographical system of constituencies and a representative house based upon the "occupational" system. There would be representation by place of abode and also by method of employment, using this in its widest sense to include both professional, artistic and industrial employment. This, says Mr. Branford, has been the indeterminate aim of the whole process of bicameral legislation, and perhaps the constitution of the present Government with its element of "occupational" representation lends some colour to the hope that a drastic change is before us.

It would be a presumption at the moment to suggest that the vast industrial population would be wiser if it aimed in this direction instead of fighting merely for the *status quo ante bellum*. For it is possible that by so doing they may apprehend the loss of much which they have gained by years of toil. But in our own realm which, though a narrower realm, is still to some extent a microcosmos of the whole, it might seem to be possible there to introduce some system of representation which would enable the merits of the *status quo* to be considered in parallel with the merits of the some advance other than the bare and bald restoration of the older conditions. I think that the apprehensions to which I have referred find their basis in the fear lest conditions after the war may be worse than before the war, rather than in the fear lest the conditions should not

absolutely be restored. I do not think that the precise details of the earlier conditions are sacro-sanct, but that if some general change or development could be brought about to provide a more alluring vista for our brethren the details of the restoration of conditions are capable of discussion. But this should be done, I think, with full and frank representation of all grades. There are difficulties in the way, I know, but they are not insurmountable. I cannot believe that the great body of Post Office servants, in choosing representatives for such a partaking in the work of administration, would be other than constructive immediately the central aim of their responsibility was changed from that of mere criticism. For mere criticism of other men's achievements is a soul-deadening thing, and the finding of fault becomes a habit which fails to see such virtues as do exist and tends to become bitter and suspicious in thought and acrimonious in expression. And there might follow a sensible solution of that problem of problems, the promotion question, for I cannot conceive that a widely based representation would desire to see great responsibilities in the hands of men and women who were not competent to undertake them, whatever their personal qualities might be, though criteria of general fitness would enter which have only been recognised in recent years.

When the Archbishop of York preached the Coronation sermon he took as his text, "I am come among you as one that serveth." The word "administration" has similar elements in its connotation. To come to the general service is not weakness. It will call for strength, but that is not quite the same thing as domination. It will widen its vision to a considerateness which will strive that no claim may escape, but that is not to lower discipline. The word "discipline" itself will call for a new rendering in which leadership and guidance, and indeed teaching, are factors. The sum total of administration would not be weaker nor would its arm be shortened if it were enlightened by close contact with representative ideas. Only they must be representative; they must not be sectional, nor must they have particular theories as their aim, beyond the true interest and the real welfare of those whom they represent. The future expansion of the Telegraph and Telephone Services, not separately but intertwined, on which subject I take leave to be a convinced optimist, will open the way for such a consideration of the re-adjustment of our human forces as will give full and free play to all the qualities of statesmanship which we can gather from every quarter.

* * * *

Thus, I think, the moral meets the apprehensions. A scheme of this kind might be drawn up in detail and I should not be afraid of the attempt, but it is wiser that the first step should be taken openly by those who have a better claim to representative knowledge than I have. So far as my contribution is concerned it is

to declare my faith, both in those who would form that wider representation, my own fellows of many years' intimacy, and in those to whom the responsibility of present-day administration falls, who are both in insight and in sympathy far in advance of the position currently assigned to them. I should like to see the new re-adjustment of industry begin in the Post Office: I should like the result of the years of agitation to be the building of a basis of construction which would give us all, according to our several capacities, the opportunity for unity of purpose and aim which in the past has been a sore lack. For when the spirit of fellowship becomes an inspiration and articulation is given to that spirit of fellowship, we shall learn that there is much that is good to be drawn from sections of our fellows to whom perhaps we have hardly given due credit in the past. And though there may be differences of opinion and disputes about method, they will be frank differences and disputes which are not devoid of mutual respect, for we shall have learned that the essay to concord is far more likely to achieve progress than the fostering of discord.

SHOULD THE PHONOGRAM ROOM BE STAFFED BY TELEPHONISTS OR TELEGRAPHISTS ?

I.—MR. C. G. JONES' PAPER.

BEFORE actually entering upon the subject of this paper it will perhaps be an advantage if we examine the work performed in a phonogram room and consider for a moment the character of the finished product.

It is probably known to all here that the work divides naturally into two classes—the phonogram, in which the transaction is direct with the subscriber, and the telephone-telegram, dealt with between two post offices. In either case the result is a telegram subject to all the rules and regulations governing telegrams, and demanding that degree of accuracy and speed of treatment without which telegrams would be useless as a feature in the business and social life of the country. These telegrams differ in one point from other telegrams inasmuch as they have special and distinctive names indicating that the telephone has been used as a means of transmission.

Why this should be, I am somewhat at a loss to understand, as it would be equally reasonable, and quite as useful, to give a special name to other classes of telegrams to indicate the means of transmission which had been used.

Apart from this peculiarity in nomenclature, they possess special distinction only in the fact that the telephone has been used in one stage of the transaction. In these days, when telephones are almost as common as fireplaces, and every office boy (or should I say office girl) has more or less practical acquaintance with this means of rapid communication, the instrument has fewer terrors than was probably the case twenty years ago and, compared with the fearful and wonderful specimens of telegraphic sending which telegraphists meet with in the course of every day's work, the reception of a phonogram is something in the nature of a holiday task, and to many telegraphists preferable to the nerve-racking ordeal of receiving telegrams on a Morse circuit from a sender who, in order to show initiative, or perhaps to avoid monotony, has improved upon the Morse alphabet until any likeness to the usual and standard signals is almost lost.

It is, of course, essential that the officers performing duty in a phonogram room should be acquainted with the use of the instruments with which they have to deal, just as it is necessary for a telegraphist to have a knowledge of the working of the various types of telegraph instruments, but there is no comparison between the training necessary to acquire the knowledge in the case of telegraph apparatus and in that of phonogram working. In the former many months are necessary and, indeed, an officer is rarely fully qualified as an all-round telegraphist in a large office under two years. The necessary training of a telegraphist called upon to do phonogram work is a very simple matter and takes at the

maximum about 50 hours, but during the greater portion of this time she is doing practical work although under the supervision of a senior officer. In very many cases much less time is necessary, but it must be remembered that the officer is already equipped with a full knowledge of the treatment of telegrams and has merely to gain familiarity with telephonic dictation and reception.

This full acquaintance with telegraphic rules and procedure is the secret of success in dealing direct with the subscriber, who expects, and frequently demands, much information as regards destinations, charges, probable time of delivery and other details of a like nature. To give satisfactory answers to the questions put is often difficult, even for an experienced officer when dealing with inland telegrams, but the difficulty is enormously increased in the case of foreign telegrams with their complex charging and counting and the many different rates for ordinary, deferred, week-end, Marconi and other variations.

Then again it is essential that when receiving a phonogram everything in connexion with it shall be in order before the transaction is completed. Very much delay often occurs when it is necessary to communicate again with a subscriber, in order to verify a destination or other detail, as frequently, in such cases the subscriber cannot be reached and the phonogram has to await his return. This almost invariably leads to a written complaint. So essential is this matter that, when the staffing of the C.T.O. phonogram room was largely taken out of the hands of the telegraphists, checking officers had to be installed to examine every form before it left the room, and their services were justified. That this was in consequence of want of telegraphic knowledge on the part of the staff, rather than inexperience, is proved by the fact that this checking is still necessary. Telegraphic knowledge is required to a very great extent also in dealing with the sub-offices as many of the assistants have little experience, and the expert guiding hand prevents many errors and cases of incorrect treatment.

It may be thought that the acquirement of the necessary knowledge of the treatment of phonograms is easy to officers other than those with practical knowledge of telegraph working, but when it is remembered that the telegraph rules contained in the instructions number 274, many with six or more sections, and, in addition to these instructions there are, in the C.T.O., some hundreds of local instructions regarding the treatment of telegrams, it will be seen that only a telegraphist who has had considerable service and has become familiar with all the essential points, can be expected to avoid the many pitfalls awaiting the inexperienced phonogram officer.

Experience in the use of the telephone is certainly a factor in the situation and forms the basis of phonogram working, but it has been shown that the necessary qualification in this respect is very quickly gained.

It will probably be admitted that, although it is advisable that a bootmaker should be acquainted with the various qualities of leather, a man might be an expert in leather but a remarkably poor bootmaker, in which case the resulting product would be decidedly unsatisfactory. The possession by phonogram operators of a certain amount of circulation knowledge is very desirable as this may lead to the detection of an incorrectly circulated telegram at an early stage and prevent additional and, perhaps, considerable delay. A knowledge of commercial terms and expressions, of Stock Exchange phrases and names, and the thousand and one things which are everyday matters to the telegraphist are equally essential items to the phonogram operator and, in fact, apart from the actual manipulation of telegraph instruments, it is difficult to see in what respect any portion of the all-round knowledge which should be possessed by a good telegraphist is not equally necessary in a phonogram room. It may be thought that too much weight is attached to this matter, but from the result of actual experience it is known in what a great number of cases mistakes have been made in consequence of the absence of telegraph experience.

Even in such a small matter as errors due to bad or indistinct handwriting such experience will tell. The telegraphist has been accustomed to meeting and overcoming such difficulties throughout her service.

Points of this character could be multiplied to a very great

extent if time permitted, but I will only add that the most useful type of phonogram operator is one having not only a practical knowledge of telegraphist's duties but of those also of a counter officer, and the measure of her value is the degree to which she most nearly approaches the perfect officer of both types.

There is a point I should like to mention at this stage and that is nervous strain. Either the dictation or reception of phonograms, or the sending or receiving of telegrams on telegraph lines when continued for long hours is an ordeal for the nerves, and the telegraphist of experience has the power of resistance to this nervous strain in a very high degree. Cases of hysteria amongst female telegraphists under the most trying conditions are extremely rare. The C.T.O. phonogram room has shown that a remarkable difference in this respect exists between telegraphists and non-telegraphists.

The volume of work in a phonogram room fluctuates very considerably and the no-delay service expected by the subscriber, together with reasonable economy, can only be attained by the ready availability of reserve staff.

In a large telegraph centre one of the elements in the rapid handling of traffic is to have incoming work dealt with as near as possible to the point where it will be transmitted, thus saving loss of time due to handling and conveying by tube or other means. For this reason phonogram sections should be in close proximity to telegraph sections, and, I believe, in the majority of the large offices in the country are so situated. When the phonogram room is staffed by telegraphists additional staff is quickly available. In the C.T.O., for instance, it is difficult to imagine how the phonogram room could possibly be worked without calling upon the telegraph staff freely for assistance, and this interchangeability is a feature of great utility as there need be little waste time when staff is available for use in both sections.

In conclusion, it must be admitted that a phonogram is essentially a telegram, and requires telegraphic knowledge on the part of the officers dealing with it in order to guard against error and delay. Long experience of the work done both by telegraphists and officers of other grades in the largest phonogram room in the country confirms the statements made to-night.

At the same time I should like to say that, in my opinion, telephone operators have done some very good phonogram work indeed, subject to their limitations in the non-possession of telegraphic knowledge, but this does not alter the fact that a phonogram requires to all intents and purposes the same treatment as a telegram, and that a telegraphist is the correct and proper officer to deal with it.

II.—MR. H. DIVE'S PAPER.

You have all, I suppose, heard of "potted plays," and this society has decided that you should make the acquaintance of "desiccated debates": at least, that is the only reason I can suggest for crowding two debates into one evening. However, the time at our disposal will, I daresay, be long enough to prove that the phonogram room should be staffed by telephonists, *under telephone conditions*. Would that I thought it probable that what we have proved we should be permitted to practice.

Oliver Wendell Holmes has said the "race is divided into two classes, those who go ahead and do something and those who sit still and inquire 'Why wasn't it done the other way?'" On this particular question the Department (I speak, as ever, of that awe-inspiring corporate something with profound respect)—on this particular question then, I say the Department has frequently inquired, "Why wasn't it done the other way?" and has continued to sit still. Is that, think you, because there has been no voice, nor any that answered? On the contrary the answer has swelled forth with trumpet-sound time and time again, but so far it has fallen on ears that are dull of hearing. To-night, let us see if we cannot make the "Trumpet heard in the City."

"Expect the best and prepare for the worst," runs an old proverb, but experience might suggest its revision "Expect the worst and prepare for the best."

I have read that over the door of the ancient library at Thebes are the words: "Here the Dead open the eyes of the Living,"

and I have at times thought these words might aptly be reproduced over the door of—well, an apartment appreciably nearer than Egypt. As in Thebes so here—the Dead may open the eyes of the Living but can the Living open the eyes of the Dead? That latter were a miracle indeed, yet let us attempt it.

And to essay the task in appropriate style let me endeavour to show that the phonogram room should be staffed by telephonists for at least three reasons:—

- (1) Because it is in the interests of the public. I put this first as we live in Democratic days.
- (2) Because it is in the interests of the Department. I put this second because I haven't put it first.
- (3) Because it is in the interests of the Department's staff, telephonists and telegraphists alike. I have put this third because it is the most important.

Let us examine number one somewhat more closely.

Because it is in the interests of the public.

Mrs. Browning refers in one of her poems to "a gracious public full of nerves." Now we of the Telephone Service know well enough that whether the public be gracious or not it is certainly "full of nerves," and we spend our lives endeavouring, with some show of success, to soothe those nerves.

It is an old story that the telephonist is selected because her personal qualities fit her for the particular duty of speaking over the telephone and coming in direct communication with the public. She receives also a carefully prepared course of instruction further to fit her for this duty, and she is whilst in a telephone exchange (permit me to emphasize that point) *whilst in a telephone exchange* closely supervised in order to see that she gives service which justifies the care and training spent upon her. It has been pointed out time and time again that the telephonist is trained to work with

Care and Correctness,

Celerity,

Clarity and Courtesy.

(and it has been written that "true courtesy implies a great many real virtues of self-restraint, gentle consideration and patience").

So much for C. But if our maidens are to be employed in the C.T.O. we may very well pass on to the T and the O, and we find these gifted girls are tireless, tactful, thorough and thoughtful, as well as obedient, obliging and observant operators. I confess you may find telegraphists who are the embodiment of some or all these qualities, but I say the telegraphists as a class are not selected for qualities of this kind. We have it on the authority of no less a master of research than Mr. Maycock, that although the perfect woman may not be the perfect telephonist yet so complete are the virtues of the perfect telephonist that she must perforce be proclaimed the perfect woman.

It may be said, however, that to make the perfect "telephonographist," a knowledge of telegraph rules is required no less than a silver tongue. After all "one handful of common sense is worth a bushel of learning." "Nevertheless," as Samuel Butler remarked in another connexion, "one had better know the rules, for they sometimes guide in doubtful cases—though not often." But the telephonist is:

"Happy in this, she is not yet so old

But she may learn; happier in this,

She is not bred so dull but she can learn."

In official papers I have read it as the expressed opinion of a highly placed officer of the C.T.O., that the telephone staff "show a rigid adherence to method and failure to grasp principles." It is quite possible that the telephonist has the defects of her virtues, but it is clear that a telephonist does not adhere rigidly to method simply because she is a telephonist but because such a course is desirable in telephone work and she has been receptive of the teaching accorded her. Trained in her early years of service to deal with phonogram work there is no doubt in my mind that the same girl would show a ready faculty to "grasp principles" yet not I trust to ignore method.

Yes, the telephonist could with advantage to the public staff the phonogram room. She does so in all the large provincial offices, and the testimony of all is that she does the work with credit to herself and advantage to the Department. The prime trouble

in the London Phonogram Service is that long delays are experienced in securing replies from the phonogram room, and these delays continue although telephonists are now working in the C.T.O. The delays continue, mark you, *in spite of that fact, not because of it*. The record table at the Trunk Exchange meets an almost similar demand with an answering time well under three seconds, but the trunk record *telephonist is subject to telephone conditions*. You ask what does that mean—well, for one thing it means that no record operator has ever complained that she found difficulty in understanding her supervisor's remarks because the mouth of that supervisor was filled with salmon and cucumber. It also means that as the work grows additional staff are drafted in to meet the load. If a subscriber wants trunks he gets them, and does not, as a friend of mine told me when he wanted phonograms, he had been

Up and doing
With a heart for any fate
Still a calling, still a flashing,
Had learnt to curse and learnt to wait.

Let us pass now to No. 2.

Because it is to the advantage of the Department.

To begin with it is to the advantage of the Department, because it is to the advantage of the public (Q.E.D.—Telegraphists love such symbols, particularly if they embrace a Q) and the Department exists but to serve the public. Again it is to the advantage of the Department because if staffed by telephonists and placed under telephone supervision the work could be grafted on to the work of one of the large exchanges (preferably the Trunk Exchange) and staff savings could be effected whilst improving the quality of the service—a fact which would have double action in saving clerical staff as well as manipulative staff, and at the same time secure a satisfied public—a rich blessing indeed!

At the present time too when telegraphists are so much in demand for war work, it seems obviously the right course to free them for duties which they alone can perform, leaving this phonogram work to those who can do it at least as well.

Come now to No. 3.

Because it is in the interests of the Department's staff—telephonists and telegraphists.

It is to the advantage of telephonists because it is telephonists' work. The telephonist, as I have already stated, has been trained to deal directly with the public, and it is to the advantage of telephonists that they should fill all the posts calling for those qualities which they possess before and beyond all other classes. I won't labour the fact that if she performs this work (as she does at present) she is entitled to fill the supervisory posts.

Again delays at the phonogram room are the bane of the life of the exchange telephonist, and if the work of answering at the C.T.O. were performed by the same class under one central authority it would be impossible to tolerate a continuance of the condition of things which has obtained in the past, and the life of the exchange telephonist would be brightened by an instant answer from telegrams.

The telegraphist on the other hand, is not specially selected for this direct communication with the public, and to her such duties must often prove a sore trial. It is, of course, possible to argue that telegraphists suitable for the work could be selected, but here's the rub. At present the telephonists are chosen by one with infinite experience of the qualities required for this work—she herself having been selected as a model of all the graces: but telegraphists are chosen for other qualities, and it might happen that the selection of suitable officers was left with one who was, let us say, of Irish extraction, and not entirely free herself from traces of a provincial dialect. Would her ear, think you, detect at once the dangers of dialect, and if not might she not be saddling some super-sensitive maiden with the task of speaking to a public who could not comprehend her?—What a sad case for a nice girl!

We know also that telegraphists are (no doubt rightly) a proud class, proud of their knowledge of the mysterious Morse alphabet and their ability to tap it out to distant points. How it must gall a person of such superior talents to spend their time doing a duty which the modest telephonist can perform not only equally well but probably better.

To sum up then—

The work is essentially work for telephonists, and further, work for the Telephone Service. It can be handed to the skilled telegraphist at the point at which his or her knowledge is required. By such a course benefit would accrue to

The Public
The Department
The Staff, let us then

say to the powers that be:—

"Begin, be bold, and venture to be wise;
He who defers this work from day to day,
Does on a river's brink expecting stay,
Till the whole stream which stopped him should be gone
That runs and as it runs for ever will run on."

TELEPHONE DEVELOPMENT IN RUSSIA AND SCANDINAVIA.

BY W. H. GUNSTON.

RUSSIA.

DOUBT has been expressed more than once in the JOURNAL of the probability of any telephone expansion taking place in belligerent countries during the dislocation of business which has necessarily ensued as a result of the great war. It is gratifying to find from a return recently received from Russia that in that country at least a steady development of the telephone system had taken place up to January 1916, which, if not so rapid as in peace time, is in the circumstances very satisfactory. A similar return was last received from Russia in 1913, and a comparison of the figures for the two years may be of interest.

The total number of telephones in the Russian Empire is given as follows:—

	Jan. 1, 1913.	Jan. 1, 1916.
European Russia	239,900	363,200
Asiatic Russia	12,600	18,600
Finland	35,200*	35,200*
	<u>317,700</u>	<u>417,000</u>

* July 1, 1911.

If the 18,600 telephones in Asiatic towns be deducted and a small allowance made for an increase in Finland since the middle of 1911, it will be seen that there are upwards of 400,000 telephones in European Russia. This figure is only exceeded in Great Britain with about 800,000 and Germany (pre-war figure) with 1,420,000 telephones.

Comparative figures for 1914, 1915 and 1916 (excluding, however, the Finland and certain privately-owned and railway telephone systems) are given in the return. They show a progress during seventeen months of war as follows:—

January 1914	279,400 stations.
" 1915	311,700 ..
" 1916	324,500 ..

The development of the chief towns is as follows:—

Government Systems.

	1913.	1916.
Astrachan	1,355	1,646
Archangelsk	602	965
Ekaterinburg	737	1,056
Ekaterinoslav	1,701	2,757
Irkutsk (Siberia)	1,283	1,452
Kazan	1,504	1,992
Kharkov	3,991	5,073
Kiev	4,635	6,143
Lodz*	4,103	(4,614 Nov. 1914)
Nikolaev	987	1,021
Perm	667	938
Reval	1,228	1,838
Samara	1,243	1,670



TELEGRAPH
AND
TELEPHONE
CABLES.

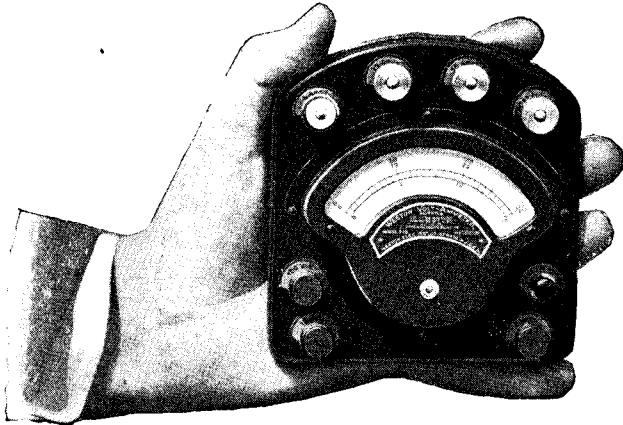
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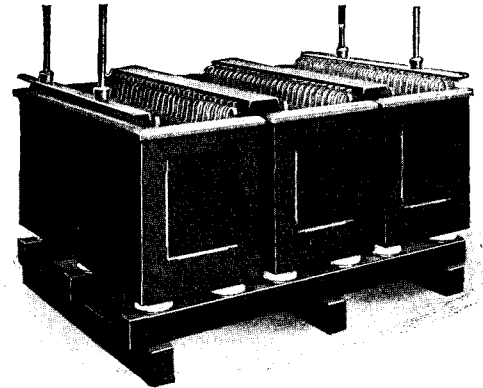
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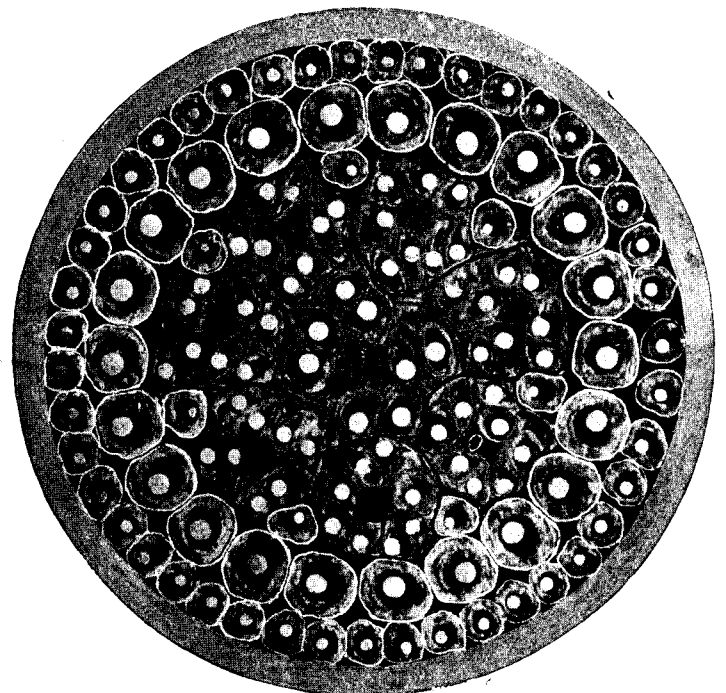
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Saratov	1,524	2,032
Tiflis	1,459	2,060
Tomsk (Siberia) ...	992	1,200
Tula	700	1,071
Tsarskoe Selo ...	780	1,088
Vilna*	1,821	(994 Sept. 1915)
Yaroslav	823	1,188

Concessionaires.

Moscow	43,348	57,358
Odessa	6,842	8,078
Omsk (Siberia) ...	814	1,295
Petrograd	46,842	62,939
Riga	8,876	7,320
Tashkend	740	1,156
Vladivostok	851	1,238
Warsaw*	28,935	(32,804 July 1915)

Leased Telephone Systems.

Baku	4,128	6,137
Nijni Novgovod ...	1,439	2,284
Rostov-on-Don ...	3,801	4,909

* At present in German occupation.

Petrograd now takes eighth place in number of telephones among European cities, London having about 270,000, Berlin (pre-war) 195,000, Paris about 100,000 (pre-war), Stockholm (Jan. 1, 1916) 103,115, Hamburg (pre-war) 77,000, Copenhagen (April 1916) about 65,000, Vienna (pre-war) 64,000, Petrograd 62,900. The pre-war figures are given for what they are worth, and this order of numerical superiority may well have changed during the last two years.

SWEDEN.

The total number of telephones in Sweden increased during the year 1915 from 254,821 (of which 169,794 belonged to the State) to 271,797 (181,222 State). The telephones in the principal towns increased as follows:—

	Jan. 1915.	Jan. 1916.
Stockholm (State) ...	62,721	66,808
.. (Company)...	33,670	36,307
	96,391	103,115
Gothenburg	16,050	17,504
Malmö	9,561	10,047
Gefle	4,369	4,588

DENMARK.

The Danish statistics give the number of subscribers and not the number of stations. Between the end of March 1915 and March 1916 the number of subscribers to the different companies' systems rose from 117,395 to 132,706. As the number of stations in the first year was 134,603 it was probably not less than 150,000 in 1916. There are also some 2,000 State telephones.

The Copenhagen Telephone Company had 73,962 subscribers as against 66,566 in the previous year. The bulk of these are in Copenhagen and suburbs.

NORWAY.

The number of State telephones in Norway increased from 43,844 in June 1914 to 47,034 in June 1915. The number of subscribers on private companies' systems in the latter year was 41,669 (approximately 47,000 stations). The number of telephones in Christiania increased from 22,818 to 24,383.

TELEGRAPHIC MEMORABILIA.

FROM the Russian capital, at the beginning of the new year, came the following greetings for 1917 to the London staff:—

“Chef Bureau Central Telegraphes, London.

We beg our dear colleagues to accept our best New Year Greetings. May 1917 be the birth of a new era of peace and quiet for all nations, great and small, May the wave of blood and destruction be forever stayed, and those who were the instigators of it reduced to annihilation and their names handed down to

posterity for execration. May all humanity unite in one universal aim resulting in peace and prosperity.

Your Petrograd Telegraph Colleagues and Allies.”

To this the following was at once despatched in reply:—

“Chef Telegraph's, Petrograd.

Our warmest thanks to you and all our colleagues in Petrograd for your kind greetings.

Most sincerely do we reciprocate your good wishes and join most fervently in the desire that after the final destruction of Germany's military power the nations of the world, animated by the principles of justice, freedom and humanity, may steadily advance towards an ever-brightening future.

Mindful of the enormous sacrifices that Russia, Great Britain and our glorious Allies have made in this sacred cause, we pray that the friendship which has been cemented by the blood of our nearest and dearest may never die.

Chief and Staff Telegraph's, London.”

The question of “What is a Government telegram”? would appear to be a very simple one with an answer as ready as any supplied in the catechism. But is this so? At least, is this the case in the present unique circumstances in England to-day? True, there are telegrams which bear the correct prefix, are duly guaranteed and attested and are evidently and distinctly on Government business. Telegrams there are from every conceivable department of the State and from each of their subsections. Telegrams, diplomatic, military, naval, political; telegrams to mention even the class of which would be to give away Government secrets. Telegrams in cypher, telegrams in clear language, telegrams whose special prefixes denote the urgent need for rushing the mysterious jumble over the wires, telegrams the contents of which could apparently in times of stress with amply sufficient despatch have been delivered by post. All these types mentioned, legitimately and according to all rules and regulations, are unquestionably “Government” telegrams “within the meaning of the Act”!

Yet there are other telegrams at the present juncture of affairs which though they cannot be classed as “Government” traffic nevertheless bear an importance which is most closely associated with the welfare of the nation—even with its safety. Shipping, food, mineral, engineering, telegrams, especially certain of these which deal with our foreign trade, should certainly be classified in the category of urgent—if non-Government traffic. And Press telegrams to Allied and Neutral countries too! These have an importance which cannot be tangibly expressed, for it is very frequently by means of these agencies that the British views and position are made known to friends and doubtfuls abroad and before the subtle influences of the enemy have had time to thoroughly permeate the continental people.

The value of these informative cablegrams, on the top of that of the thousands of diplomatic messages which pass through the Anglo-Continental cables each week, is a measure of the importance of the Anglo-Continental cable system chiefly centred in the Cable Room of the London C.T.O. When one considers how much depends upon these lines of communication, one is thankful indeed for the British Navy which renders the service possible. These men are our naval linemen who keep watch and ward over the thin copper lines as truly as they are the guards of our white-cliffed coasts.

The British end of these lines is now chiefly worked by women telegraphists, only a diminishing male staff including the remnants of above-age Belgians remaining. Now while it is evident that the majority of the gentler sex are thoroughly proficient from a manipulative point of view, it is at times quite evident that the years of experience gained in the management of foreign worked circuits by the now exiled male portion of the staff, was a much more valuable asset than perhaps was formerly estimated. It is not a matter so much of the capacity of the two sexes as of experience which, despite all the later-day theories of “telegraphists complete in three months,” has always counted, does count, and do blessed ever will count in the art of telegraphy in general and with an Anglo-Continental system in particular. Nevertheless our women-folk have carried-on well, and if during

this last stressful Christmas-time many of them have shown signs of the extreme pressure and the long hours—what wonder?

Unfortunately the organisation of a Government telegraph office has practically no margin for elasticity of rules, and the nature of telegraphy and telephony is such that with a constant fight against Time, supervision and staff are always obsessed with getting on. Telegraphy and Telephony like Time and Tide wait for no man—or woman—and our work cannot be shut up in our office-desk to wait until the morrow, when we are lessed fagged.

Reverting to the importance of Anglo-Continental working, it was pointed out by an observer on a recent occasion that London has to keep in constant telegraphic touch with the various allied military headquarter staffs, and it would be interesting to be able to give some idea of how these communications are obtained and worked. That somewhere in this island of ours, telegraphists are daily dealing with this important traffic is evident, and that no expense should be spared to maintain an efficient service with traffic of so vital a character appeals at once to all lovers of our craft.

The writer was fortunate enough to be present at the reading by Mr. Harrison of his paper on "Keyboard Perforators" on the 8th ult., and to listen to one of the lucidly historic essays for which Mr. Harrison is almost famous.

One thing only could have been wished, and that, that the paper had been read prior to the Creed amalgamation, when we should doubtless have been witness of some of the pretty sword-play between rival inventors, and this view was very happily expressed by one of the subsequent speakers.

Mr. Newlands, Controller C.T.O., started a well-merited eulogy of Mr. Harrison's diagrams, which indeed formed a distinct feature. Subsequent commentators following Mr. Newland who made special mention of the careful mnemonic and helpful lettering, expressing the hope that other inventors would follow suit.

Mr. Creed in his usual well-balanced style, gently moderated the C.T.O. Controller's enthusiasm for the Creed or similar keyboard perforator, by emphasising the fact that although the single touch of such a keyboard might produce on an average the result of three stick-punched touches, it could not really be said that the output of a Gell was three times that of a stick-puncher. He said this without detracting one iota from the excellency of Mr. Gell's invention, which view the subsequent tribute paid by Mr. Harrison in his reply handsomely supported.

One thought that there was just a tendency to over-rate the results obtained by typists as against trained typist-telegraphists. There are some very strong opinions held in the C.T.O. respecting the typist who does not understand Wheatstone slip and who had no knowledge of telegraph apparatus until she first saw a perforator keyboard, and perhaps these have affected the writer's pen!

This meeting of the P.O.E.E. Society opened on a solemnly sad note by recording its deepest sympathy with Mr. Noble in the double loss of his wife by sickness at home and of his only son on the battlefield, the audience standing in tense silence for one brief space of time, each thinking his own thoughts of that

"One sad little story out of all the heaped-up sorrow of the world."

Mr. A. P. M. Fleming of the Westinghouse Electric Company, Manchester, who is an expert on industrial training, recently gave an account of the up-to-date scheme of training employees. The opinion of this expert appears to be that it is impracticable for youths to do effective study at night after a hard day's work in the shops, and the principle appears to be carried into practice in the above works where instruction is given to pupils during work hours. This view seems to coincide somewhat with the experience of the Post Office Stores Department as explained, if memory be correct, by Mr. Mansbridge at one of the T. and T. Society's meetings.

Electricity recorded, in common with the general public press, the destruction by fire of the telegraphic and electrical stores of the South-Eastern and Chatham Railway at Tonbridge during the month of December, when the telegraph main line wires were very seriously interrupted. None of the same press however appears to have noted—perhaps it did not know—the smartness

with which telegraphic communication was restored, a matter of but two or three hours, something approaching a record one would esteem.

J. J. T.

LONDON TELEPHONE SERVICE NOTES.

THE acknowledgments which are reaching Mr. Salter, the secretary of the Christmas Parcel Fund, show that the recipients greatly appreciated their *confreres'* remembrances and the care and thought spent on the gifts. It may perhaps be possible at a later date to give a few extracts from the letters received. In the meantime it is a pleasure to all who remain to wield that which is alleged to be mightier than the sword (even if not so sharp) to meet from time to time warriors on leave and to hear at first hand of their experiences. It is also gratifying to learn of the decorations awarded to *our* men and to know of their promotion to higher rank. We offer our congratulations to E. F. Arthur, one time of the Contract branch, who is Captain-Adjutant, an honour also borne by H. Stone, the Registrar. By the way the latter's two successors in office have both now been incorporated in the Armies of Britain. W. J. Clearer is by this time an old soldier in the A.S.C., whilst H. Morgan figures as a recent recruit in the R.E.'s. We are also glad to know that W. L. C. Rathbone who was recently awarded the Military Cross has now been advanced to the rank of Captain, whilst W. F. Dobson, the pre-war Manager of the Trunk Exchange (where he paid a visit recently) now carries the dignity of a full Lieutenant; and W. A. Catling—formerly an Assistant Clerk in the Accounts branch—has just been posted to the Northumberland Regiment as a Second Lieutenant. He served for many months as a private in France, took his discharge as a Time Expired Territorial, rejoined a Training Corps and in due course passed the examination for a Commission. This list does not purport to be by any means an inclusive one and scarcely a day passes without bringing news of the advancement of one or more L.T.S. naval or military members.

It is not alone, however, in the combatant forces that the members of the L.T.S. figure as war workers. Miss Liddiard, the Superintendent of the Revenue branch, has been loaned for six months to the Pensions Ministry in order to assist in the organisation of the women's section of that office. One can imagine the pleasure of those members of Miss Liddiard's staff who by a fortunate chance accompany her to these new fields of labour. Mr. Albert Gray, one of the senior First Class Clerks, transferred from the National Telephone Company's service, where he had won golden opinions has gone to aid the Food Controller, and we understand he was privileged to bear away with him an expression of appreciation from the women clerks of the Installation Section, of which he had control whilst in the L.T.S. It is always a pleasure to hear of these spontaneous expressions of opinion. Of the joy of receiving such we know nothing, but can imagine much.

Not content with the excitements of reality, those of our number who are responsive to the voice of rumour have recently been enjoying a period of continuous ebullition. One day they would be full of the possibilities of a new home for the Controller's office owing to the call for the immediate release of the Queen Victoria Street block as a hospital. A hospital indeed! Could any building be less suitable? Some over-imaginative brain must have conjured up a connexion between a most unpleasant smelling disinfectant and the fact that the building was aye odd o' form. (Sorry, dear Mr. Editor, it shall not happen again.) On other occasions the building was to become a barracks, an overflow for Adastral House, a branch of the Ministry of Munitions, and last but not least, an official residence for the Ministry of Labour. Yet it still remains *inwardly* a busy hive of industry, housing part of the staff of the Controller, L.T.S., and *outwardly* a gloomy looking structure pasted over with the most untidy bedraggled assortment of posters anyone could possibly imagine—and so probably it will remain.

The London Telephonists' Society met for the first time in 1917 on Tuesday, Jan. 16, and listened to two papers. The first, a prize essay, was contributed by Miss Baldwin of the Trunk Exchange—a prize winner in this and each of the two previous

sessions. Her theme was a familiar one though its guise was a new one. Miss Baldwin is also to read a paper this session before the Telephone and Telegraph Society. The other essayist was Mr. H. G. Corner of the Traffic Staff and Building Division of the Traffic branch (these notes won't appear before Feb. 1), and under the title of "The Struggle" those who were lucky enough to be present were interested and entertained by some unusual points of view of matters of every-day occurrence with the Telephone Service to provide the connexion. We hope to see one or both of these papers reproduced in this journal at an early date. Mr. Corner by way of preface to his remarks gave some account of the unofficial war activities of the staff of the L.T.S. It was indeed a record to be proud of and but for the fear of leaving no room for "Telegraphic Memorabilia," in these days of restricted space, we might be tempted to set out some part of the list here and now. But the subject is one which may perhaps be touched upon by Miss Heap in her address before the Telephone and Telegraph Society. If it is, it cannot fail to add interest to Miss Heap's paper and even if it is not, that paper (unless past experience is utterly to be belied) will be one of the most instructive and entertaining papers ever read before the society.

The Telephonists' Society are to have another meeting on Tuesday, Feb. 13, when Mr. John Lee will address them. The title of the paper is to be "The Influence of the Telephone in Social Re-organisation." An interesting night may be expected.

An account of the L.T.S. concert at the Post Office Hospital is deferred till next month.

REVIEWS.

A System of Physical Chemistry. By William C. McC. Lewis, M.A., D.Sc., Brunner Professor of Physical Chemistry in the University of Liverpool. (Published by Longman, Green & Co., 36, Paternoster Row, London. Vol. I, 523 pp. Vol. II, 552 pp. Price 9s. net per volume.)—During the last few years a knowledge of physical chemistry has become of more and more importance to the electrical engineer who would keep himself abreast of the developments of his profession, and there is no doubt that, after the war, there will be a still greater development of those branches of electrical engineering which are concerned with chemical processes. In order to be in a position to take advantage of the openings which will thus be available, the electrical student should make himself familiar with the laws by which these processes are controlled, and for this an acquaintance with physical chemistry is essential.

Until recently, the student who wished to proceed beyond the elementary stages of the subject was met with the difficulty that the information he desired was only to be obtained in books, each devoted to some one special branch, or from original papers. In addition, many of these books or papers were written in German, and were therefore, unfortunately, not accessible to a large proportion of electrical students in this country. About twelve years ago, however, the first of a series of text-books of physical chemistry, edited by Sir William Ramsay, K.C.B., F.R.S., was brought out, and the present volumes are the last which have so far been published.

The previous volumes of the series deal with special branches of physical chemistry, and, in these special branches, are probably somewhat beyond the requirements of the majority of electrical men. The present book, however, covers the whole ground of physical chemistry, and exactly meets the needs of students who, having some preliminary knowledge of physics and general chemistry, are "asking for more" in the way of general knowledge of this most fascinating subject.

The book is very clearly written, and frequent references are given, which enable the reader desirous of further information on any particular point to obtain it either from other books or from original papers.

It is one of the best treatises we have seen on the subject, and we can recommend it to anyone wishing to pursue his studies in this extremely useful and growing department of physical science.

How to Make Low-Pressure Transformers. By Professor F. E. Austin, Hanover, N.H. (Third Edition. 22 pages. Price 10 cents. E. & F. Spon, Limited, 57, Haymarket, London.)—The information given in this little book will enable the amateur electrician to build a 100-watt step-down transformer, which can be connected to the lighting supply of a house, and will give a variable secondary voltage suitable for many experimental purposes.

The instructions are clear and detailed, and we can recommend the book to any of our readers who are interested in practical work of this nature.

ANOTHER LETTER FROM GERMAN EAST AFRICA.

WE print another interesting letter from Mr. F. J. Ford, at present in Schinyanga, German East Africa:—

Although my letters to England seem to be going astray I have decided to make a further attempt to get news through and am taking advantage of the fact that both of my wires are down and will not in all probability be repaired by the native linemen I have sent out for some hours. The giraffes here are our greatest enemies, playing havoc with our lines from time to time, generally many miles from the nearest office. Baboons swarming on the lines also cause considerable trouble, while heavy rains and lightning storms always have disastrous effect on our poles and apparatus.

You already know that our force, the Lake detachment from Muanza, has performed the job with which it was entrusted; and, as a consequence, I expect shortly to be removed to another part of this country. I am pleased to say that our section has been very warmly praised and thanked by the authorities for the manner in which we have kept our end up in face of great difficulties and with a small staff whose numbers have been continually reduced by sickness. I am the only one who has not been in hospital.

The weather here is somewhat better now, but the September rains have changed the aspect of the country entirely. Sandy earth has been replaced by a green carpet and everything is fresher and brighter. The heavy rains are due to commence in a few days, and will turn the country into a vast swamp. The transport people are not looking forward to it.

At times now we have a chance of leaving the office for a bit; and the three of us occasionally go out shooting. We often bring home a buck for dinner, making a pleasant change from the everlasting ox-flesh. There are a lot of lions hanging about here at night, and some of the chaps in the supplies have been setting traps for them. A few days ago they caught a huge hyena, but have as yet entrapped nothing else.

Late in the afternoons when the sun's rays are less fierce I sometimes take a bicycle or a motor-bike and go for a spin through the bush, along the innumerable paths worn hard and bare by the naked feet of generations of natives going to and from the water-holes. I greatly enjoy these short trips. Every tree and plant is an object of interest and every insect also, being of types hitherto unknown to me. Birds of all colours are very numerous, and some of them are of huge size, particularly the eagles, gliding like aeroplanes hundreds of feet in the sky, which is as clear and blue as that above the Mediterranean. Yesterday I saw a large bird whose entire plumage was bright blue in colour; and on the same excursion I came across thousands of insects like locusts with wings painted with every colour of the rainbow beautifully blended together. I have secured a couple of ostrich eggs, will try to take them home, but doubt whether I shall be successful, as I may have to discard all unnecessary possessions later.

A few days ago my tent was destroyed by fire, caused by the carelessness of a native boy; so I now sleep in the old German Government house and fort here. During the night the place is invaded by insects of every description together with innumerable lizards and bats. All these creatures spend their evenings in crawling up the walls or falling from the wooden ceiling on to my bed; and I am often awakened by some of them dropping on my face or biting my limbs which, owing to the heat, it is often intolerable to keep well covered.

We are more fortunate just now as regards food, having had the luck to discover the means of obtaining a fair supply of fresh milk every day. Rice has also become very plentiful and comes in very useful as a substitute for vegetables. Our ration of sugar, however, never lasts the proper time; and as it is impossible to buy or eadge any round here we have to get on without it three days out of eight. We are inundated with tobacco as a result of the generosity of the inhabitants of Cuba,

The Telegraph and Telephone Journal.

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NOTICES.

As the object of the JOURNAL is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications, together with photographs, diagrams, or other illustrations, should be addressed to him at 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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EDUCATION.

It is not a little significant that so much attention should be focussed upon education in the very midst of the vast European conflict. All are agreed that some reform is needed, but so far there is little indication of general accord as to the direction which that reform should take. In our own Service there are indications of the same tendency. While we have been occupied with new duties, with wider demands upon the Services, there yet has been time to look into the future, not without a sense of apprehension. The technical examination, which is the normal preliminary to promotion, has been criticised: the method of Correspondence Classes which was adopted by the National Telephone Company has its supporters as an alternative. What seems to be clear is that we need some official and authoritative guidance in study, some co-ordinated system of education in the craft, which will cater for all and not merely for a specially fitted minority. There lies behind this demand some quickening of the new spirit. Men and women are not demanding promotion merely as a right in the way of advancement: they are demanding both promotion and the opportunity of qualifying themselves intellectually and technically for promotion, and they are beginning to realise that this training and education shall not cease with the obtaining of promotion. Put differently they are beginning to realise that the telegraph and telephone crafts call for something much more in the way of effort than the performance of the work of to-day. The brotherhood must be in process of being fitted for the work of to-morrow. It lies as a responsibility upon this generation that the next generation shall be capable of an unmistakable advance both in the technical and in the commercial and economic adaptations of science to industrial needs.

If it could be brought about that the official appreciation of education and training could be a part of administrative methods and not apart from administrative methods, the additional cost would be a sound investment. There is some truth in the old contention that the technical expert is not necessarily a better supervisor, but it is only true in so far as the art and spirit of true supervision have not been included as part of our deliberative training. Consequently the evolution of super-telegraphists and super-telephonists has brought with it, in parallel, so to speak, the occasional development of the characteristics of domination and of assertive authority which make capability for control evident and visible but do not, of necessity, make it attractive or efficient. The survival of the fittest is somewhat discredited as a doctrine to-day, and in its place we see the germs of a new doctrine which is that care should be taken that the fittest shall survive, which is a totally different conception. If this contraposition of fundamental ideas be examined to the roots we shall see why it is that with all the care and conscientiousness with which promotions are conducted, there yet remains a feeling not exactly of lack of confidence in the system so much as of desire for some widening and broadening of the system which may perhaps result not merely in the choice of the best men but in the training of those who may prove to be the best men. The gift of devolving responsibility so that others may learn is not an universal gift, and sometimes the best and most capable workers give their subordinates too little opportunity. To systematise the training; to make our daily work educative; to get the best out of each individual man and woman—these will do much to sweeten and to elevate the conception of fellowship. It is perilously easy to break the bruised reed; it is a holy task to fan the smouldering flax to a flame.

Men with exceptional abilities not only can afford to be generous, but to be generous is the mark of ability. They may seem to be indifferent to some such change as that which is suggested: they may seem to prefer the method of ruthless competition. But they themselves would be the gainers from the discipline of training. They might lose something of the personal trust in their abilities and gain something of the corporate spirit which mingles and commingles the varieties of talents in one beautiful amalgam. True corporate efficiency will come from appreciating that which is of value in each of the varied types of mind in a vast industry rather than from giant abilities, so to speak, standing continually on toe-tip. And if we set out to foster some educative method which shall have this general idea of corporate betterment and of corporate efficiency as its aim we shall have removed, by choosing and frankly declaring that aim, the initial obstacle. The battle will always be to the strong and the race to the swift, but that is no reason why we should not so strive to conduct the contest as to aim rather at corporate than at merely individual improvement.

RURAL TELEPHONES.

An article in the Chicago journal *Telephony* on "The Rural Telephone in Europe," which bears the sub-heading "Government Ownership has left Rural Telephony Undeveloped," gives the result of some investigations with regard to rural telephones in this country, France, Switzerland and elsewhere, whence it arrives

at the conclusion that "experiments which contemplate enlarging the functions of the Post Office department are likely to prove financially disastrous and disappointing." With the larger issues of this problem we have no intention of dealing in this place, but will confine ourselves to the main question which the author handles—namely, rural telephones—in so far as he refers to Great Britain. In the first place, in commenting on the "conspicuous failure to develop" in this country, the writer speaks of farm telephones (meaning rural party lines) as though they were the principal and indeed the only description of telephone which could be properly described as "rural." This limitation seems to us at once arbitrary and opposed to fact. The experimental party line system to which he confines his data has hitherto met with but moderate success in this country. The scattered disposition of farms and rural residences does not facilitate this method of affording service at a low rate, and the lack of secrecy on party lines does not commend them to agricultural rivals. The total of 2,265 lines, or one to every 4,290 country inhabitants, which is given as the rural telephone development of the British Isles is a fallacious and quite uninformative figure. We should estimate that five-sixths of the rural service of this country is afforded by means of direct lines.

We have not the leisure to analyse in war time the statistical material at our disposal in such a manner as to ascertain the precise proportion of the telephones in this country which can properly be classified as purely rural. We can only indicate roughly that the total is enormously in excess of two and a quarter thousand.

In the thirteen years previous to the outbreak of war the British Post Office opened 1,378 exchanges in country places, of which at a moderate estimate some 1,300 were in villages or small country towns of a rural character. These at a fair average of eight subscribers per exchange would produce some 10,400 lines. In addition the Post Office opened nearly 2,000 rural call offices at villages so small that they could not support an exchange. It is to be noted that most of the exchanges referred to were established in places where the prospect of expansion was so small as to offer little inducement to a commercial company to develop them, and that the opening of the rural call offices was in many cases only economically practicable for an administration which was in a position to make use of existing telegraph lines for the purpose. But it must not be assumed that the system acquired from the National Telephone Company in 1911 operated solely in urban districts. In the last few years of its life the Company opened many village exchanges, and at a modest computation there must now be some 15,000 to 16,000 telephones serving purely rural districts, or 1 to every 625 country-folk instead of every 4,290. Closer investigation might well show a very considerable increase on the estimated total.

This, of course, compares poorly with the American figure of 1 to every 10 of the rural population, quoted in the article under review, which figure, by the way, seems to us rather a high estimate; but as we have pointed out on more than one occasion it is bootless to compare American and European rural conditions. The regular collection and delivery of letters even in remote

districts, the widely extended telegraph system and other advantages which obtain in Western Europe, render the telephone less indispensable than it is on an American farm. When we also consider the difference between the American and the British farmer, the difference in their methods, needs and conditions of life, much of the discrepancy is accounted for. It is vain to attribute it to the alleged shortcomings of Government ownership; indeed, as we have shown, Government systems, from considerations of national service, often step in where commercial companies would fear to tread.

HIC ET UBIQUE.

ACCORDING to the *New York Mail* it is an excellent idea to marry a telephone girl, and five good reasons are given to support the contention, amongst which are robustness of health, mental and physical alertness, amiability, common sense and thrift with regard to dress, and amenability to reason. What more, indeed, could be added? We imagine that Mr. Preston would consider any insistence in the English press on the marriageability of telephonists to be a work of supererogation. London telephonists, judging by recent statistics, are sufficiently philogamous already.

MISS SCHMITT, who employs girls for the Telephone Company in New York has a preference for medium-tinted ones. Any one extreme in colouring is apt to be more extreme in temperament. We read that the equable temper of her staff is such that a cry of "Fire!" or "Mouse, Mouse!" would fail to make them turn their heads from their work. Miss Schmitt scouts the idea of those romantic marriages with millionaires, which are fabled to be the outcome of the *Silvery Voice*. They don't mix business with sentiment in a New York exchange. "They are trained to politeness and poise. Beyond that there are no amenities." And yet they marry after three years of service! Nevertheless it all reminds us somehow of Gilbert's lines, concerning that Jane who was

"as good as gold,
She always did as she was told,
In after years she was given in marriage
To a first-class earl who keeps his carriage."

THE *Telephone Engineer* of Chicago describes a unique method of taking telephone call meter readings: "There is, of course," it says, "possibility of human error in the reading of these meters, just as it is possible for the reader of one's gas or electric meter to make a mistake. . . . The New York Telephone Company has met this possibility of error by a unique device. This device was adopted principally to overcome the difficulty of reading all of the thousands of tiny meters promptly at midnight on the last day of the month, so as not to include calls registered after midnight. A special flashlight camera was devised which at one snap made a distinct picture of all the meter totals. The meter readers were thus enabled to make out the bill of each subscriber more leisurely and carefully. Moreover, the system of taking these photographs gives the company an indisputable record to refer back to when complaints of overcharge are received."

ROWLAND HILL BENEVOLENT FUND.

A donation of £75, part of a surplus fund, which was maintained by a number of telephonists under the late National Telephone Company, has recently been handed to the Rowland Hill Memorial and Benevolent Fund, by whom it has been gratefully received.

WOMEN'S WORK IN THE POST OFFICE.*

By MISS A. A. HEAP.

THE title of this paper opens up such a wide subject that I have been somewhat at a loss to decide what particular phases of it I could deal with in the limited time at my disposal this evening.

That interesting document, the Postmaster-General's report for 1914 and 1915, gives the number of women employed in the Post Office as—

24,655 established
and 28,063 unestablished

a total of 62,718

It must be evident that no detailed description and survey of the work of so large a staff can be adequately treated in a short paper such as this, and I have decided to give—

1. A short description of the origin of women's employment in the Post Office.
2. Its development in later years.

The first part of my subject, viz., the *origin* of women's work in the Post Office, has presented many difficulties, for I have not been able to find records of it.

Most of my information has been obtained from old numbers of the *St. Martin's Magazine*. The search through these numbers for information bearing on my subject proved a little depressing. Number after number contained long articles on "Celebrities in Post Office History," but never a mention of a woman among them. A long series of articles on "Reminiscences of the Telegraph Service" showed the same lamentable omission, until I began to doubt the existence of women in the Post Office. Eventually I came to the conclusion that we had not existed long enough to be classed either as historic or celebrated!

I suppose there have always been women in the Post Office service as sub-postmistresses and postwomen, but such appointments were probably due to accidental circumstances or to local exigencies. The employment of women in great departments apparently dates from 1870. Up to that year the telegraph business of the country had been in the hands of several private companies, which in 1870 were taken over by the State and made a part of the Post Office. Among the staffs of these various companies were a number of women.

In a recent number of the *St. Martin's le Grand Magazine* there was a picture of the Instrument Room of the Electric Telegraph Company in Bell Alley. It is dated 1862, eight years before the company was transferred to the State. The picture shows a number of women engaged in telegraph work, presided over by a lady seated in a kind of lofty pulpit. All the women wear the large crinolines that were then fashionable, and one can only suppose that space was not so precious in those days as it is to-day.

Some of the women in the picture were no doubt the pioneers of women's employment in the Post Office, and, presumably, in spite of their unbusiness-like appearance, they were a success, for in 1871 the experiment was tried of employing women on duties of a non-manipulative character, and the Department to try the experiment was that of the Accountant-General.

The first women to be tried on the duties were selected from the existing staff of women telegraphists, and their work was that of checking errors in telegrams. They were known as the Clearing House branch, and consisted of 40 women under the direction of a superintendent.

So successful was the experiment that Mr. Scudamore reported that "the work of the women in this branch of the Service can scarcely be over-estimated, and the success with which it is carried through is, in itself, a sufficient proof of the capability of women for clerical employment."

At a later date Mr. Chetwynd, speaking before the Playfair Commission, said of these women: "They have performed the duties excellently—they leave nothing to be desired."

About 1873 a small staff of women was introduced on the postal side to deal with returned letters.

This branch now numbers over 100 women, chiefly recruited from the top of the list of successful candidates for women sorterships.

The success of these experiments encouraged Sir John Tilley, the then Secretary of the Post Office, to extend it to the Savings Bank, but here a new departure was taken. Instead of selecting women from the existing female staff, the new clerks entered by examination. At the time of which I am speaking open competitive examinations were unknown, and entrance to most, if not all, civil service appointments was by nomination followed by examination. This plan was followed in the formation of the new class of women clerks for the Savings Bank, and in 1875 about 30 women passed the educational test and were admitted to the Bank.

The first duties allotted to them were those of forwarding formal acknowledgments to depositors and inquirers, but the women showed such zeal and intelligence that within a very short time what are known as warrant and ledger duties were given to them, and the branch rapidly grew both in numbers and importance.

In the meantime women were being introduced in the large provincial post offices as telegraphists and returned letter sorters, though at this time such terms as telegraphists and sorters were not used: the general title was clerks, prefixed by the name of the branch to which they belonged.

* Paper read before the Telephone and Telegraph Society of London, on Monday, Jan. 22, 1917.

The pioneers of this movement for the employment of women were Sir John Tilley (under the then Postmaster-General, Lord John Manners), Mr. Scudamore and Mr. Chetwynd, and no doubt their intentions were two-fold. One was to open a field of employment for the daughters of professional and middle-class men (including the daughters of Post Office officials), and the other was, economy by giving the less responsible duties to lower paid officers.

The first mentioned, viz., employment for women of the middle classes (for whom up to now there had only been one opening, that of governess-ship) was an urgent necessity.

It will seem incredible to the younger members of this audience that at the time I entered the Service going out to earn one's own living in a business capacity was looked upon as more or less of a degradation, and was followed by some loss of caste. The only possible occupation for girls of the middle classes was that of teaching: not teaching as we understand it to-day, after long preparation and the passing of educational tests, but drifting into a sort of half-nurse and half-governess or a badly paid drudge in some private school. In 1868 a Commission was appointed to inquire into the schools of this country, and the report of the Commissioners shows the education of women in the middle classes to have been extremely defective. One of the Commissioners says "these defects will never be remedied until the governesses are properly trained." He also points out the evil results of the exclusion of women from all professions but that of teaching; one of the chief of these evils, he says, is that it forces all women who have to earn their own living to become governesses, whether they have any qualifications or not.

He goes on to say that few girls of the middle classes can feel sure that they will not some day have to earn their own bread, and if they do so it is nine chances to one that they will have to do it by tuition.

Small wonder then that the new openings afforded by the Post Office were eagerly sought after, affording as they did permanency of employment in a respectable environment.

The advanced ideas of the pioneers of the women's movement in the Post Office did not extend to the salaries paid to the women, for I find that in 1872, when there were less than a thousand women employed in the whole of the Post Office Service, the wages paid to them ranged from a minimum of 8s. to a maximum of 30s. per week; 675 of the total number of 972 were on a scale of 14s. to 24s.

The women clerks at the Savings Bank began at a salary of £40 per year, rising to a maximum of £65 as second-class clerks.

The theory underlying these low wages was that a living wage was not needed; the class of girl employed usually came from a good home and her earnings were looked upon as pin-money. This may have been more or less true, but it worked out very hardly in many cases where the father or perhaps both parents were dead.

These low rates of pay prevailed until the days of that enlightened Postmaster-General, Mr. Henry Fawcett. During his term of office the sphere of women's work was extended, and for the first time women medical officers were introduced into the Post Office to deal with the illnesses of women.

For the first time, too, it was realised that women ought to have something like a living wage, and the counter women telegraphists, and sorters' wages were increased to a maximum of 35s., rising from a commencing wage of 10s.

In connexion with the Fawcett revision of 1881 I might perhaps mention that for about a year prior to it the women had for the first time begun to agitate for better conditions, and for the first time (I think) were received in deputation by the Postmaster-General.

In 1881, when the first Postal Orders were issued, a small staff of women clerks was drafted from the Savings Bank and Accountant-General's Department to form the new branch. In 1898 a further extension of women's employment took place in connexion with the Money Order Department, and again this staff was chiefly composed of women drafted from the Savings Bank and Postal Order branches.

Meanwhile, outside the Post Office a new occupation for women had come into existence by the advent of the telephone. Early in the eighties several private companies existed which later were absorbed by the National Telephone Company. At first the experiment was tried of staffing these exchanges by boys and men, but this not proving a success they were substituted by women and girls.

In 1896 the trunk lines of the National Telephone Company were bought by the State, and a staff of 166 telephonists was transferred from the Company to the Post Office. In 1902 the Post Office London Telephone Service was started with a staff of about 30 women. The Service extended very rapidly, and in 1912, when the transfer of the whole of the local service to the State was made, there were already in the L.T.S. exchanges a staff of 1,500 women.

The transfer of the local lines in 1912 brought an immense number of women into the service of the Post Office, no less than 6,132 telephonists being transferred.

At the present moment in London alone there are 5,140 day telephonists and supervisors.

It may be interesting to the feminine portion of my audience if I give a short description of the conditions under which the women of the Post Office worked in the seventies.

In the first place there were no palatial and carefully planned buildings such as the King Edward's building or the Post Office Savings Bank. Even the Queen Victoria Street building, now occupied by the branch to which I belong, had not yet reared its head, and the new departments of the Post Office as they arose were housed in old warehouses or top rooms of existing

Post Office premises. Usually the department or branch grew beyond the capacity of the building or floor allotted to it, and all kinds of devices were resorted to in order to squeeze a quart into a pint measure. (This, by the way, is a not unknown device in modern times, as some of us who belong to the London Telephone Service know only too well.)

I am told that the women's branch of the Accountant-General's Department was first housed in a building at the end of Blackfriars Bridge, now given up to the proprietors of a well-known patent medicine. At times when the river was high it invaded the women's dining-room, and hasty rushes to higher and drier grounds were not uncommon. There is also a legend that the puddings eaten in this dining-room were made by the senior women clerks who considered it a part of their office duty thus to assist the cook.

The office in which I commenced my career was an old warehouse, rat-ridden, insanitary, and dangerous. The feeding arrangements were of the most primitive character: there were no dining clubs and no provision of food—each member of the staff had to bring her own. The kitchen was presided over by two frowsy old women whose personal cleanliness and habits left much to be desired. These women cooked any food that was brought, and as they were incompetent and careless, chops and steaks frequently got mixed, and high quarrels took place between the owners and the cooks. I must say the cooks usually triumphed, for they had a command of language unknown to the inexperienced young girls whose servants they were supposed to be. Great tyrants those cooks were, and we were much more afraid of them than of our supervisors. For one thing they always could get the matron's ear, and any complaint to her of rudeness or unreasonable demands on the part of the staff was summarily dealt with, without the accused officer being given any chance of defence.

In those days twenty minutes for lunch and fifteen for tea was thought ample time for growing girls to eat their food on an eight or ten-hours' duty. Some part of this time was taken up in fetching the food from the kitchen to the dining-room and in taking back to the kitchen the dishes used. The deities who presided over the kitchen did not wait on us.

There were no sitting-rooms or sick-bays provided and however serious the illness, the only accommodation for the patient was two hard wooden chairs placed in the kitchen so that the cooks could give a little attention to the invalid in the intervals of cooking 200 dinners!

The hours of duty were irregular to a degree unknown to us in these days, and the mealtimes were correspondingly irregular. Needless to say there was a great deal of sickness, chiefly caused by gastric trouble. This description applies more or less to all the women's departments in the seventies, but as the older women gained experience they began to make changes for the better, and dining clubs which provided a satisfying meal at a reasonable charge were started in many of the larger offices and were the foundation of the subsidised clubs of to-day.

In spite of the discomfort and disagreeable duties we were a merry set of girls. There was a feeling of emancipation and a belief that our feet were set on the run's of a ladder that led to independence and freedom. The women of previous generations had never known independence, they had always been dependent on their male relatives, and when these failed from one cause or another the lot of the women was a hard one.

The desire for independence gave a great impetus to our work and no doubt helped more than any other factor to make the first staffs of women so successful.

In those early days in most of the offices, if not in all, the sexes were strictly segregated. The men worked in quite a different part of the building from the women and there were separate dining-rooms and even a separate staircase. These conditions have to a large extent disappeared, and in most of the large offices the two sexes work together.

At the risk of appearing old-fashioned I should like to say that I do not consider the later arrangement an improvement. Discipline is easier and I think more effective when each sex works under the control and supervision of one of its own members. I have had experience of both methods, and this is my well-considered opinion.

The Post Office was fortunate in its choice of the first women superintendents and owes a debt of gratitude to them for their example and energy.

In my own office we had a brilliantly clever woman to supervise us. She was said to be a good Greek scholar, but of that I know nothing. I remember her as a strict disciplinarian, but with a kind sympathy to anyone sick or in trouble. She has been dead more than 30 years but I still find some of her maxims useful to me in my daily work.

All women in the Post Office owe a debt of gratitude to Miss Constance Smith, I.S.O., until lately the Lady Superintendent of the Savings Bank. Her foresight and wonderful powers of organisation have placed the women of the Savings Bank on a level they might not have reached for many years—if ever—but for her influence, and this has had its effect on the positions of women in other departments.

Another of the early superintendents was Miss Saul of the Central Telegraph Office, whom I never knew personally, but I have so frequently heard her spoken of in terms of reverence and respect by those who worked under her that I feel sure she was one of those pioneers who helped to bring her fellow-women on to a higher plane in the business world. When we remember that these pioneer women had had no business training, that they had had no predecessors whose example they could copy, that they had to learn by their own mistakes, we must, I think, consider that they did wonderful things.

"Let us now praise famous men," says the writer of the book *Ecclesiasticus*, and the women of the Post Office might well take the exhortation to heart and sometimes think with praise of the women to whose example and influence we are all indebted.

We will now proceed to the consideration of the second part of my subject.

The present-day development of women's work in the Post Office.

From the days of Mr. Fawcett women's sphere of work in the Post Office has gradually extended until, in 1917, we have arrived at a condition of things that even three years ago we should have thought impossible.

Let us turn our thoughts for a moment to that morning in June, 1914 (only two and a half years ago), when we opened our newspapers to read of the assassination of the Austrian Archduke and his wife.

I think probably all of us had the same feelings, first one of horror at the deed, and second a feeling of sympathy with the aged Emperor of Austria who had suffered so many trials of the same terrible character; but I suppose that to none of us came any premonition that this event was going to alter all our lives.

Sarajevo was a long way off and few of us had the imagination to picture the tragedy that had happened in its old streets, and the two unfortunate victims were mere names to us.

If one of the newspapers had been inspired to prophesy that England would in two short years have become a military nation with all the flower of her manhood either on the battlefield or in the camp, and that the work of these young men would be in the hands of women we should have thought the editor of such a paper had gone mad. If the officials of the Post Office could have looked into the future that morning and seen post-women, women-sorters, and even drivers of mail-vans, they would have thought themselves the victims of some illusion and would have said most emphatically "impossible!"

Yet in less than three years thousands of women have been trained, not only in the duties I have mentioned but in many others, and we no longer argue as to what women can or cannot do, our only thought is where and how we can obtain women in sufficient numbers to fill the places of those men who have gone to do their duty to their country in another field.

The abnormal conditions brought about by the war have affected every department—Savings Bank, Accountant-General's, Engineers, Telegraphs, Telephones, and last, but not least, the Secretary's Office. Large staffs of temporary women have been engaged at the Savings Bank and in the Accountant-General's Department. Enormous quantities of new work have poured into these departments in connexion with the War Loan, Exchequer Bonds, War Savings Certificates, War Pensions, &c., and a great strain has been put upon the established staff in the training and supervision of the large numbers of untrained temporary staff that it has been necessary to employ.

The Telegraph and Telephone Departments perhaps felt the strain earlier than any other. For several days before war was declared the demand for telegraph and telephone communication was very great. I think I may say with truth that these two great departments have borne a great strain from the time of the week preceding the declaration of war up to the present moment.

The Telephone Department was probably one of the first to employ women to take the place of men. So early as February 1915 it was realised that as our night staff consisted entirely of men, many of whom were of military age, some preparation was immediately necessary if the night service was to be effectively maintained. An advertisement in the public press produced a large number of applications from all classes of women, among them a number of those who had been trained either in our Service or that of the National Telephone Company and who had left for marriage or other reasons. It was possible, therefore, at first, to form staffs of already trained women for night work in various exchanges. At the present time we have nearly 600 women performing night duty, but all the later entrants have had to be trained. The conditions under which the female night staff work are fairly comfortable. Their hours of duty are forty-eight per week spread over four nights of twelve hours. The women come on duty at 8 p.m. and leave at 8 a.m., so that the ordinary means of travel are available. Each woman is allowed one hour for refreshment during that period and two hours for rest. The latter privilege has brought about a new necessity, viz., that of dormitories. In my own office, G.P.O. South, there is a dormitory of nearly 100 beds. The night service has not suffered by the advent of so many inexperienced women, indeed I sometimes hear it whispered that it has improved. This may very well be, as I think all telephone experts are agreed that women make better telephonists than men.

It was my duty to interview several hundreds of the first applicants for night work, and many sad stories were told to me by the women. In some cases women, no longer young, of good birth and education, found it necessary for the first time to go out to earn their living. In other cases the women were married, their husbands had been called up for military service and they must earn a little money to keep the home together.

I often think of these women on air-raid nights. On such occasions they have shown a courage and devotion to duty that cannot be surpassed. Never once have I heard of hysteria or fainting attacks, even in the most terrifying circumstances. Yet think of their anxieties at such times. There is the ever-present anxiety for the husband at the front, and on air-raid nights how often must their thoughts be on their children at home, wondering if they are safe. In all the terrible air-raids that London has suffered the Telephone Service has never failed and the public owe much to the devotion to duty of the women, both of the night and day staff.

When the first letter-carriers appeared we all felt a little amused, but the postwomen soon turned our feelings of amusement into respect. To see them going about in all weathers in their neat uniform, always cheerful quite business-like, leaves no room for anything but respect. In a recent number of the *St. Martin's Magazine* there was a little poem by that amusing writer who signs himself or herself "Bell Smith," and perhaps you will

permit me to read a short extract, as it bears on the employment of women as letter-carriers. The poem is based on Rule 36 for postmen, which says "Brass buttons must be kept burnished."

1.

We meet him on the Highway, in the Market and the Slum,
Intent upon his duty midst the City's busy hum;
We glimpse him in the woodland or by curlew-haunted mere,
In cattle-dappled meadow with its sleepy hamlet near;
In country lane, in granite street, or on the flat's long stair,
"U-bi-que" is his motto and we meet him every where!
He rises with the dawning, and he works till late at night,
But he always comes on duty with his buttons clean and bright!

He's a *MERCURY* in Trousers with a Tunic and Shako,
There's not a place upon the map to which he doesn't go,
And where'er we come across him he's a very cheerful sight,
As he sparkles on the landscape with his buttons clean and bright.

2.

There's not so many of him now, because he took his chance
And went to fight the Germans on the blood-soaked fields of France,
He's changed his blue for khaki, and he gives the Kaiser fits,
For in Flanders' muddy trenches he's engaged in "strafing" Fritz;
He is battling for our freedom in a struggle stern and grim,
And the women (bless their little hearts) are substituting him,
So he's gone where glory calls him, but he doesn't think it's right
That they make him *black* his buttons to prevent them shining bright.

So now it isn't *MERCURY* with Trousers and Shako,
'Tis *Venus* in a coat and skirt—and corsets! Even so!
But when the War has reached its close and Peace comes clear in sight,
He'll come on duty once again with buttons clean and bright.

Through the courtesy of Sir Robert Bruce I was allowed to go through the great sorting office at Mount Pleasant during Christmas week. At this office 2,500 temporary women sorters were employed. They were not all on duty at the time of my visit, but I saw a great many of them. They were employed on all the duties proper to a sorting office except that of lifting the heavy bags and of wheeling the loaded trucks.

The controlling officers spoke very highly of the work and conduct of the women. One of the superintendents said that he had opposed their advent because he did not consider the work and conditions suitable for women, but the women had converted him by making themselves suitable to the conditions. I could not help being struck by the neat business-like appearance of the women and by their concentration on their work. I saw no stopping to rest or to talk for a few seconds. Everyone seemed bent on doing her best to get rid of the piles of letters and newspapers that to an outsider like myself seemed too great ever to be got rid of.

The Engineering Department has also suffered a feminine invasion in the form of women cord-repairers and fault clerks. In the telephone exchanges in the Metropolitan area these women share the domestic quarters of the telephonists. I thought it only fair to the latter that we should have some voice in the class of women introduced, and by the courtesy of Mr. Moir I am permitted to choose the applicants for cord-repairing.

I suppose I have seen about 200 women, and my work in this direction has perhaps spared the Engineering Department a few difficulties.

The applicants on the whole were a very respectable class, many of them had been dressmakers or milliners who found their trade bad and were glad to take new work which in hours of employment and wages compared very favourably with the work they had been doing. But there were a few queer persons who applied. I think on the whole the employment of women in the Engineering branch has been successful. Its chief difficulty perhaps, is that of frequent changes. So many of the women go through the training and then some more attractive employment offers itself and they leave. But this applies to all temporary employment and every department suffers in the same way.

In the Secretary's Office women are being employed on some of the clerical duties hitherto performed by men. In the Telephone Traffic Department women have been borrowed from the telephone exchanges to deal with traffic schedules, &c. I have no intimate knowledge of the work they are now doing, but I am told they are doing it with success.

In the September number of the TELEGRAPH AND TELEPHONE JOURNAL the writer of "Telegraphic Memorabilia," in alluding to this meeting, visualises the G.P.O. North of the future with its staff of University women sitting on committees of finance, administration and control, compiling portable Post Office Guides, beautifying the present ugliness of our telegraph offices and aspiring to joint control of the secretariat itself.

I am not sure whether the writer was in jest or earnest, but I hope he prophesied better than he knew, and that the day is not far distant when there will be a woman Secretary at G.P.O. North. I think even the wisest of Postmaster-Generals and the most experienced and astute of permanent secretaries might sometimes be glad of a woman's opinion on the problems that arise in connexion with a staff of over 60,000 women.

This paper would scarcely be complete if I did not mention the special work of women of the Post Office in connexion with the war. In spite of the extra strain that has been felt by every department the women have found time and energy to do much to alleviate the sufferings caused by the war. Directly it broke out the women of the various departments, under the direction of Mrs. Hobhouse, responded to the Queen's appeal for clothing

for the poor and comforts for the soldiers. The women of the Telephone Service alone sent over 4,000 garments to the Queen's Guild in the first year of war. The women of the Savings Bank made liberal contributions to the Prince of Wales's and other Funds. In addition to their regular subscriptions to the Post Office Relief Fund, the women of all branches sent gifts to the hospital in Kensington Palace Gardens, towards its equipment and its medical needs.

The women doctors of the Post Office have for several years held First Aid Classes in connexion with St. John's Ambulance Society, and they have always been well attended, but since the war broke out the classes have been crowded and many of the women have had to avail themselves of outside classes for the teaching of First Aid. Not only have they qualified in First Aid, but they have taken the more advanced courses and many precious Saturday afternoons and Sundays have been spent in attendance at one or other of the hospitals in order to obtain practical experience. Some of our women are now nursing in military hospitals and there is a long list of others who are anxious to go when the department can spare them.

The women of the Postal Order Department are doing a noble work in connexion with the Post Office prisoners of war. Every week they pack and send off parcels of food and other comforts to our unfortunate men. When I tell you that the annual cost of this is now £8,000 per annum you will get some idea of the magnitude of the work that Miss Loch and her assistants of the Postal Order Department are doing.

Last year the women of the London Telephone Service felt they would like to have some share in the building of that noble institution, the Star and Garter Hospital for Disabled Soldiers and Sailors. By many and various devices they raised the magnificent sum of £600—a sum sufficient to build and equip in the hospital two rooms which will bear the name of the donors.

This autumn and winter, under the energetic presidency of Mrs. Pease, a branch of the Queen's Needlework Guild has been formed in all the various departments in London where women are employed. The result is that between August and September over 8,000 articles, mostly hospital requirements, were sent to the Queen's Guild. Of this total I am proud to say that the women of the London Telephone Service contributed 4,000. In the large provincial offices the women are helping various charities, among them the Scottish Women's Nursing Unit.

In searching through back numbers of the *St Martins le Grand Magazine* for information for this paper, I came across an article called "More Recollections," written by an old Civil Servant. In it he says:

"But of all the wonderful things which have occurred during the last 30 or 40 years (he is writing in 1898) the most wonderful to my way of thinking is the emancipation of women. We look back upon the days of our mothers and grandmothers with their poke-bonnets, hoops and crinolines: prim and demure as became their station and sex: who busied themselves with such mundane affairs as cooking our victuals, mending our clothes and taking care of our offspring: and we contrast them with the women of to-day, who have drunk deeply of the fount of knowledge long before they are out of their teens, who in too many cases hardly know a needle from a handspike; who are jacketed, coated and knickered till it is difficult to say to which sex they belong; who hunt, shoot, fish, drive, play golf and ride a bicycle, leaving womanly duty to hirelings or, oftener as not, not done at all.

When we look upon this picture and upon that and reflect that all these changes are the work of comparatively few years the conviction is forced upon us that we are face to face with a great social cataclysm, the consequences of which no one can foresee."

Well!! that was written nearly twenty years ago, but the prophecy has not been fulfilled, and if the writer be still alive I think he must withdraw his indictment that women do not know a needle from a handspike.

The 8,000 articles sent to Queen Mary's Needlework Guild were in the main cut out and sewn by the women of the Post Office after a day's hard work.

Even before the war there were Arts and Crafts Exhibitions in which our women gave proof that they had not lost their feminine tastes by entering into the business world.

Someone has said that the best thing that has come out of the war is that women have come into their own. It is true that women for the first time have been allowed to show what they can do, and it can never again be said that women are lacking in courage or devotion to duty, but they have not been allowed to manifest these qualities without opposition. Again and again the old cry has been raised that this or that is not fit work for women. In my native county, Lancashire, there is a factotum in all the manufacturing towns called a "knocker up." He is employed by the mill-workers to go round each morning at a very early hour to tap on their bedroom windows and thus awake them to be at the mill when it opens. He has a piece of whalebone or some similar substance fixed to the end of a long stick and is thus able to reach the bedroom windows. I saw in the paper the other day that as many of the "knockers up" had gone to the war, women had had to fill the breach. "At first" said the article "it had been feared that they would not be able to do the work properly, but they have proved quite a success!!!"

No doubt some of the opposition to women's employment in place of men is due to fears of what may happen when peace is declared and we begin to try and return to our ordinary way of life. Such a fear is very natural. Women's labour has been too much exploited in the past, but the remedy for this is not in trying to restrict woman's energies, but in granting to her what she has long desired, viz., that she should not be considered merely as a sex but as a citizen. In this war she has surely made good her right to

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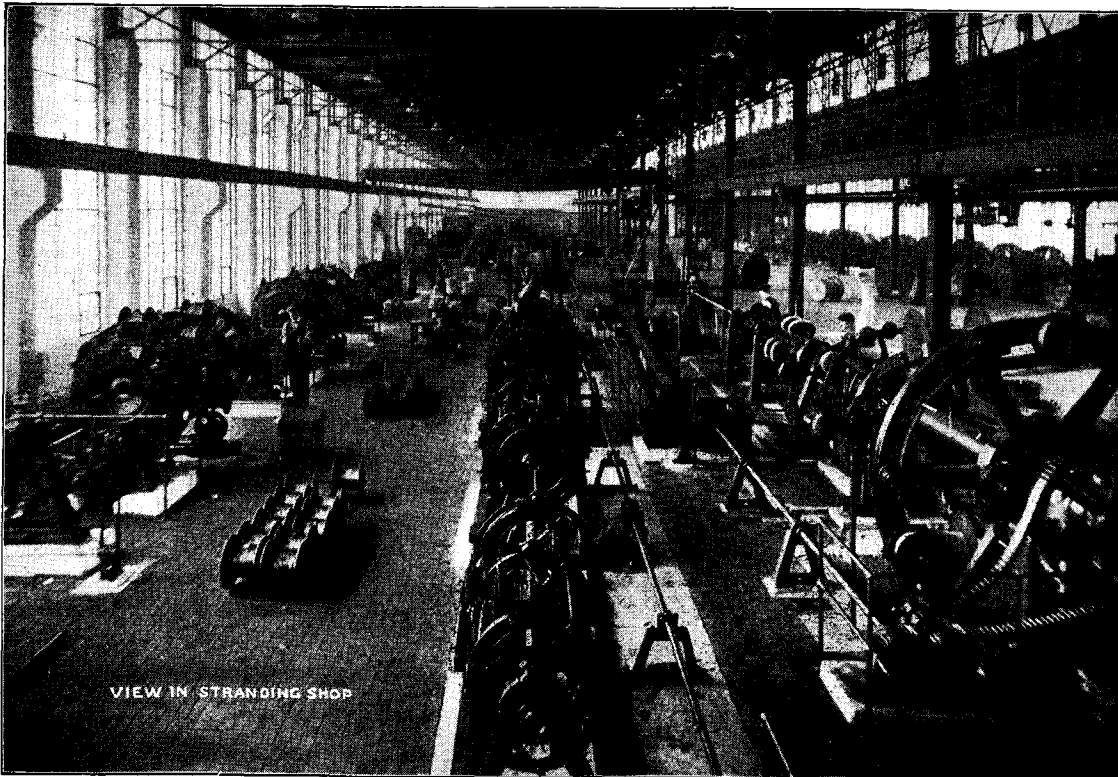
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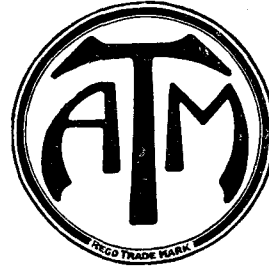
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citizenship, and if men have any sense of gratitude they will see that she gets that right. If this war has proved anything, it is that no nation can afford to repress the energies and ignore the ability of half its members.

To repress energy is not to destroy it, and repression can only be carried to a certain point. Women's energies in this war have been to a large extent devoted to mending what the wrath of man has broken, to the preservation of life and to helping the business of this country to go on as usual. There will still be need of her energies in these directions when the war is over.

I sometimes think that if women had had more voice in the counsels of the nations, this terrible war would never have been begun. It is worth remembering that the nation who was the aggressor has perhaps the lowest standard for womanhood of any civilised nation.

You will excuse me of having wandered from the point of my paper and of treating you to a digression on women's rights, but in considering the present extent of women's work in the Post Office such thoughts must arise.

I have tried to show in this paper how from very small beginnings and in the face of considerable difficulty the women's departments of the Post Office have risen to their present magnitude and importance. The Telegraph Service may reflect with pride that it supplied the first units of this huge army of 62,000 women. When we consider that it has grown up in 40 years; women may indeed feel hopeful for the future.

I believe the day is at hand in which women's influence will be more and more felt, and who can doubt that their influence will be on the side of humanity. To obtain better conditions for the workers, to counteract the antagonism that seems to have grown up between the different ranks, and to build up an organisation that shall tend to the health and happiness of its members.

CORRESPONDENCE.

PHONOGRAMS AND TELEPHONE-TELEGRAMS: TIME VALUES AND LOADS.

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

I was interested in reading the letter from Mr. Bateman in the January issue. It appears to me that the working at Plymouth is idealistic. A week's return would not, I am inclined to think, produce results anything like so favourable. I will at once agree that time does not admit of full investigation in these days, but there are a few questions I should like to bring under notice.

Perhaps I should say that I see visions of great things in the matter of using the telephone for telegrams, and I am interested in the question. I take it that the 483 messages referred to represented a day's traffic? If that be so, the size of the exchange may, in a measure, be gauged. This is an important point to my mind, for except during the busiest hours an operator would not be on "distribution" solely, but would, I take it, assist in the transmission of the messages, at an exchange doing that number of telegrams a day, but if a telephonist was so engaged I should like to ask—Was she reckoned as an operator pure and simple? I should like to hear of the difficulties, if there were any, and how these affected the output. For instance, there is the unusual circulation due to the weekly half-holidays at sub-offices; the duration of the time taken by officers engaged in seeking the necessary information should be taken into account if a return is to determine the staff required for a certain amount of work, for, however carefully the lists of addresses which have to be circulated to secondary delivery offices may have been prepared, some time would be lost. How was it accounted for?

Another point on which Mr. Bateman and I are in agreement is the fluctuating nature of telegraph work. "A box of tricks" and a good conjurer fail to stir the imagination of the telegram-sending public.

What was the delay in the busiest hour?

Are the trunk and local exchanges separate and are the sub-offices, which are combined telegraph and call offices, terminated at the local exchange? Is there at Plymouth a circuit which is reached *via* two local exchanges and the use of a junction involved?

Are the phonogram sets situated in the instrument room?

Was the staff taken as a whole or were the telephonists selected?

With regard to the sorting of the telegrams it is assumed that one person only was employed for two and a half hours, and it would be interesting to know what proportion of telegrams was "confirmed" and whether envelopes had been previously prepared.

There are many factors arising out of these questions. Undoubtedly the number of words in messages must be regarded in the days in which we are living.

The present traffic and conditions being abnormal any return of work is more or less speculative, and I am of opinion that those taken now will be of little value in less troublous times: a test of speed only—taken in the most favourable circumstances—is of little value and misleading. I do not say that this was done, but I am seeking information.

On occasions when work on the telegraphic instruments has been averaged in conjunction with telephone-telegram work I have been disappointed with results, and analysis proved that the telephone work had prejudiced the rate of working.

I want to view the subject in a broad light, and it would be interesting to know the exact conditions under which 30 messages were disposed of in one hour. Perhaps it may be assumed that such a result was not obtained on an omnibus circuit where work for more than one office would be dealt with.

I hope Mr. Bateman will not consider that I have put these questions in too critical a form. Let me assure him that I am grateful for the oppor-

tunity he has given for the discussion of a matter which calls for the closest attention in order that the law of economics may not be violated.

Ipswich, January, 1917.

J. E. C.

TECHNICAL TRAINING.

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

The article on "Technical Training in the Post Office" by Sir William Slingo is one of the most interesting which has appeared in the pages of this journal. If a criticism may be allowed in regard to certain parts the writer will be very grateful. Sir William's theory that every capable clerk should take charge of his instrument, and every superintendent his section, is an ideal one, but with all the vaunted advantages of such training this result has not been arrived at in practice. The methods adopted by the department for the furtherance of such knowledge are in many instances extremely apathetic. There is also favouritism, from time to time, when one is marked out for promotion.

Sir William stated that he was largely instrumental in formulating such a scheme about twenty years ago. By his zeal in this direction, he appears to have taken more upon himself than his position warranted. Had he the approval of the entire mass of associationists for formulating the same? Past history shows he hadn't. Enthusiasm is an excellent thing, but when it subsequently operates adversely on thousands its effects become baneful. To illustrate the point. Prior to 1897 telegraphists were worthy of such a name, but after technicalities penetrated the Service, staffs became divided into unequal sections of students and workers. Undue preference frequently manifested itself for the former, while the latter, some of the finest operators in the Service, were sadly neglected. When promotion is so slow nowadays the chief point to consider is, which of the two renders the greater service to the State in the long run. Is it the student who, in some cases, may be an indifferent operator, or is it the telegraphist who performs the splendid work in all the phases? Well may Sir William lament the fact that the goal for some is reached when an increment is secured. Surely this is one of the best arguments for a better living wage. What benefit does the department derive from people who pass the examination in early life, and who perchance have to wait a decade ere their knowledge can be applied, or from ladies who are never called upon for service in this direction. Public money wasted yearly.

A more serious aspect in these days of speeding up and of arduous work is the health of the individual. This technical imposition—a bugbear to the greater number in our Service—has been the means of prematurely retiring a lot of workers who could not stand the double strain of work and study, and in isolated cases fatal terminations have resulted. May the day not be far distant when this excessive syllabus will be wholly removed from our midst.

In conclusion, if Sir William desires to foster an intelligent interest in technical matters throughout the Service, the remedy is mainly in his own hands. Why should the department not issue a book on technical instruction? and why not have Sir William write the small volume himself? Not one suitable for University graduates, but a short, simple and concise exposition of theory, skeletonised diagrams and practical hints for all the various instruments in use, and tests required. This, together with opportunities for a given and a constant period would more readily achieve Sir William's purpose, but perhaps the suggestion is too practical. It would at least make for a more efficient Service, and confer, when so much strain exists, better health and a happier life upon individual members of the Telegraph Service.

"THIRTY YEARS SERVICE."

ENTERTAINING WOUNDED SOLDIERS AT THE EAST EXCHANGE.

There was a most delightful function at Canning Town Public Hall when for the second time within a few months the staff of the East Exchange and other exchanges in the East area were entertaining wounded soldiers and sailors. The earlier event took place in October, at the Sailors' Palace, Limehouse, when 100 men were given a very happy time; but on this present occasion arrangements were carried out on even a more ambitious scale, and the staff is to be heartily congratulated on their efforts. The function was made possible by each member of the staff subscribing for herself and one soldier at least. There were 150 wounded men present. About 50 came from the Bethnal Green Hospital, approximately the same number from St. Bartholomew's, a smaller party from Poplar Hospital, and a number from West Ham. There were a few sailors among the company, whereat the ladies, whose fondness for Jack is proverbial, were, of course, very pleased.

A dainty and liberal tea, which included many delicacies such as fruit jelly and blanc-mange, was heartily appreciated, especially when it became known that the ladies themselves had made nearly everything edible that had been placed on the tables.

Those who participated in the programme included the Misses K. Harding, M. Lamplough, M. Miller, E. Chester, M. Jones, M. Downham, L. Palmer, E. Rose and L. Norman, and Messrs. B. Fickling, A. Bennett, and W. Shim.

Two competitions produced great amusement. One, a hair-dressing competition—a most popular event. The competitor who came nearest to giving a presentable effect received a prize; needless to say, what with embarrassment, hand-shaking, and the queer tricks of which hair-pins are known to be capable, some of the efforts were no quite artistic. The other competition, a dough-nut bobbing scramble, was an amusing and hilarious success.

The soldiers, through their own spokesmen, conveyed their heartfelt thanks to their entertainers—sentiments, however, which they found themselves better able to express in individual conversation.—Abridged from the *East End News*, Jan. 16.



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ENTERTAINMENT TO WOUNDED SOLDIERS AT GLASGOW.

PERSONALIA.

NEWS OF THE STAFF.

LONDON TRAFFIC STAFF.

Transfers—

Miss E. L. ASHTON, a telephonist of Regent Exchange, has been transferred to Trunks.

Resignations—

Miss G. A. RYDER, an Assistant Supervisor, Class II, of Regent Exchange, has resigned in view of her approaching marriage. She was presented by the staff with a case of silver fish knives and forks and other gifts.

Miss A. M. HANCOCK, Assistant Supervisor, of Regent Exchange, has also resigned on account of marriage. She was the recipient of a large number of useful gifts from the staff, including a tea service and case of silver fish knives.

Miss WELLMAN, a telephonist of New Cross Exchange, has resigned in view of her approaching marriage, and was presented with a case of fish knives and forks and a biscuit barrel.

Miss BRIDGES, a telephonist at Woolwich Arsenal, resigned and was presented by the staff with an ebony mirror with silver initials.

Miss GEORGE, a telephonist of Dartford Exchange, has resigned in view of her approaching marriage, and was presented with a silver cake basket and other useful gifts.

Miss N. Taylor, of Regent Exchange, has resigned on account of marriage. She was presented with a "Queen Anne" sugar bowl and cream jug and silver serviette rings.

Miss D. DOCKER, a telephonist of Regent Exchange, was presented by the staff with a tea service and other useful gifts on the occasion of her resignation on account of marriage.

Miss E. L. PORTER, of Holborn Exchange, has resigned on account of marriage. She was presented by the staff with a glass fire screen.

PROVINCIAL STAFF.

Miss A. G. VICARS, telephonist, Leicester, has been promoted to be Assistant Supervisor, Class II.

ENTERTAINMENT TO WOUNDED SOLDIERS AT GLASGOW.

A function, unique in its character, took place at Glasgow on Saturday, Jan. 13, when a party of wounded soldiers was hospitably entertained by the staff of the Head Post Office. For some time past Mr. Armour, Superintendent (Telegraphs), has been assiduous in organising concerts for the benefit of wounded soldiers in several of the military hospitals in the district, and the gathering at the post office was in the nature of a return visit. The entertainment, which was under the auspices of the dining-room committee, took place in the staff dining hall, which was beautifully decorated with plants, flowers, and flags for the occasion. The concert programme was sustained by the Telegraphs Concert Party; the Telephones Concert Party; and by ladies on the temporary staff in the Postal branch. This combination of all the talents proved irresistible; the concert went with a sparkle from start to finish, to the unbounded enjoyment of the soldiers and the members of the staff who were privileged to be present.

At an interval in the proceedings the soldiers were regaled with a "high tea" kindly provided by a member of the staff, while, thanks to the liberality of the staff in general, a plentiful supply of tobacco and cigarettes was at the disposal of the guests throughout the entire afternoon and evening. And, in addition, each soldier on leaving received a packet of cigarettes as a special parting gift from the staff employed in the dining room, who, from the manageress downwards, did everything in their power to make Tommy Atkins happy. Towards the close of the proceedings, Mr. Pullen, Postmaster and Surveyor, in a few remarks appropriate to the occasion, proposed a well-deserved vote of thanks to the artists who had contributed so much to the success of the gathering, to which Mr. Armour, on behalf of the artists, suitably replied. The National Anthem was thereafter sung, and the curtain rung down on what was one of the most enjoyable functions ever held within the precincts of a post office, and one which has left pleasant memories for all time in the minds of those who were present, soldiers and civilians alike.

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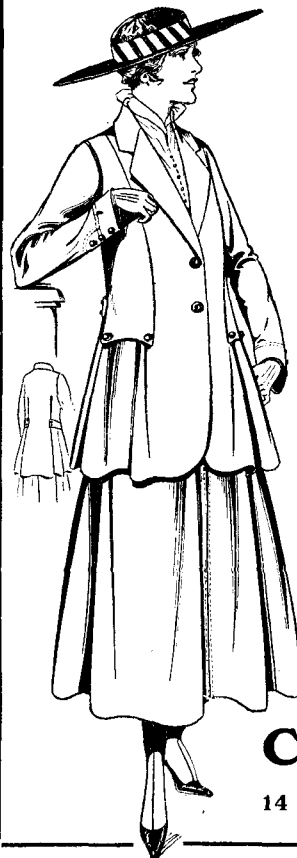
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THE SOLDIER LINEMAN.

BY CAPTAIN A. A. JAYNE, R.E.

AT the commencement of the war the number of linemen on active service was very small. Of course there was "K" Company, R.E., which left its work with the Post Office in Ireland very abruptly on mobilisation and came to France to work mostly on Lines of Communication, that is, building and maintaining lines from the Base to G.H.Q., and afterwards on to the Army Corps. Then came the Special Reserve, a very small number, consisting of Post Office telegraphists and permanent linemen, and they were spread over G.H.Q., Corps and Divisional Signal Companies. They were also with the original Expeditionary Force.

As the Army began to grow the call upon the Post Office for linemen increased correspondingly, and now judging from the number I see out here there must be very few left in England. The old Military Post Office lineman is now an infinitesimal percentage of the total of present day Post Office linemen in the Army.

These notes are written with a view to sounding forth a note of the deepest appreciation to the Post Office for the engineers, the telegraphists, and the linemen they have unstintingly supplied to the Army Signals. Not alone for the *personnel*—for the material. For the never-failing supply of stores of all descriptions, telegraphic apparatus and the now multitudinous number of telephones and telephone exchanges. For the expert advice on problems which are always facing the Army Signals during this war; in fact for everything which has made our Army Signal Service what it is—efficient, up-to-date, reliable.

People may well ask who is responsible for directing this trained *personnel* into the proper channel so that, in spite of the growth of the Army and the extension of the battle front, the telegraphic and telephonic organisation grows with it and produces a system that compares favourably with communications during peace.

They may well ask, for I am certain they will never be told by the gallant officer himself.

And it must be remembered that in spite of the drain upon men and material from the Post Office for France and other parts of the world, there is the defence of England to be maintained, and there is the everyday commercial and social life of England to be kept going. How it is done in England I am unable to say since war started, but that it is done I know for I have tested it during those "little bits of heaven" known as short leave.

I can speak, however, regarding France, for I have watched

our Signal Service grow from the days when Field-Marshal Sir John French used to give us notice the evening before that he wanted "his telephone" fitted up at his Command Post early the next morning and we used to join up the only Trench Telephone working "up the line" from G.H.Q., to the present day when G.H.Q., Army, Corps, Divisional and Brigade Headquarters have as complete a telegraphic and telephonic system as busy commercial towns.

Such a system is obviously another proposition at the Front than during peace, and it is just this that has called for all the courage and skill that our trained *personnel* can produce, and upon no class has it made greater demands than upon linemen.

Can anyone say too much for them? Wet or fine, day or night, shelling or no shelling, they work away with skill and patience until their task is done. They seldom fail one in spite of the fact that it would often be extremely difficult to convict them of negligence if they did, and this attribute alone speaks wonders for the training and discipline they had in the Post Office.

Rugged of features, rough of hands, simple of speech, they will sit perched unmoved on high poles connecting lines through despite everything—icy winds and often shells flying round them, *wet through to the skin.*

How often have I stamped around at the bottom of poles trying to keep warm while the lineman up top never turned a hair. He knows certain lines must be through at a certain time and one's cap may lift with the anxiety of it, feverishly watching every minute of one's watch, but he is unmoved. Then the welcome sound, "Hullo, 129th Brigade, is that O.K., give us a ring," and so the list is gone through and with a sigh of relief you move away to the next job.

I used to feel inclined to be irritated with linemen who spoke in broad dialects, though I took care never to let them see it. After all, perhaps, there is a little excuse for one when the meal-times go flashing by and still a lot to be done. But Scotch sounds sweet at bad times when the call comes, "Hullo, sir—that line to X Battery is through and working, sir."

An autocrat is the linemen to people outside the Signal Service—he brooks no interference. "My officer told me to do this and you can go and see him about it," is the regular attitude. A General came in the hut one day and told me, "I rang up on the telephone just now and said, 'give me the . . . Brigade, please,' but someone with a loud voice replied, deliberately and distinctly, 'Git off the blinking line.' Of course I got off, but as soon as convenient I should like to speak." I apologised and explained that the line had been down and was being repaired. He went off with a merry twinkle in his eye.

Said a corporal to a class of learners: "Now you don't handle armoured cable same as you would an *armoured train*," and his

elementary disposition came on top I thought when he commenced a discourse on preventing damp on test boards by "Now you all know that water is an ever-present evil!" A stout fellow this, though, with a heart of gold. For five days and nights he sat in shell holes under heavy barrages of hostile fire joining cables through and making joints as calmly and skilfully as if he had been sitting doing the same work in a test box in Cheapside. Not a single fault was found in any of his work, for which he was immediately awarded the Military Medal. I saw him a few days after but he was not wearing the ribbon, and upon my asking him about this he quite honestly and almost stubbornly said, "Well, sir, why should I have a medal when you think of all those poor fellows killed and wounded, makes what I did very small." I said: "You saved many other lives by your work, but if you don't think you are worth it, the King does. Moreover, it being the King's medal, you have no option but to wear it." "Well in that case it's different, I never looked at it in that light," he replied. He put the ribbon up at once.

Nobody but those who have to work the lines can fully realise the chaotic tangle they are in around some places. It generally takes a good day to sort things out even roughly. On the second day one calls the linemen together for a conference as to what is best to be done—by that time they also have some idea as to where the lines go. Then is the time to listen with what patience one may have to detailed descriptions in North Country, Cockney and South Country as to the routes they follow.

"Now then, Sapper Jones, where does that pair go that cross the road from the house bracket?"

"Well, sir, that's a pair to R × P."

"What's that?"

"Well, sir, R × P is a place about two miles up the road just out of Lee Tinkles."

"Lee Tinkles, Lee Tinkles, let me see, where's that?" Deep diving into maps.

"Oh, yes, I've got it. Right, go on."

"Well, sir, that used to be an R.S.O., but he's moved out and it's now a "Casualty Clearing."

"I see, then this line runs to the Casualty Clearing Hospital at R × P."

"No, sir, you see this pair which is P × 13 and 14 on the railway was cut at the junction pole on the level crossing this side of 'Lee Tinkles' drops down to P × R 17 and 24, and after three bays, goes off on comic poles till it reaches the house standard over the French Civil, then it goes on house brackets, which, by the way sir, are *some* brackets. We shall have to get a party up there and put some poles in with side arms, for while I was up on one of them tracing the pair through it was going up and down like a see-saw."

Pause to make a note *re* poles with side arms.

"How many poles do we want there, Sapper Jones?"

"Eight, sir, but one of them will have to be a good 36-foot pole, because one of the houses comes right out into the side walk and we shall have to get the wires over the house."

"Thirty-six-foot pole, eh? We can't get any poles that size nowadays."

"Well, sir, I know a place where there *is* one."

"Sapper Jones, don't you get moving any poles from anywhere unless I tell you. We must buy it. Who owns it?"

"Oh, it don't belong to anyone, sir, least, I never saw anyone when I was doing a scout round."

Note *re* pole and owner thereof.

"Well, we must get the farrier to make us seven braces, &c., for the side arms. Is the farrier around?"

"Yes, sir, but he's busy getting his forge to go."

"Doesn't it go? What's the matter with it?"

"Don't exactly know, sir, he said he was going round to-morrow to see if he could knock up some bellows for it."

"Right, well we must hire a civilian forge. Is there one?"

"Yes, a bit of a one, but from what I could make out from the old girl there, her son has gone for a soldier. The old girl uses the forge for making various 'fakes,' but when it comes to shoeing horses, she's a bit out. Some of the R.F.A.'s in the billets along that

street give her a hand with the shoeing, but it's her living, so to say, and she wants four francs a day for hiring it."

"Well, we can't pay four francs a day, one franc is about the price."

Note *re* forge.

"Well, now what about this pair?"

"Well, as I was saying, sir, when we come to the end of that street where the forge is, the 'Roo dermeans' (Rue d'Amiens), it drops down on cable because the main route goes along the 'Rue de Or,'—it looks as if the Town Major used to be in circuit on this line—then it goes along until it meets the French route to the railway where it comes back to join P × R 13 and 14 to the R.O.D.'s hut at Wangaree Siding. He has a switch on to the Casualty Clearing just at the back."

"I see, well, that's that pair." And so it goes on and one sees weeks of work getting the lines together into some sort of order. This is where your linemen come in, and with many villages in like condition it would be quite impossible to work the Signal Service efficiently without their skill and patience. Of course such lines if left alone would work after a fashion, but one always has to keep in view the possibility of enemy shelling, and it would be a serious business if fighting lines, even if in order, were down, though only for a short time; but disorganised lines down, would be—well, I don't like to think about it.

The case of one lineman stands out in my mind. For weeks we had been clearing up a certain small town and on the last job of all I saw him up a pole with his mate assisting. Stopping just to say, "Well, this completes everything, does it?" "Yes, sir," he replied, and I passed along. An hour afterwards I heard that the lineman on the pole had been killed by a bomb and the other man seriously wounded. The route was down but it didn't take long to get right.

I had only known these men a year, but if ever men had fought a good fight and finished their course, these men had. In a humble sphere in the Post Office they achieved work for the Army of which the weekly wage or the yearly salary is never, never, even an approximate measure.

A MEASURED RATE TARIFF FOR AUTOMATIC EXCHANGES.

BY B. O. ANSON.

UPON inquiry we find that the majority of the automatic exchanges of the world are operated under flat rate tariffs, and that there is a considerable body of opinion which urges that the flat rate is the correct tariff for use at automatic exchanges. In the writer's opinion this is a matter for debate as the principles underlying the construction of tariffs are not entirely dependent upon the methods of operating the switching plant. The flat rate is unsatisfactory, not because it is unsound financially, but because it must be a high rate if it is to be remunerative and therefore it fails to attract the small user and deprives the telephone administration of its proper development; this applies to both manual and automatic systems.

As regards the application of the measured rate to automatic exchanges there are certain special features to be noted. First, the fact that the measured rate appeals to the small user means that there is a class of telephone subscriber that is very sensitive to errors in the service, especially when such errors lead to the loss of calls and the consequent loss of money. When an automatic exchange is opened this attitude of sensitiveness on the part of the subscriber is stimulated by the fact that he then becomes his own operator, and as the Service Observation Returns show that even trained telephonists make errors in operating it follows that the subscriber, himself untrained, will make some errors in dialling and in a certain proportion of cases will call wrong numbers. When this occurs the calling subscriber's meter is operated. This must be the case in any automatic system because the conditions of design are such as demand that result: *i.e.*, the trouble is in the nature of the case and cannot be remedied. Further we must

admit that "wrong numbers" will be obtained in a certain percentage of cases because of unavoidable failures in the mechanism. Failures are incidental to mechanical as to manual operations: if it were not so maintenance staff would be unnecessary. It appears reasonable, therefore, to introduce some feature into the tariff whereby the subscriber will be given a compensating

From	To																			Busy & Hour Total originating traffic of each exchange
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	
A	172	64	19	7	26	19	19	15	26	16	5	4	2	6	3	6	6	3	8	2136
B	67	132	32	2	1	12	1	41	3	2	1	4	1	5	1	1	1	1	1	337
C	21	6	57	1	2	3	1	5	5	5	8	9	10	2						135
D	33	3	2	122	20	1	1	10												198
E	26	1	18	67	1	1	3	2												121
F	15	27	1	13																58
G	19	2	1	5	3	28	4													72
H	5	100				2	31													148
J	48	3	3	10	9	12	45	4	1											149
K	16	2		15	1	1	3	2	41											81
L	10	4	7																	52
M	20	15	10			7	3	2												113
N	6	3	14			1														47
O	4	2	9																	31
P	2	1	10																	22
Q	4	2																		14
R	4	1	9	1																19
S	2			3																21
T																				11

TABLE I.—Busy half-hour traffic of a telephone area consisting of one large and eighteen small exchanges.

allowance. Such an allowance would doubtless impress the subscriber with the fact that the administration fully recognises the new conditions and is anxious to treat him with fairness. On the subscriber's part an endeavour would no doubt be made to derive the greatest possible advantage from the allowance, and this would tend to the exercise of more care so that more accurate dialling would follow. The result in the ultimate would be to the advantage of the administration because a better service would ensue.

The next item that calls for consideration in connexion with the measured rate is the subject of junction fees. At most large centres there are three ranges of junction service, viz., calls with no junction fee, those with 1d. fees and those with 2d. fees. These fees are charged in addition to the local call fee which varies according to the "block" of calls used to date. Either an operator or a machine can be expected to register each completed call (i.e., to count the calls), but neither can be expected to operate profitably devices which will accurately record the three classes of junction calls including the local fee.

At automatic exchanges a subscriber wishing to make a junction call dials a specified number, usually "O," and obtains the attention of the junction operator. This operator has no means of identifying the calling subscriber's line, and for accounting reasons she must ask him for his own number in addition to the particulars of the call he requires. This is not a very satisfactory operating requirement. The extra operation occupies valuable time; for obvious reasons it is not very precise and therefore calls for some process of verification. Hitherto it has been the practice at automatic exchanges to "ticket" all junction calls, and to collect both the corresponding junction and local fees upon the basis of these ticket records. This applies even to junction traffic with no junction fee. It would be no doubt be practicable to "meter" the latter if their bulk were sufficient to warrant such a course. If, however, we could evolve a system under which all junction calls could be metered, the operation of the outgoing junction positions would

be simplified, and we should have a scheme under which so far as one can see at the moment the development of machine switching could proceed unrestricted.

The impracticability of metering junction calls at the manual board of an automatic exchange arises from fundamental conditions which carry with them two other objectionable consequences of great moment. It is impossible to open satellite or branch automatic exchanges when the traffic to be transferred involves junction fees. It is also impossible to introduce rapid semi-automatic working in areas where junction fees are in force, because the conditions affecting the semi-automatic telephonist are precisely those which impede the junction operator at the manual board of a full automatic exchange. Both these developments are of importance as regards the future of automatic working in this country. The adoption of satellite exchanges would lead to a substantial saving in line plant, and the introduction of semi-automatic working is believed to be the only sound procedure preparatory to the transfer of a large area from manual to automatic working. For these reasons it is necessary in order to ensure the development of machine switching that the real obstacle, the junction fee, be abolished.

It is presumed that an administration cannot afford to lose the value of the junction fees, and that if the fee *per se* be abolished the money must be obtained in some other way. It appears, therefore, that the proper course would be to compound the junction fees with the message block of the measured rate tariff. It is instructive to see how this can be done, and a specific case is given below.

Table I shows the cross-country traffic for the busy half-hour of a telephone area which consists of one large and eighteen small exchanges.

Table II shows the junction fees concerned in intercommunication between point and point of this area. We assume that the introduction of automatic working at exchange "A" is in contem-

	T	S	R	Q	P	O	N	M	L	K	J	H	G	F	E	D	C	B	A
A	2	2	0	2	1	1	1	1	2	1	0	0	1	0	1	1	1	0	0
B	2	2	0	2	1	0	1	0	1	1	1	0	1	0	2	1	1	0	0
C	2	2	0	1	0	0	0	0	0	2	1	1	1	0	2	2	0	0	0
D	1	0	1	1	2	2	2	2	2	1	0	2	0	1	0	0	0	0	0
E	1	0	1	2	2	2	2	2	2	1	1	2	1	2	0	0	0	0	0
F	2	2	0	2	1	0	1	0	1	1	1	0	1	0	0	0	0	0	0
G	0	0	1	1	1	2	2	2	2	1	0	2	0	0	0	0	0	0	0
H	2	2	1	2	2	0	1	0	1	1	1	0	0	0	0	0	0	0	0
J	1	1	0	1	1	1	1	1	2	1	0	0	0	0	0	0	0	0	0
K	2	1	1	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0
L	2	2	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
M	2	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	2	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O	2	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE II.—Junction fee schedule for the system shown in Table I.

plation, and applying the junction fee schedule to the traffic of exchange "A," we find that the 2,136 originated calls include traffic, representing junction fees to the value of 156 pence. This amount spread over the whole traffic works out at approximately 8d. p r 100 originated calls.

Table III shows the present tariff "A" in columns 1 and 2. In column 3 is given the proportionate amount that should be added to that tariff to cover the cost of giving junction service, and the revised subscription resulting from that addition is shown in column 4. Column 5 shows the meter readings that would correspond to the annual subscriptions if a 5 per cent. allowance were made to the subscriber for automatic working in accordance with the suggestion made in the earlier part of this article. The figure of 5 per cent. is quoted as an approximation and not as a precise value. The proper figure would be obtainable from Service Observations.

Present tariff "A" for exclusive line.		Proportion of junction fees at 8d. per 100 calls.	Revised subscription including junction service.	Revised No. of calls including subscribers operating allowance.
No. of calls.	Annual subscription.			
(1)	(2)	(3)	(4)	(5)
	£ s. d.	£ s. d.	£ s. d.	
500	5 0 0	3 4	5 3 4	525
750	6 0 0	5 0	6 5 0	787
1,000	7 0 0	6 8	7 6 8	1,050
1,250	7 15 0	8 4	8 3 4	1,312
1,500	8 10 0	10 0	9 0 0	1,575
1,750	9 5 0	11 8	9 16 8	1,837
2,000	10 0 0	13 4	10 13 4	2,100
2,500	11 0 0	16 8	11 16 8	2,625
3,000	12 0 0	1 0 0	13 0 0	3,150
3,500	13 0 0	1 3 4	14 3 4	3,675
4,000	14 0 0	1 6 8	15 6 8	4,200
4,500	15 4 0	1 10 0	16 14 0	4,725

TABLE III.—Columns (4) and (5) show revised tariff for exchange "A."

An examination of Table I makes it clear that a tariff of this kind would be satisfactory at the main exchange, but would not be suitable for application at the smaller offices, because the latter have a large proportion of junction fees. It is clear, however, that the proposed tariff would be suitable for just such cases as we are considering—namely, those exchanges at which machine switching is likely to be introduced. The smaller exchanges shown in the table considered by themselves would not be remunerative automatic exchanges, and therefore the application of the revised tariff would not be proposed. The tariff indicated on Table III is based upon traffic figures obtained from a single busy half-hour record, but a much more extensive investigation would be needed before adopting the system. Moreover it would be undesirable to deal with exchanges singly. A weighted measured rate tariff, similar to that proposed, should be constructed as a result of investigations carried out simultaneously at all the exchanges under consideration, and the same tariff applied at each of them.

The objection to be urged against the adoption of a weighted measured rate tariff on the lines indicated will doubtless be based upon the criticism that a subscriber who makes few junction calls will pay for the traffic of another subscriber who makes many. This contention is at once admitted, but it is to be remarked that it is only an extension of the principle we are obliged to follow in other respects. There are many factors in the cost of telephone service which do not appear in the account of the individual subscriber, but for which the administration nevertheless is careful to recoup itself. For instance, conversations may be long or short; exchanges may be large or small; the prevailing weather in a district may be stormy or calm; subscribers' lines may be long or short, and calls may be made by day or night.

Having regard to the lessons afforded by the history of invention, it is certain that we cannot ignore the claim that automatic telephony in its present state of advancement has to our attention, and it seems reasonable to urge that an administration would be wise, in considering new tariffs, to give consideration to the fact that tariffs embodying junction fees are likely to rob it of the advantages to be derived from the use of mechanism for switching purposes. If, as the writer believes, the whole of the requirements can be met without violating the principles that underlie measured

rate tariffs, there is every reason to think that the near future should be productive of much advancement.

It will probably occur to the reader that the tariff proposed for automatic exchanges might be adopted (without the subscriber's operating allowance) at manual exchanges where meters are provided. The writer considers that there is a great deal to be said in favour of such a course provided the investigations upon which the tariff is based includes all exchanges where registers are fitted.

TELEGRAPH APPARATUS.—AN INTRODUCTION TO THE STUDY OF TELEGRAPHY.*

BY A. SIRETT.

[We are glad to be able to meet a demand for an article of an introductory character on the elementary principles of telegraphy. We therefore welcome the opportunity of printing Mr. Sirett's paper which will be continued in forthcoming issues.—Ed., "T. & T. J."]

It is stated that in 1823 when the British Government was offered the rights of a certain electric telegraph system, they replied officially that "*the telegraph was of no use in times of peace and that the semaphore in time of war answered all the required purpose.*"

It is difficult to realise what our position as a business nation would be to-day if we had no electric telephone or telegraph systems, no news coming through to fill the daily papers and no electrical signalling on the railways.

I will quote two instances showing the speed with which news travelled in the good old days. It is recorded that the news of the great fire of London took five days to reach the Duke of Buckingham at Bognor, which is within 60 miles of London.

Coming down to a more recent date we find it stated that, in February 1836, an Englishman of some rank who was in Paris wrote in his diary "That the King's speech had been delivered in Paris within 29 hours of its delivery in London, a rapidity of transmission almost incredible."

As a contrast, I would point out that you can now speak direct to your friends on the Continent by using the telephone.

By this contrast we can fully appreciate the immense difference between the normal daily practice to-day in business and private life and that of the days before the invention of telegraphy or even the early days of the electric telegraph.

Several types of apparatus in use to-day afford in themselves material for a whole evening's paper but, as my subject is new to the Sheffield branch of the Institute, it will be well, I think, if we study first some of the earliest telegraph instruments, as used for experimental purposes long before telegraphy was of any commercial value or convenience, and then trace, step by step, the development of the more useful types of telegraph apparatus down to the instruments in use to-day.

I will first of all touch briefly on the historical side of the subject dealing with the early experimental instruments, and I hope to show you how the original ideas of the early scientists and inventors and the ideas of later inventors who have profited by the failures of their predecessors are embodied in the modern apparatus.

Historical Outline.

Experiments in telegraphy were made as far back as the year 1753. In that year an article appeared in a British magazine proposing several kinds of telegraphs acting by the attractive power of electricity. The electricity was to be conveyed by a series of parallel wires corresponding in number to the letters of the alphabet. Words were to be spelt by the electricity attracting letters or by striking bells corresponding to letters. In 1782 another proposal was made to indicate the letters of the alphabet by the

* Paper read before the Sheffield branch of the Junior Institute of Engineers on March 24, 1916.

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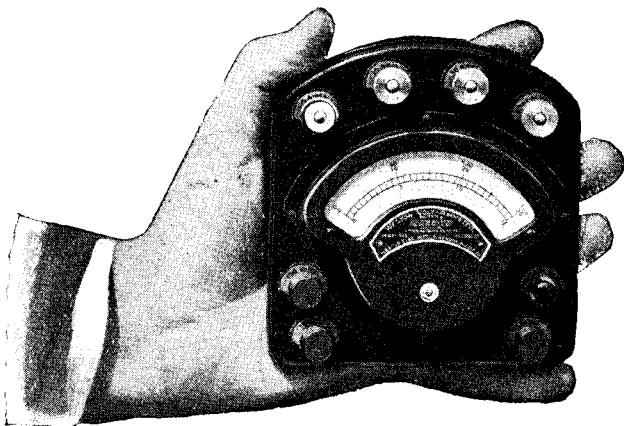
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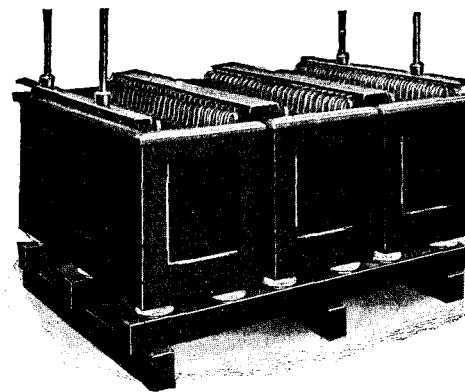
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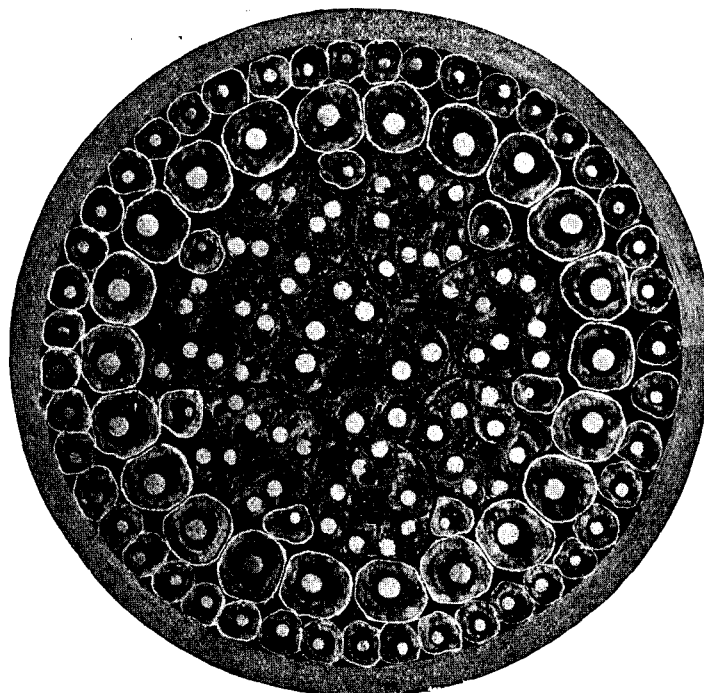
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attraction of light bodies by electricity conveyed by means of 24 wires. Nothing seems to have come of these suggestions.

In 1811 Sömmering, a medical student at Göttingen, suggested that the effect of chemical decomposition might be observed as the means of indicating the letters signalled, if voltaic electricity were used. He followed up his suggestions by experiments and produced apparatus which is sometimes regarded as the first practical telegraph instrument made. His experiments are said to have commenced on July 8, 1809. On Aug. 6 of the same year he telegraphed through a wire 724 feet long and on Aug. 18 through a wire 2,000 feet long.

Sömmering's apparatus is illustrated in Fig. 1.

It contained 27 wires for 25 letters, the stop and repeat signs. The wires were covered with insulating material and made up in the form of a cable. Each wire ended in a gold pin at the receiving apparatus (C). The pins were fixed in the bottom of a rectangular glass box filled with water. The other end of the wire was connected with a frame (B) containing 27 contact keys. The keys were lettered to correspond to 25 letters of the alphabet, the stop and repeat signals. As the keys were depressed a current of electricity passed from the battery (A) through the wire to the gold pin; from the pin through the water to the return wire and back to the battery. As it left the gold pin, bubbles of gas were given off and by this means the letters were signalled, as the pins were all lettered to correspond to the letters of the alphabet,

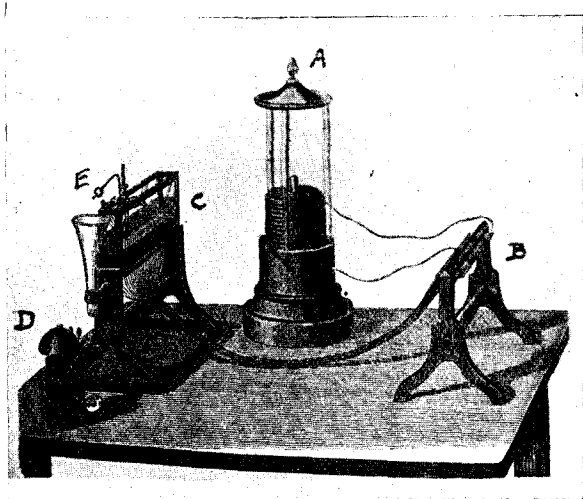


FIG. 1.—SÖMMERING'S TELEGRAPH INSTRUMENT. A Battery. B Keyboard. C Receiver.

and the observer had to watch to see at which pin the bubbles appeared. As already stated, for this apparatus no less than 27 line wires were required, whereas only one wire is now required for a telegraph circuit.

The calling bell (D) of this instrument was a very ingenious arrangement. A leaden ball (E) was fitted loosely on the horizontal arm of an angular lever. The other end of the lever supported a spoon-shaped glass vessel placed so as to catch the escaping gas from the gold pins. When the evolution of gas commenced the spoon was raised and the arm was lowered so as to allow the ball to fall through a glass funnel upon the lever of a clock which made the bell ring and gave the required signal. Sömmering's apparatus was never applied to practical use.

Illustrations of the apparatus on which the Admiralty relied in 1823 are given in Figs. 2 and 3. All the original telegraphs depended upon the telescope. It is recorded that 27 telegraphs of this type conveyed information in 3 minutes from Calais to Paris, 22 from Paris to Lille, 46 from Strasbourg to Paris in 6½ minutes and 80 from Paris to Brest in 10 minutes.

In 1819, ten years after Sömmering commenced his experiments, the deviation of the magnetic needle through the action of an adjacent galvanic current became known, and Ampere in 1820 and Fechner in 1829 showed how to make use of this discovery for telegraphic purposes.

Ampere's plan, we are told, was to use 30 needles or indicators and 60 wires. Fechner's, 24 needles and 48 wires, for it was thought there must be a separate indicator for each letter or sign signalled. These proposals, however, were put to no practical use.

Further experiments were made in 1832, but the first electro-

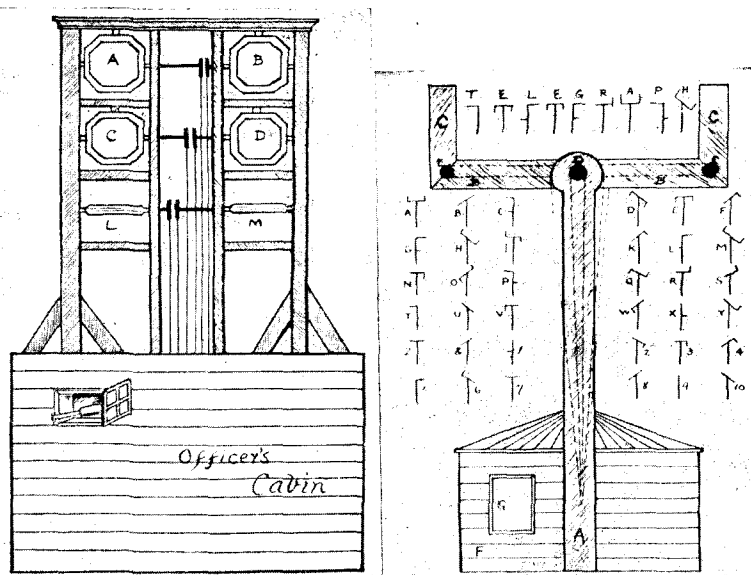


FIG. 2

FIG. 3.

magnetic telegraph of which practical use was made was constructed in 1833 by Gauss and Weber at Göttingen, with a line 3,000 feet long. Their original apparatus is represented in Fig. 4. "B.B" is a frame in which the magnet "A" is suspended by means of a silk thread. "M" is a small mirror connected with the magnet. The frame "B.B" is wound with several turns of wire and the apparatus forms a galvanometer. Any slight movement of the magnet brought about by the passage of a current through the coils of "B.B" could be detected by the movement of the mirror.

The sending apparatus represented in Fig. 5 consisted of two large magnets "A." The induction coil "B" was placed loosely so that it could be moved up and down by the lever "L." A quick movement of the coil generated an induced current which passed from the coils along the line wires to the galvanometer

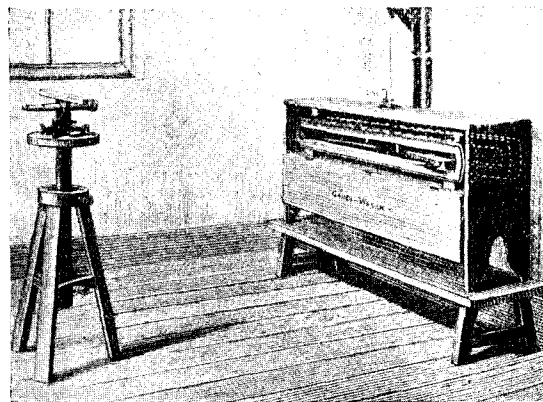


FIG. 4.—GAUSS AND WEBER'S TELEGRAPH RECEIVER.

frame "B.B." This current caused the magnet "A" (Fig. 4) to be deflected. The direction of the deviation was determined by the direction of the movement of the coils "B" (Fig. 5) whether up or down.

We have now reached that stage when it is obvious that by a combination of the deflections of the magnet a whole alphabet

could have been built up. In spite of this the apparatus appears to have been relegated to a magnetic observatory and several years elapsed before more was heard of the new invention.

The year 1837 marks the commencement of practical telegraphy. There are three distinct claimants for the invention, but a close study of the apparatus just described leads one to think that a

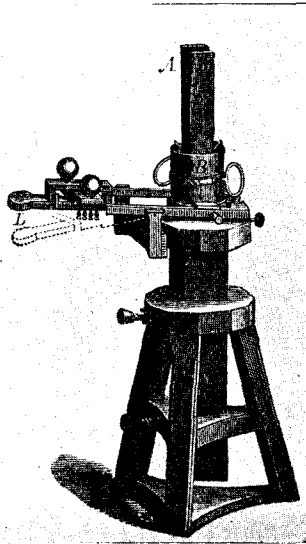


FIG. 5.—GAUSS AND WEBER'S TELEGRAPH SENDING APPARATUS.

good deal of the merit given to these claimants is due to Gauss and Weber. The three inventors referred to are Steinheil of Munich, who was a pupil of Messrs. Gauss and Weber, Sir Charles Wheatstone and Mr. Morse of the U.S.A. The telegraph of Wheatstone and Morse embodies the principles of the Gauss and Weber apparatus, viz., the deflection of needles or magnets caused by the passage of a current of electricity, but that of Steinheil is original in some respects. It consisted of an apparatus for making a ribbon of paper move by clockwork, whilst interrupted marks were made upon it by a pen or stamp, brought into contact with the ribbon by the action of an electro-magnet.

These later inventions formed what we may term the foundation of the present-day telegraphy, viz., the needle or non-recording instrument and the printing or recording instrument.

Steinheil worked on the Gauss and Weber telegraph and produced the first writing telegraph instrument. In this instrument the current was generated by moving induction coils past

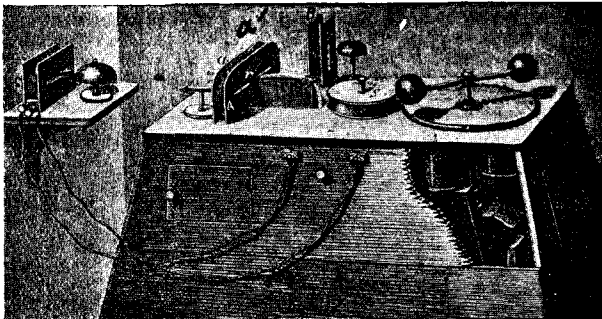


FIG. 6.—STEINHEIL'S TELEGRAPH INSTRUMENT.

the poles of a permanent magnet. These coils or bobbins were closely wound with fine wire which was in contact with the line so that the current generated in the bobbins could be sent through the line wire to the receiving instrument. We find that the direction in which the current was sent through the instrument was the means utilised to form a readable record on the tape.

Fig. 6 is an illustration of Steinheil's telegraph instrument.

"A" is a galvanometer frame round which several turns of wire are wound. In this frame two magnetic needles "a." "a'" turn on vertical axes. Each needle has a small ink holder which is brought into contact with the paper ribbon as the current impulses are received from the sending apparatus. The alphabet is formed by a combination of dots, and as the current passes in one direction one ink holder is brought into contact with the ribbon; and when it is reversed the other holder is in contact. The two bells "B" and "C" shown, are simply alarm bells or call bells. A magnet swings in the galvanometer frame in a horizontal or vertical position and is brought into contact with the bell by the passage of a current through the coils of the galvanometer. This apparatus was used over a private circuit exceeding seven miles in length.

Whilst Steinheil was experimenting with this apparatus, William Fothergill Cooke saw a telegraph instrument in Germany in 1836 which he copied. He brought his copy to England. He joined Wheatstone and together they constructed a four-needle and a five-needle instrument. Four or five line wires respectively were required for these instruments. The signs were given by the deviation of two needles at the same time. The five-needle instrument is shown in Fig. 7. This apparatus was patented in 1837.

It is well to note at this point that Wheatstone invented the relay, which now plays a very important part in telegraphy, for

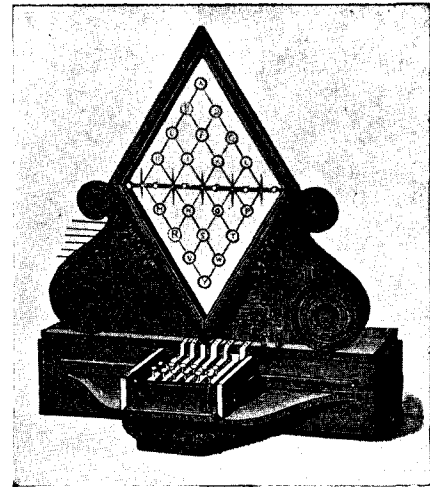


FIG. 7.—COOKE AND WHEATSTONE'S FIVE-NEEDLE INSTRUMENT.

use in connexion with his five-needle telegraph instrument. He found it was possible to telegraph with much weaker currents than were required to ring the call bell. To obviate increasing his line current to ring the bell he arranged to fix his call bell in a strong local battery circuit which could be joined up by the weaker current received from line.

The first relay is shown in Fig. 8. "M" is a frame around which wire is wound. Inside the frame a magnetic needle swings vertically; "a.b" is a lever fixed to the needle. As the current from the distant station passes through the wires, "l" "l'" and through the coils of "M," the lever dips at "a" into the two cups of mercury and completes the local circuit "a.B.E." "B" is the local battery, "E" is the electro-magnet with its armature free to move towards the bell. When the current passes through the coils of "E" the armature is attracted at the lower end and the hammer "S" strikes the gong. The part "M" is more delicate than the bell, consequently the weak line current will work that and so join up the local circuit which includes the strong battery, whereas it would not work the bell direct.

This idea has been perfected and to-day the relay forms one of the most important parts of long-distance telegraph apparatus.

The first experiment with the five-needle instrument was made on July 25, 1837, between Euston and Camden Town, a distance of one and a quarter miles, and between Paddington and West Drayton, near Uxbridge, in 1838, and later the trial circuit was extended to Slough. The line wires were not carried overhead.

They were laid in grooves cut in pieces of oak about 2 inches square in sectional area, and secured by oak clips driven in the grooves. Insulation difficulties soon arose. The line was workable so long as the wood kept dry but as soon as it became wet the insulation broke down and the system became useless. The difficulties in maintaining the line in working order proved so great that some

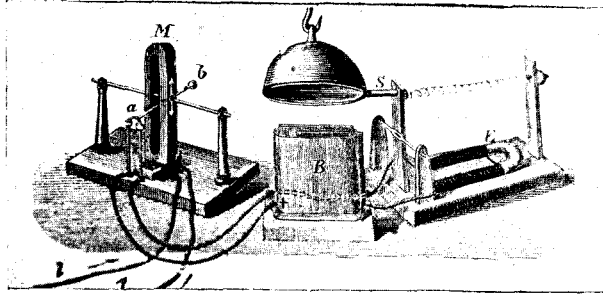


FIG. 8.—WHEATSTONE'S RELAY.

other kind of apparatus requiring fewer line wires had to be thought of, and a double-needle instrument took the place of that just described.

This instrument is now a thing of the past, but it is said to have been an excellent piece of apparatus by those who worked it.

Fig. 9 is an illustration of the first pointer telegraph. It was invented in 1839 by Wheatstone. The sending part consists of a ratchet wheel "K." The springs "n.n'" are so arranged that, when one spring makes contact with a tooth, the other spring will stand between two teeth. One pole of the battery is connected to the metal wheel, the other pole to the line. The wire "+.1" of the sending station leads to the terminal "K" at the top of the receiving instrument. Terminals "K 1" and "K 2" are connected to the springs "n.ni" of the sending instrument. When the wheel "K" is moved, the battery current will flow alternately through the coils of the electro-magnets "e" and "ei" passing through the coil "e" when the spring "n" rests upon a tooth, as shown in the figure, and through the coil "ei" when the spring "n'" comes in contact with a tooth. Owing to the alternate magnetising of the electro-magnets "e" and "ei," the armature "a.a i" to which is attached the escapement, will swing backwards

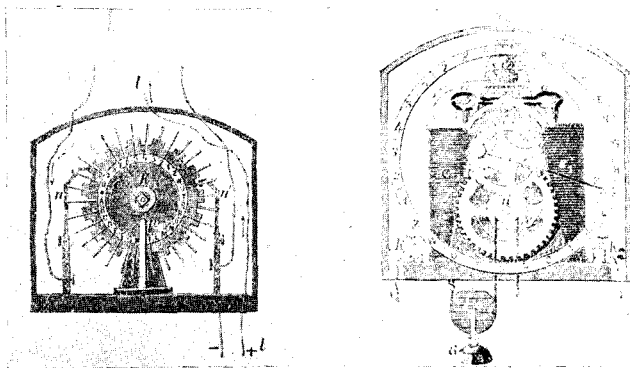


FIG. 9.—WHEATSTONE'S POINTER TELEGRAPH.

and forwards, allow the clockwork to be set in motion and bring the pointer to the letter desired. Every time the spring comes in contact with a tooth the pointer moves forward one letter. To start, the sending dial must be set at zero when the receiver's pointer is at zero. The two will then work in synchronism.

It is from this that the Post Office apparatus, the Wheatstone A.B.C., has gradually developed.

(To be continued.)

[We are indebted to Messrs. Cassell's *Electricity in the Service of Man* for several of our illustrations.]

LONDON TELEPHONE SERVICE NOTES.

THESE Notes finished last month with a promise of further information about the L.T.S. concert given at the Post Office Home Hospital on the first Friday in January. It is difficult to know, however, what more need be said than that the musical arrangements were in the hands of Mr. E. A. Pounds. His reputation in these matters extends far beyond the L.T.S. or even the Post Office, and the excellent quality of the entertainment will be appreciated by those who were not there when they learn that the pleasures enjoyed by those who went far exceeded their most exacting expectations. If anything was needed to make the evening a full and final success, it was forthcoming in the presence of the "Chiefs," including the Controller, Deputy Controller, Acting Assistant Controller and the Superintendent of Revenue.

Whilst on the subject of entertainments we feel compelled to refer to the work done by individual exchanges. Almost every Saturday (let alone other days) sees the staff at one or more of the London exchanges providing at their own expense lavish entertainment, either for wounded soldiers or poor children. If each one were reported at length the size of the JOURNAL would have to be increased and all other matter excluded. It is, therefore, only possible to give a passing reference to many and some, such is the modesty of the prime movers, go unrecorded save in the cherished memory of those fortunate enough to be amongst the entertained or entertainers. We have heard, however, of the following, each of which added laurels to the brows of those responsible for their organisation. The Lee Green staff gave a right royal time to wounded heroes at "The Priory," Lewisham, on Jan. 27, and so successful was it from all points of view that it is to be repeated in February. The Hampstead staff organised a whist drive for Feb. 3 in aid of the "Mayor of Hampstead's Fund for Wounded Soldiers." Its success socially was no less than its success financially, and the fund received a contribution of £21. Saturday, Feb. 10, saw the Paddington staff giving a good fairy-like time to the poor mites who congregate in the neighbourhood which lies about the exchange, whilst the Croydon staff were entertaining wounded soldiers from the Davidson Road War Hospital. It goes without saying that at each and all of these gatherings individual members of the Telephone staff proved that the qualities of voice which make the successful telephonist are musical in the highest degree.

The Telephonists' Society had a treat indeed on Feb. 13, when they listened first to a prize essay by Miss Edith Venus, describing her experiences on "raid" nights. The second item was Mr. John Lee's description of the possibilities of the telephone as a factor in the "Social Reorganisation after the War." In the words of Miss Heap (than which nothing could be more apt), Mr. Lee is a prophet who prophesies "smooth things," and on this occasion they proved the smoothest of the smooth. It was quite evident that everyone thoroughly enjoyed his prophecies and the rhythmical cadence in which they were delivered. The society was particularly fortunate in that Mr. Lee's appearance resulted in a large gathering of those from the calm sequestered pleasantries of the Secretary's Office, and the company had the added joy of listening, amongst others, to speeches by the Assistant Secretaries, in charge respectively of the Telegraph and Telephone branches. We trust Mr. Lee will often address these meetings and that his following will grow larger and even larger. In the general discussion after the paper some lines of Shakespeare's were referred to, and as they seem peculiarly apposite as a description of the essayist we quote them here. It is a pity that the individual who attempted their quotation at the meeting had not made himself more completely master of them.

"... A merrier man,
Within the limit of becoming mirth,
I never spent an hour's talk withal,
His eye begets occasion for his wit;
For every object that the one doth catch
The other turns to a mirth-moving jest;
Which his fair tongue (conceit's expositor)
Delivers in such apt and gracious words,
That aged ears play truant at his tales,
And younger hearings are quite ravished;
So sweet and voluble is his discourse,"

The Telegraph and Telephone Journal.

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

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Committee		MR. J. W. WISSENDEN.
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NOTICES.

As the object of the JOURNAL is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications, together with photographs, diagrams, or other illustrations, should be addressed to him at G.P.O. North, London, E.C. 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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CONTROL OF PUBLIC SERVICES.

Engineering commenting on an American paper on "Reform and Regulations," says—in the course of a long and discursive editorial, in which Sir William Harcourt, the London County Council, Mr. Gladstone, an American Commission, the German Military autocracy and the Post Office in turn receive castigation—that the author, Mr. Humphries, "makes no such extravagant demand as that the efficiency of Government Departments shall be raised to the level of the best class of private undertakings, but he strongly expresses the opinion that the efficiency of service can never be as high under a democratic régime as is attained at times under an autocracy. History, we believe, bears this out. The public services in the earlier part of the reign of Louis XIV were incomparably better in France than in England, and have, we believe, been substantially superior in modern Germany to what they are in this country. Whilst this is true, it is also equally the case that the standard never falls quite so low in democratic countries as it has done in certain autocracies. Probably, indeed, if an average be taken over the whole world the advantage may be, on the whole, with the democracies."

"The difficulty," it is said, "lies in part in the fact that no man can serve two masters." And further on: "The great danger against which democracies have to guard is the interposition of a buffer of politicians between the community and expert opinion." Can it then be contended that in an autocracy the autocrat is less likely to come between the community and the beneficent advice of the expert, than in a democracy, the Treasury, say, or some politician? Does the shareholder's interest never come between

the interests of community and expert opinion in the golden régime of privately controlled utilities?

Engineering, we think, goes somewhat far back in exhuming its stories of Mr. Buxton, Mr. Heaviside and Sir William Preece. There has been for some time an extensive research department in connexion with the Post Office. It is not necessarily true that uniformity and progress are mutually incompatible, unless of course the first is expressly designed to include the second. We venture to maintain that in Government Departments this is not usually the case. It is perhaps difficult for the public to appreciate the spirit of public service; so much more is heard of its shortcomings than its good works; so many of its necessary checks and routine are classed generically as "red tape." The Government clerk has perhaps on the whole more opportunity of exercising the much-prized quality of "initiative" than a clerk in a large private company, but new decisions with far-reaching consequences cannot so lightheartedly be given by officials with responsibility to the nation as by the official who has only to secure the approval of his directors.

We are told that Sir William Preece, "speaking as an old Post Office servant, observed that Sir Oliver Lodge was mistaken in thinking that telegraph engineers had learnt anything from Heaviside," which assertion was met by the crushing rejoinder that Sir Oliver fully accepted Sir William's statement. *Engineering* doubts whether the irony of this did not escape many of its auditors, but we think that a full sense of humour has seldom been lacking in the Civil servant from Charles Lamb downwards. How should it be otherwise? To have ancient and quasi-humorous concepts of his work passed off upon him for facts, to find democratic critics decrying his greater initiative and independence in favour of the conditions existing in capitalistic organisations, may well engender that sense. "The official leopard," we are told once again, "has not changed his spots." It is surprising in view of the frequent belabouring he receives that the beast is not now striped. We fear we must bow to the superior wisdom of the humorist and cry "Peccavi! We own that the animal is as full of spots as a rocking-horse. But our critic can take heart. In the first place there is a good deal of that autocracy which he admires going about at present, and in the second perhaps the multitudinous new riders who are being called in to augment our numbers may rub off and efface some of the said spots."

Engineering concludes with a story which is worth reproduction. A certain Resident of the Federated Malay States once confessed to one of his engineering officials that he made it a point never to consider the merits of any proposal when first broached, but always turned it down in the belief that if the suggestion were really of value it would be brought up on another occasion. But surely this is not so much typical of the Civil servant as of the cautious temperament. Successful business men, however unworthy of imitation, have been known at times to act thus on the lines of least resistance. The anecdote certainly adorns the tale, but we cannot see that it points any moral.

HOPE.

By an odd irony the optimist has come to be regarded as a weakling. It is fashionable to be a pessimist, and to lose faith in humankind is almost a creed. Amid the crash which civilisation has met we fail, too often, to see the signs of patient upbuilding. There is a haste to restore 1914, with its bitter but undramatic warfare, its tinsel comforts, its shallow and short-sighted thought, its scorn of labour, its apotheosis of idle control. But also there is evidence of discontent with 1914, of desire for clearer thinking and broader sympathising, of determination to organise so that mankind and womankind may have opportunities for seeing more than the trivial round and the common task. Of this evidence a new book *The Hope for Society* stands out, bold and conspicuous. It is a bundle of addresses given last year at the Summer School at Swanwick. It thrills with the true optimism, with the faith which sees and the courage which is fearless. The addresses are essays on social reconstruction. Men of varied political and economical and religious views met together for conference, and the result is a heartening appeal. It is an appeal to the world outside our own world of telegraphs and telephones. None the less it is a significant appeal to our own world. It asks for reconstruction, for re-forming of the spirit which lies behind labour and of the intention which lies behind the control of labour.

Hardly a page of the book but is applicable to our own craft. When Mr. Clutton-Brock writes of "Austerity, art and joy," he touches upon fundamentals which we can see below the telegram and behind the telephone call. When Mr. J. A. Hobson adds a chapter to his book on "The Evolution of Modern Capitalism" we can find in it reference to halfway houses between complete nationalisation and private industry which have significance for those of us who have faced the comparison between English and American methods of controlling our craft. Sir Hugh Bell writes from the employers' side on Trade Unionism; Dr. Carlyle from the Trade Union side. And there is not so much disparity in the contentions as one would expect. For all cast their vision forward, not without anxiety but yet without fear. The new day is dawning and the ivory gates of Hope are moving on their hinges.

Mr. Ernest Barker winds up the volume. He looks for a new social relationship after the war. He is not content with a mere industrial relationship. And as part of this new relationship the problem of workshop control takes an important place. "Let the workers in each department of any works be conceded some measure of autonomy; let them have overseers or foremen in whose selection they have a voice; let them have a say of their own about their hours of starting and their hours for meals, and the general conditions of their day's work. The real human grievance of the worker is not only, and perhaps not so much, inadequate wages; it is the sense of being 'driven' and of working under a taskmaster's eye. If we could, consistently with good economic management, remove this sense and abolish this grievance; if we could create in the workshop a spirit of self-control and self-government, we should have gone a long way to secure a better system of social relations in the world of industry." It is a bigger demand than it

seems to be. It asks for a new spirit on both sides. It asks for a spirit of co-operation and not for a spirit of mutual criticism; it asks for faith and not distrust, for the contribution of the voluntary best in place of the disciplined second-best. "We must steel ourselves to think of change, and—what is more difficult—to do the long and painful work of carrying our thoughts into effect."

HIC ET UBIQUE.

WE offer our sincere congratulations to Lieut.-Col. T. Kelly, Surveyor of the North Midland District, who has been awarded a C.M.G. besides being mentioned in dispatches, and to Col. E. V. Turner, Superintending Engineering, Ireland, who has received a D.S.O. Amongst the many Post Office men who have received honours lately we notice Capt. A. A. Jayne, an Assistant Traffic Manager in the Secretary's Office, who has been awarded the Military Cross. Capt. Jayne is already well known to our readers as a contributor, and we publish a welcome article from his pen in this issue. Lieut. Roadknight, of the Telephone branch of the Secretary's Office is also mentioned in dispatches.

MR. ARNOLD WHITE tells us:

The mental fatigue which would follow the introduction of the telephone was foreseen by Mr. Gladstone. When he was asked by Mr. Edison's representative whether he would like to have a telephone apparatus set up in his house, he wrote on a postcard: "Sir, my means of communication from without inwards are already equal to my needs and in excess of my desires."

Of course people have learned by now that the advantages of the telephone outweigh any drawbacks that it may be credited with. As in war some defence is always ultimately found for each new weapon of offence, so it is with the telephone, and we imagine that Cabinet Ministers have long since devised a means of warding their privacy from the attacks by telephone of the pushing and impertinent.

IN a London suburb recently a lady called at a shop which exhibited the familiar sign: "You may telephone from here," and asked the proprietor's wife to make a telephone call for her, stating that the message was both important and urgent but that the Post Office would not accept it as a telegram.

On being asked for particulars of the person for whom the message was intended she confessed she did not know the name, but knew the street and the district and was sure there was no telephone in the house.

We regret to state that the lady's sublime faith in the omnipotence of the Post Office telephone system, which she expected to send a telephone message to a non-subscriber whose address she did not even know, was not justified. After some vituperation of our inefficiency, she added: "And I suppose you would have charged me for it, if you had got through!"

OBITUARY.

WE regret to announce that Mr. A. W. MARTIN, the Staff Officer in charge of the Telephone branch of the Engineer-in-Chief's Office, died on Feb. 14, after a long and painful illness. By Mr. Martin's death the Post Office has lost an able officer who was thoroughly versed in all the technicalities of his art, and those personally acquainted with him a friend and willing helper.

Our sincere sympathy is with the widow and her children.

THE REPORT OF THE HIGH-SPEED COMMITTEE.

THE committee appointed two years ago to examine the question of the present position occupied by various systems of high-speed telegraphy has, notwithstanding the unforeseen circumstances which prevented the elaborate pre-arranged tests from being completely carried out, made certain definite recommendations without prejudice to further developments which may arise, and has compiled a report which, besides containing in a concise form facts of historical interest to the Telegraph Service, deals in a judicial spirit with the advantages or otherwise of the various systems considered.

Under high-speed systems are grouped all those which provide a total carrying capacity of more than 60 words a minute, even when the individual operator may be disposing of a relatively small share. A sub-division is made on the well-recognised principle of automatic or multiplex systems and a reasoned case is presented for the superiority of the latter in disposing of the ordinary inland commercial traffic passing on main circuits. It is, perhaps, a little surprising that such a decided attitude has been adopted at what must be admitted to be an initial stage of the experiments and, probably, much controversy will be aroused before the problems discussed are finally settled. The interest developed, however, will have a beneficial effect in turning the attention of the staff to the points requiring consideration, and when the enquiry is resumed there will, no doubt, be available definite data of a trustworthy kind as to the effects on the operators called upon to staff the new systems. It has been the aim of this committee to limit its activity to a comparison of the advantages and defects of the various systems for traffic purposes and it has on this ground, apparently, left the personal factor out of account. This is not likely to escape notice for long, but it would be desirable to have the opinions of authorities not likely to be partisans either of the employer or his staff before following out to a large extent the conclusion of the committee.

Within the last twenty years we have seen a remarkable oscillation of opinion as to the merits of hand-manipulation, and the reasons for these variations cannot be said to be adequately explained in the report presented. The vigorous attempt to repress Wheatstone working in 1900 was followed in a very few years by attempts to organise the method, and such a detail as slip-gumming or improved perforators does not fully account for the success which accompanied the re-introduction of Wheatstone working. There is in the Telegraph Service still a fairly large body of opinion which favours Wheatstone working even more than automatic systems. This may be the result of the achievements of the Wheatstone multiplex system in former times when it was on occasions staffed by specialists. We are in danger of falling into a similar fallacy now in judging of systems staffed by picked and enthusiastic experts. Methods which show excellent promise when in the most efficient management become woefully disappointing when allowed to drift into less capable control. This fact is recognised in a striking recommendation that chief operators on multiplex systems should have their value specially rewarded.

It cannot be said that the committee's unanimous verdict in favour of the Western Electric Company's multiplex was anticipated by the staff generally. Notwithstanding some objections from operators as to the physical strain in continuous Baudot working, there has been a feeling that the output and comparative stability of this system would have given it a strong hold on administrators. With the recommendation to utilise the Creed receiving apparatus for news work, most practical officers will heartily agree, and there may be some demur if its function is strictly limited to this class of traffic.

Synchronism and corrections appear to be the rocks upon which high-speed systems split, but it is scarcely likely that inventors will allow these difficulties to destroy their systems. We are clearly passing through a transition stage and no finality can be expected. The report is one which should be widely read and carefully considered.

A. N.

For the convenience of our readers we print a summary of the leading conclusions of the committee appointed to consider the question of high-speed telegraphy:—

(i) Systems on the multiplex principle are definitely superior to the automatic high-speed systems on the large majority of main circuits for ordinary inland commercial telegraph work.

(ii) The extension of systematic Wheatstone working should be discontinued, and the question of displacing it by multiplex circuits taken up gradually.

(iii) Of the multiplex systems at present available the Western Electric has given the best results. We recommend that a number of quadruple duplex installations of this apparatus be ordered. We think seven or eight such sets should suffice, as although present conditions favour the rapid application of systems with the greatest output, it is desirable to avoid too great a dislocation of working, and to allow time as far as possible for other makers to demonstrate their capabilities.

(iv) Page or column-printing is preferable to tape-printing on the busiest routes, and the Western Electric Company's page-printing on a continuous roll of paper, cut off after each message, is quite satisfactory. Mr. Murray's system, with a separate sheet for each message, has been given a trial on his Manchester multiplex, but a fuller trial of his improved method will be necessary. We do not think it desirable that either page or column-printing should be adopted throughout the Service to the exclusion of tape-printing.

(v) The five-unit alphabet as a code for printing telegraphy is better than the Morse code, news traffic and submarine cable communications being left out of account.

(vi) The application of type keyboard signalling instruments to the present Baudot circuits is desirable.

(vii) Creed receiving apparatus can most profitably be used in the Post Office Service for news work.

(viii) The application of printing methods to the less important circuits should be kept steadily in view, and early trials of the one-way and two-way installations of the Western Electric and of the light line printer of the Automatic Telephone Manufacturing Company should be made. We are impressed with the possibility of two-way working with one operator at each end, both to signal their messages simultaneously to the other end and then both to gum the tape. An hourly load can be carried in this way equivalent to the average Morse load with two operators at each end, and having the additional advantage of printing the telegrams.

(ix) The introduction of multiplex methods for news work will call for serious consideration in the near future.

(x) The application of multiplex systems to give simultaneous communication on one wire between each one of three or possibly more offices, should be kept in view as multiplex methods are extended.

(xi) The pay and prospects of officers selected to be "leading operators" of multiplex circuits should be reconsidered.

ENTERTAINMENT TO WOUNDED SOLDIERS BY THE SYDENHAM EXCHANGE STAFF.

The staff at Sydenham Exchange invited 36 wounded soldiers from the Crescent Hospital, on Saturday, Jan. 13, to what proved to be a very jolly entertainment; and it would be difficult to say who enjoyed themselves most—the entertainers or the entertained.

The gathering took place in the schoolroom adjoining the Enmore Road Congregational Church, South Norwood. After a liberal tea, the members of the telephone staff and some of the wounded soldiers sang, and then came games, musical chairs, balloon football, hat trimming competition for soldiers (three prizes), &c., &c.

The party broke up about 9 p.m., after a very enjoyable evening, with three cheers for the ladies.

Motor cars were lent by Messrs. Dunster, Lowe and Squires to take the visitors back to Selhurst, tired, but full of many pleasant memories.

TELEGRAPHIC MEMORABILIA.

OWING to official duties the writer was debarred the unfeigned pleasure of listening to Miss Heap's paper on "Women's Work in the Post Office," but was fortunate enough to obtain an advance copy of the same.

The most prominent feature of the lecture appears to have been its candour. At the very outset Miss Heap does not hesitate to state that one of the motives which prompted the introduction of female labour was "economy, by giving the less responsible duties to lower paid officers." Nor does she hesitate to close with the avowal that "women's influence will be more and more felt, and who can doubt that their influence will be on the side of humanity, and to obtain better conditions for the workers."

There are, of course, many debateable points, and if one had the question of women's rights under review and not "Women's Work in the Post Office," one might attempt a considerable amount of destructive criticism. One might, for example, dare to query whether woman's influence will always be in the direction of bettering the condition of the worker, by asking whether women themselves have always been famous for liberal treatment of those, even of their own sex, whom fortune has placed under them. Again it is equally open to debate whether "woman's voice in the counsels of the nations" would have averted the present war. One is certainly entitled to take the direct negative view of the last proposition. Then again Miss Heap's solicitation for and ideas concerning German women in a land which has "perhaps the lowest standard for womanhood of any civilised nation" might be somewhat modified if she could see the real *hausfrau* at home, where, so it appeared to me in more than one instance a decided case of the "grey mare."

It would probably be found when matters are weighed up as between one sex and the other that foibles, weaknesses and sterling qualities are fairly well balanced as between the two, while there is a heap of human nature in both. That, given opportunities of education, training and development, there are few—if any—occupations which women could not successfully follow, studies of history and ethnology would certainly tend to confirm. There are, however, other and probably more serious considerations which may prove the undesirability of pushing this thesis to its utmost logical and practical limit, and the study of which would certainly prove to be one of intensest interest. As soon as pen is put to paper on the subject of woman labour in the Post Office it is quickly realised how impossible it must have been for Miss Heap to refrain from touching on the general position of her own sex, the Post Office question being a mere chapter in a volume of larger history.

Miss Heap expressed a doubt as to whether the writer of a paragraph which appeared in this column of the September number of the TELEGRAPH AND TELEPHONE JOURNAL was really serious in his reference to the possible future of women labour in the Post Office, and I am in a position to state that never was a paragraph written with more faith in the ultimate realisation of its prophesy. He would even emphasise that paragraph by declaring that in a democratically governed country it is inevitable that with the increase of woman labour must come an increase in woman supervision and administration.*

One could even visualise a departmental situation in the Post Office of the future where the powers that be may even have to decide between the claims of a man and woman candidate, for, let us say, a high secretarial appointment, and the puzzling problem being solved by a woman's simple wit—that of proposing to and marrying her rival and setting up house on her spacious marriage bounty? Here too, Miss Heap, judging by modern tendencies and literature, I may be judged as more than half serious.

One problem of vital importance was, almost naturally, left untouched by the authoress of the paper, and yet a problem which will be the problem of the future. How far will the increased

employment of women affect the number and future of our race. How far will the matter of quantity and quality of population be affected by the increased economic independence of womankind? These indeed are questions of larger issue than can be discussed in these pages. Nevertheless they arise out of a study of Miss Heap's thought-producing paper, and will knock hard at the door of the nation for an answer during the next decade.

There is an intensely pathetic association in connexion with the concluding war sketches written by Lieut. Stroud while in France, which appear in the current number of the *St. Martin's le Grand Magazine*. Even while the type was being set up the gifted writer had paid the supreme price which can be demanded of a man by his country. To one who, though not knowing him, has nevertheless enjoyed his facility and aptness of expression, his touch of mysticism and his clear-cut pen pictures of French life and of war in its various phases, the knowledge that the world has lost yet another potential artist and poet come as something approaching a personal gap.

One cannot well believe that such souls really die—their very being seems of the essence eternal—rather do we hope that,

—in the moment when the light fails here
The darkness opens, and the vision clear
Breaks on his eyes."

A correspondent has written asking if there be any book or pamphlet published on "The care and adjustment of telegraph relays and repeaters," but I regret that I have been unable to trace such a publication either in my own restricted Slingo library or in any public technical collection of books. The adjustment of repeaters and relays would appear to be so much a matter of acquired practical experience in which delicacy of touch, keenness of sight and hearing, combined with what may be termed the telegraph instinct for detecting faults, that paper and ink could scarcely assist materially except on very broad lines. Every trade and profession has its subtleties which do not lend themselves very readily to pen and paper description. The telegraphic profession is no exception. The libraries may be search in vain for a reliable pamphlet on "How to sharpen a razor or a butcher's knife," and neither of the tradesmen concerned could impart the requisite knowledge except by the practical *viva voce* method.

Nevertheless if any reader should happen to know of the existence of any printed matter on the subject of relay adjustment he would render good service by forwarding the same, care of the Editor.

Thanks to the kindness of a Belgian telegraphist I have been favoured by a thorough perusal of a copy of *La Libre Belgique*, that courageous publication which typifies the very best of the indomitable Belgian spirit. Printed and published in Belgium for the last two years, on excellent paper and in the clearest of type, the responsible staffs have so far evaded all the thoroughness of German vigilance as to the place, method and time of its printing and publication. Number 62 presents a cartoon of a puzzled Teuton official who between his teeth appears to be muttering the couplet :—

"Depuis un an déjà je te cherche nuit et jour
Petite abhorée, tu m'échappes toujours."

The price of the publication is best described in the words of the publishers, which read: "Prix du numéro—élastique, de zéro à l'infini," with a humorous touch, probably, at a local grievance of pre-war days, viz., "Retailers are requested not to exceed these prices!"

In less bellicose times the report of the High-Speed Telegraphy Committee would probably have attracted considerable more attention in the outside world than the present few scrappy notices in the non-technical press. It is even possible that in more peaceful times the report itself would have materially differed from its present form. It is not unlikely that with longer experience of the Siemens-Halske system the latter would have impressed itself more favourably upon the committee, a committee be it remembered which was composed of extremely busy men, latterly even still more pressed owing to war demands upon their time and attention. There should be no surprise at the evident favour with which the fascinating Western Electric has been received and recommended with its type-writing keyboards, ingenious electrical devices and

* Since writing this column Mrs. H. J. Tennant and Miss Violet Markham have been appointed respectively as Director and Assistant Director of the Women's Department of National Service.

page-printing delivery. Nevertheless one is still entitled to the opinion that had it been possible to extend the trials over a somewhat longer period a sounder estimate would have been possible regarding the maintenance cost of the Western Electric as compared with, let us say, the Baudot multiplex system. The committee doubtlessly had a very difficult and unenviable task to perform, in record time and in record circumstances, and yet, so quickly do events move and conditions change nowadays that, even in the fact of so recent a report, your monthly scribbler feels rather inclined to emphasise than otherwise his January paragraph regarding the extension of the Baudot system to several provincial offices.

Only the deepest regret can be expressed that the war, which has so much for which to answer, should have indefinitely postponed a complete and definite trial of the result of Mr. H. H. Harrison's thought and skill, and the committee appear to have very sincerely taken that view, and not entirely to have shut the door upon the Harrison combination.

Post-war conditions it is also hoped may do much to assist the Creed Company in reducing the price of their spare parts, and thus enable this worthy system more to fully vindicate its position in the telegraphic world. "Should the Phonogram Room be staffed by Telephonists or Telegraphists?" appears to have been very smartly and humorously dealt with by Mr. H. Dive in his paper on the subject from the pro-telephonist's view and most ably handled on the pro-telegraphist's side by Mr. C. G. Jones. The latter appears to have dealt with the subject in a thoroughly practical and serious manner, applying the result of years of knowledge of telegraph work to a telephone problem. Mr. Jones' opponent on the question would probably have proved more convincing had he adopted a less flippant style in dealing with his subject, a less condescending one when referring to the "maidens" and the "nice girls" of a public service, treated his wider audience of readers to less alliterative homilies by the kindergarten method, and the telegraphists to fewer jibes on their "superior talents."

The "Some Apprehensions and a Moral" articles have been read with accumulated interest by many members of the supervision and the rank and file, and the culmination of surprise at their frankness and boldness has so far been very nearly approached by Part IV. Men and women are rubbing their eyes and re-reading it.

When one has been very specially associated with a number of men and women for any considerable length of time in official duties there is always a touch of regret at any break in that association. When that association has been enhanced in value by reason of the very special "war" nature of these same duties, then the bond becomes even more regretfully severed simply because one and all have felt the uniquely national importance of the services rendered. The Editor, I trust, will permit this personal reference to a devoted and combined Foreign and Inland staff whose special services must remain for the present unnamed, but to whose whole-hearted co-operation simply justice demands the heartiest testimony.

J. J. T.

THE INVISIBLE GUIDES OF THE UNIVERSE.*

BY MISS MARY VIOLET BALDWIN (*Telephonist, London Trunk Exchange*).

STRANGE to say there is not one telephonist in a thousand who realises what an important part her work plays in the progress of the world in general. So many speak of the dreary monotony of sitting working at a switchboard day after day, week after week and, in some cases, year after year. Yet, does not the very fact of being in such a position for so long a time prove how necessary and reliable the individual has been? Would the Department allow her to stay at that section if she did not give satisfaction to both subscribers and supervisors? Again, the usual business girl is only engaged in work that concerns her own particular firm,

while that of a telephonist covers a far wider sphere—hence the importance of accuracy and careful attention to the smallest details.

In reality every switchboard represents a centre of traffic with the telephonist acting as invisible policeman on duty to guide it successfully. Here do we learn more quickly than elsewhere the art of being tactful and ever on the alert, for we have to deal with all sorts and conditions of people, from the small boy who stands on a huge sugar box to pass his number to the highest dignitaries of the land.

Although all operators go through the same routine on first taking up telephony, it is a remarkable fact that each one preserves her own individuality in working. No one is more fully acquainted with this peculiarity than a relief operator whose duty it is to relieve one telephonist after another for short periods at a time. One board seems to be full of impatient people who insist on banging the switchhook up and down while waiting for attention, while another position seems to require no effort at all, although it may be a far busier section as regards traffic.

Is it really narrow and dull to deal daily with such a large variety of persons? It is true we do not see those with whom we work in actual life, but have we not continually a series of mental pictures passing before our eyes? Can anyone possibly answer a call from a subscriber without any idea whatever of the person speaking? Does not the telephonist know at once by the voice whether the individual addressed is a man, woman, small boy or servant girl? More than this does the voice convey to an observant operator. It portrays the character and surroundings of the speaker. The tone of voice of a lady asking for a number from her private house differs greatly from that of an irate business man speaking from a noisy room in a great warehouse. One can sometimes even get in touch with the situation of the subscriber's office. The sounds of motors and other traffic passing by reveals a place in a main thoroughfare somewhere or other.

In the same way must the voice of the telephone guide make an impression on those with whom she deals. The woman with the gruff, impatient voice never makes a successful operator, however good her intentions may be, simply because her voice is her only means of coming in contact with her subscribers. The longer one remains in the Service the more one feels convinced of this very important fact.

It is well known that operators like to have their own sections, and it is not to be wondered at that, after a time, each telephonist has certain numbers on her board to which she devotes more attention than others, in spite of the fact that she is supposed to answer all calls in rotation. Experience and observation lead the guide to the most troublesome points in the traffic, and she allows these danger signals to become part and parcel of her life, and instinctively reserves the right to deal with them herself, however proficient may be the telephonists sitting on either side of her.

This action rather shows her self-confidence and tact than any disregard of rules and regulations, and should be treated as so doing. It proves that the worker is intelligent and far-seeing and knows and understands her subscribers better than any higher official can ever do, simply because she deals personally with them. It would be a great boon to the staff to be allowed to use a little common sense now and then instead of being so tied down by rules which are often the outcome of observation only. Practical experience is worth far more than the latter because there are always little hindrances that can only be discovered in the actual working.

We are not often favoured with the public opinion of the telephone operator, but a chance remark passed by a subscriber some time ago made such an impression on me that I venture to quote it. On his being advised in the authorised fashion, to replace his receiver to enable the unknown "cut off" subscriber to come through to him again, he remarked, "I daresay you would be a nice girl, but you are so tied up with a bundle of pink tape that I can't make out who or what you are." Must the present mechanical way of working be carried out to such an extent that we are even to forfeit the credit of being human?

The work of a telephonist does not terminate with business life only, but penetrates the homes and happiness of the public

* Prize paper read before the London Telephonists' Society.

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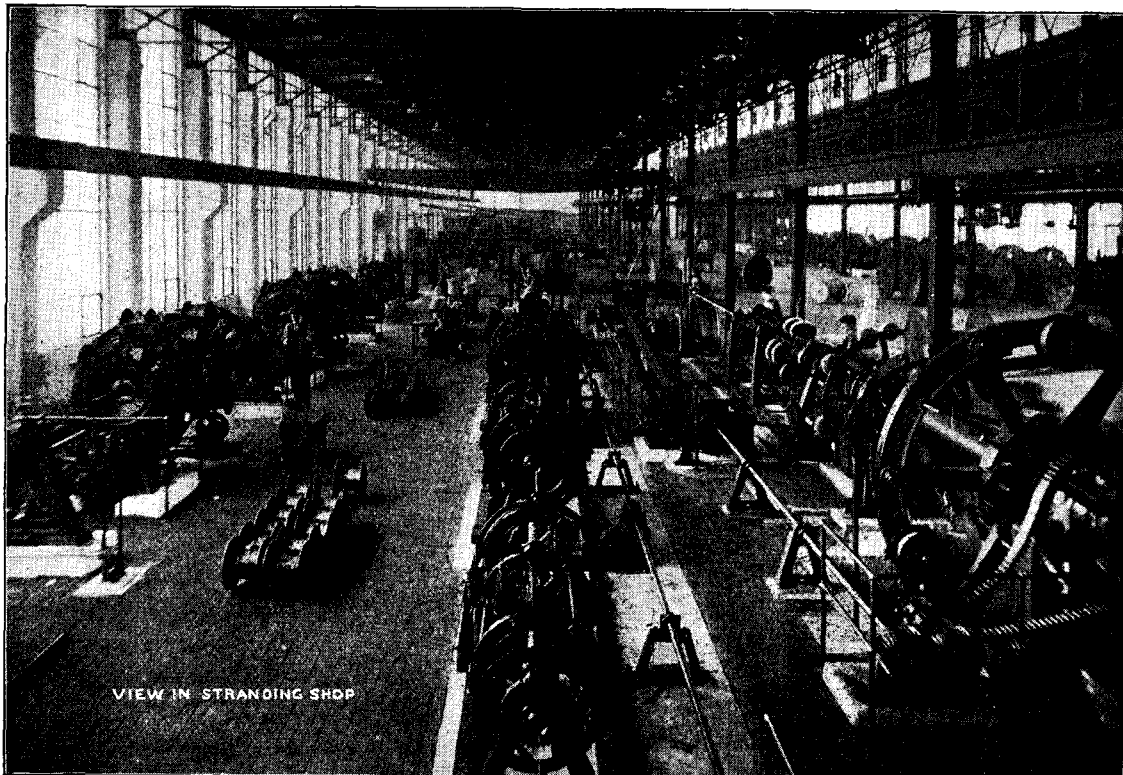
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to a very great degree. So many people make a practice nowadays, particularly in bad weather, of shopping and ringing up their friends that they would consider life impossible without the telephone, and I feel convinced that if the public were only aware how inexpensive it is to telephone to places a great distance away, it would become still further indispensable. Perhaps the greatest advantage people have is that of being able to get into communication by means of the guide at any hour of the day or night. The recent air raids have surely been sufficient proof of our proficiency and reliability. We might almost say that there is not a single national, local or political event that takes place without the invisible aid of the telephonist.

It is interesting to picture operators of other lands all doing the same work but speaking different tongues, dressed in different costumes and being placed in widely different surroundings, yet all working with the same idea, to guide the universe.

No doubt each country does its best to enable its guides to carry out the work to the best advantage, and one of the most important items would be the apparatus. It stands to reason that it should be up to date and kept in good repair before anything like efficiency can be expected. No one more fully realises this fact than the telephonist herself, and I think she should be informed by the Department and allowed a free discussion before any so-called improvements take place in her exchange. Many things that sound all very well in theory are not of much use in practice and the operator finds herself sometimes inconvenienced instead of assisted in her work. How can one possibly operate with a satisfied mind when the order wires and junctions are all arranged anyhow, and the concentrated boards with a dozen trunk lines on them only have seven or eight pairs of cords attached to them? One longs for the termination of the war when, it is hoped, these things can be attended to, for as long as we work at a disadvantage there will be considerable financial loss to the Department through the unnecessary cancellation of delayed calls that could have otherwise been effected.

It is a regrettable fact that even in cases where an operator can herself remove difficulties, or further improvements, she is not permitted to do so. It would, I am sure, make her life far more worth living, were she allowed to become a personal instead of a mechanical factor in the Telephone Service.

Sufficient has doubtless been said already about the vastness of telephony, but not until the operator receives every encouragement and consideration will she successfully guide the universe, however hard she may strive to give satisfaction.

[Miss Baldwin is evidently under a misapprehension regarding the attitude of the higher administrative officials towards suggestions by the operating staff. We feel sure that suggestions are welcomed, as they ought to be.—ED., "T. & T. J."]

THE LONDON EXPLOSION.

By MATILDA M. YOUNG.

THE recent explosion at a munitions factory near London was probably the cause of a bigger "report" than any yet experienced, even in official circles. Having the fortune to have been on duty at the telephone exchange nearest the scene of the disaster, I have thought that a few notes on the occurrence might be found interesting.

The shock of the explosion was such that the exchange building seemed to actually sway to such an extent as to convey to one the idea of an earthquake. It is of no use to say that the telephone staff was cool and collected, they were scared, and scared badly. To add to the grimness, the glass roof was illuminated by a blaze of fire which lasted for several seconds, accompanied by a weird hissing noise as though the overhead wires were fusing.

Fortunately for the service, the normal habit of appealing to the supervisor is so ingrained, that even at times of horror such as this, it was to the supervisor that the staff turned. The supervisor's side of the story is best told in her own words: "All I

could see was a whole lot of white faces looking at me, and all I could think of was that I must say or do something. I immediately called out 'It's all right, girls, it's only an explosion; it isn't in our building.' The supervisor was guessing some, but her surmise served its purpose, and as the telephonists once more faced the switchboards, there was no more time for worry. It looked as though every subscriber on the exchange was calling, and for nearly two minutes the speaking was off, probably owing to the large drop in the battery voltage, as the result of the load so suddenly thrown upon it.

It was a hopeless task to deal with every caller for the moment, and the new emergency system, as to the subscribers who had to be answered first, was of great value to the staff.

The telephonists who happened to be in the neighbourhood quickly came to the exchange and assisted with the rush. One telephonist was actually able to appreciate the artistic effect of the different coloured calling lamps all glowing together, but it might be noted that it was an hour later before she realised that she had not taken her coat off, but was still operating in her outdoor attire.

The traffic pressure was doubtless one of the factors that prevented the staff from giving way, either to fear or emotion, and it is with some satisfaction, and not a little congratulation, that the fact is recorded that no officer was compelled to cease work for even a minute owing to nervous breakdown.

A word of praise, in fact, several words are due to the night staff who were suddenly faced with such unaccustomed conditions on their arrival to duty. To those of them who were telephonists prior to their marriage, it must have seemed quite like the old-time busy hour over again. Their arrival was more than welcome, for an hour of operating under such conditions as then existed, and at the end of a long day in addition, takes a large amount of vitality out of a telephonist, and the rest was well earned.

This incident will live long in the memory of the telephonists who were actually on duty at the time of the explosion.

"COIN BOX COLLECTIONS SELDOM AGREE WITH EXCHANGE RECORDS."

(Auditor's Memo.)

Just a word about coin box recording,
A worry that's aged me by years,
The chief clerk rich satire affording
And the fee clerks all driven to tears.

Discrepancies ever recurring,
The tickets won't match with the cash,
The sheets I am ever referring
To the P.M.'s with vigour and dash.

I've made checks with box automatic
And prowled around kiosks, and when
The collector was not too erratic,
The pence and the meter were ten.

Sometimes there are twenty pence missing,
At others the tickets are short,
"Valued sheets" then go fluttering and hissing
Like yacht sails from starboard to port.

They are scanned with a rush to discover
Who it is that has made such a hash.
Do telephonists lazily cover
Bad figures with wrong codes that clash?

Does the night operator when sorting
Each group in a neat little pile,
To save him the fag of reporting,
Light his pipe with the tickets meanwhile?

Is the meter recording left-handed,
Or do callers put three pennies in
When no more than two are demanded?
Please tell me, and save me from sin.

There is at H.O. an official,
Who has given this subject much time,
To him I indite this epistle,
And hope he will send me a line.

S. J. P. (Preston).

CORRESPONDENCE.

PHONOGRAMS AND TELEPHONE-TELEGRAMS; TIME VALUES AND LOADS.

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

IN response to J. E. C.'s letter in the February issue of the JOURNAL I wish to state at the outset that my figures were obtained at Maidstone and Chatham phonogram rooms, these being in the Canterbury telephone district to which I am temporarily attached. Although the investigation was of necessity a more or less casual one, I shall try to satisfy J. E. C.'s desire for further information.

The Maidstone Exchange has 400 lines and Chatham 600 and these are centres of districts served by a number of smaller exchanges and sub-offices. Nobody would look for ideal results at such small centres as these, but as places of this size are far more numerous than the very large ones usually chosen for investigation purposes, it is well not to exclude them from our calculations.

At Chatham the trunk and local exchanges are combined, but at Maidstone they are separate and the sub-offices, which are combined telegraph and call-offices, *i.e.*, "joint" call offices, are all terminated at local exchanges. I have never yet come across a "joint" call office that was not terminated at either a local or a combined local and trunk exchange.

As the phonogram rooms adjoin the instrument rooms, access is easy, and practically no time is lost in the transit of written messages from one room to the other.

Yes, there is a circuit which is reached *via* two local exchanges, and the use of a junction is involved.

It would have been absurd specially to select telephonists for such an occasion, so the staff were taken as a whole. There was therefore nothing in the nature of a speed test.

A total of 100 confirmatory copies were despatched, and these together with the sorting and checking of all the telegrams occupied a telephonist approximately one and a quarter hours at each place, this, of course, being equivalent to the two and a half hours previously stated. It should, however, be mentioned that some envelopes were prepared by the telephonists during the lulls which occurred at intervals throughout the day.

The delay during the busiest hour was approximately ten minutes.

A day's traffic is represented by the 483 messages referred to. This was handled direct by telephonists without the intervention of a separate telephonist at a "concentrator" or "distribution" board.

There were no difficulties worth mentioning. Consequently the output was practically unaffected by any. As might be expected there were no foreign telegrams, so difficulties from this source were entirely absent. Unusual circulation due to weekly half-holidays at sub-offices is so slight as to be negligible, and the areas are not sufficiently complicated to create circulation difficulties for the telephonists. Whatever the experience may be at Ipswich, the plain fact remains that subscribers in this district do not demand much information as regards charges, destinations, probable time of delivery, &c., so that loss of time from these sources is small. The preparation or use of address lists have not been found to present any appreciable difficulty. As a general rule telephonists recognise at sight the names of subscribers who have agreed to receive their telegrams by telephone, but when in doubt and too busy to verify a particular case, they are not above "risking it" and delivering the message telephonically, refusals very rarely being received. Not strictly in accordance with rules perhaps, but the message has been disposed of, and that is where the telephonist shows her commercial instinct.

I stated that one telephonist has been known to dispose of 30 messages in an hour. Such a smart performance I confess has never been witnessed by me, but I am assured it was done by a telephonist who happened for the greater part of an hour to be working under favourable conditions, *i.e.*, on a direct sub-office circuit terminated in the phonogram room with practically no switching operations necessary. If the messages were short, as they frequently are, and came in quick succession I see no reason to doubt the performance, though, as previously pointed out, it was exceptional. J. E. C. will no doubt agree that the number of messages that can be handled depends largely upon the class of circuit, the nature of the traffic, and whether there is a skilled operator or a dull subscriber at the other end. The possibilities of variations in results under different conditions are therefore great.

The 22 messages per telephonist in the busiest hour which I mentioned as a fair average load may appear idealistic to J. E. C., but when I say that some independent results obtained by colleagues in other parts of the country which have recently come to my notice, approximate closely to my own, he will see that the practical and the ideal are not as far apart as the poles.

As the record was quite representative of the average day I do not think a week's record would produce materially different results.

Perhaps on some future occasion J. E. C. will state exactly how, when the work on telegraphic instruments was averaged in conjunction with telephone-telegrams, the telephone work prejudiced the rate of working. My curiosity may be pardoned because I recall an instance where a similar allegation was made—in connexion with a record taken just after a very heavy gale when a great many local and junction telephone lines were down. I venture to say that J. E. C. would not have to look far to discover instances where the telegraph rate of working was improved by its association with the telephone.

I agree that the present traffic and conditions being abnormal, any return of work is to a certain extent speculative, but opinion as to the proper

load for a phonogram telephonist is still more speculative, and as soon as this speculation is reduced to something like certainty considerable economy in staff will be effected.

G. D. BATEMAN
(Assistant Traffic Superintendent).

Canterbury, February, 1917.

PERSONALIA.

LONDON TRAFFIC STAFF.

Transfers—

Miss M. POWER, Assistant Supervisor, Class II, has been transferred from Hampstead to Gerrard Exchange.

Miss M. M. YOUNG, of London Wall Exchange, was presented with a gold wrist-watch on the occasion of her transfer to East Exchange as an Assistant Supervisor, Class II, on probation.

Miss F. A. STEVENS, a telephonist of Putney Exchange, has been transferred to Paddington.

Miss W. JOHNSON, a telephonist of London Wall Exchange, has been transferred to G.P.O. North as a typist.

Resignations—

Miss F. M. COOMBS, Assistant Supervisor, Class II, of Battersea Exchange, has resigned on account of her marriage. She was presented by the staff with a silver cake basket.

Miss W. E. WALTON, a telephonist of Hampstead Exchange, was presented with a cruet and carvers on the occasion of her resignation with a view to marriage.

Miss F. M. MALE, of City Exchange, has resigned on account of marriage.

Miss A. E. M. FLOOD, of City, was presented with a silver cake basket and other useful gifts on leaving the Service to be married.

Miss DOROTHY H. COLLAR, of London Wall Exchange, has resigned to be married and was presented with cutlery, a salad bowl and carvers.

Miss LILIAN M. GOODACRE, of London Wall Exchange, has resigned to be married and was presented with a case of silver teaspoons and sugar tongs from her colleagues on the clerical staff, and as she is travelling to Ireland she was given the money with which to buy a dinner service by the Exchange staff.

Miss MARION F. MUSGRAVE, of London Wall Exchange, has resigned on account of her approaching marriage and was presented with a tea service and glass ware from the staff, and afternoon tea knives from the telephonists in her section.

Miss CLARK, of Hornsey Exchange, has resigned in view of her approaching marriage and was presented with a cake basket and numerous other gifts.

Miss E. K. BALLARD, of Paddington Exchange, has resigned on account of her marriage and was presented with a dinner service.

Miss MAY ANDERSON, of Wimbledon Exchange, has resigned and was presented by her colleagues with a fountain pen.

Miss MADGE ROLT, of Wimbledon Exchange, has resigned and was presented with a handbag.

Miss L. H. PRIER, of Putney Exchange, has resigned in view of her approaching marriage and was presented by the staff with a silver cake basket, tea strainer and bread fork.

Miss EDITH M. BANFIELD, of the Trunk Exchange, has resigned on account of marriage and was presented by her colleagues with a silver tea service and other useful presents.

Miss GRACE E. FOREMAN was the recipient of several useful presents on the occasion of her resignation from the Trunk Exchange on account of her approaching marriage.

Miss M. L. HITCHCOCK, of Mayfair Exchange, has resigned in view of her approaching marriage and was presented with a silver cake basket, epergne and other useful gifts.

Miss ETHEL RUSSELL, of Museum Exchange, has resigned on account of marriage and was presented by her colleagues with a silver cake basket and other gifts.

Miss BETTS, of Bromley Exchange, has resigned and was presented with a breakfast service by the staff.

Miss VIOLET DOROTHY BALL, of Holborn Exchange, has resigned on account of her approaching marriage and was presented with a dozen table knives and several other gifts.

Miss E. E. FRENCH, a telephonist of Harrow Exchange, has resigned and was presented with a gold brooch by her fellow colleagues.

PROVINCIAL STAFF.

On resigning her post as Female Clerical Assistant in the District Manager's Office (telephones), Canterbury, Miss M. PICKERING was presented by the staff with a suede handbag.

Miss A. H. WOOD, Supervising Female Clerical Assistant in the fees section of the District Manager's Office, Canterbury, has retired after 11½ years' service, to be married. She was presented by the combined staff in the other sections of the District Office with an electro-plated cake stand. The staff in Miss Wood's own particular section also presented her with a biscuit barrel.

Miss SNOW, Telephonist, Hanley, has been transferred to Shrewsbury as Operator-in-Charge with Supervising allowance.

Miss LEES, Telephonist, Hanley Central Exchange. Promoted to Telephonist with Supervising allowance.

Miss MUSKETT, Telephonist, Northwich, has resigned.

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THE Telegraph and Telephone Journal.

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THE STRUGGLE.*

BY H. G. CORNER.

THE struggle referred to in the title of my paper is the great struggle now going on throughout the hitherto civilised world which affects us all without exception, so closely, so intimately. No discussions which are going on now can avoid it and we in our society have heard a good deal about how it affects our Service. But hitherto we have spoken of it only as it affects what I may call the mechanical or business side of the Service, and it has struck me in listening to various debates that there is another and really far more important way in which it touches us, and that is in its human or vital aspect. It touches us I mean not only individually—that of course it is not for me to talk about—but, as a staff, in a very personal way, a way in which it touches the whole of the community and may therefore be thought not to be appropriate to the discussions of this society. But I think that if we can look at it from this wide point of view for a few minutes it might be not only very interesting but very useful. And there are broadly two ways in which we can consider it: first, as to how we as a staff have entered into it; secondly, how it does and will react upon us, upon our whole system and the administration of that system—mainly in the future. My paper will, therefore, be divided into two quite distinct parts as it deals with these two aspects of the catastrophic events in the midst of which we are moving.

First then as to how the staff have entered into it. And here let me say that I believe no body of men and women have cast themselves into the struggle more wholeheartedly, with more energy and self-sacrifice than the staff of the London Telephone Service. What it has given in lives, in energy, in care and in money cannot be calculated, but to give you some idea of the part it has played I have assembled a few facts and figures as illustrations. And first as to the great sacrifice. Out of a total male staff of military age which numbered about 1,100, 877 enlisted. The rest I need scarcely say were nearly all medically unfit. Twenty-seven of those who joined obtained commissions. Of the total number, 40 have already laid down their lives (in some cases there is still a faint hope for they have only been reported as missing—and eleven are prisoners of war. Our men have gained their share of distinctions, for they can show one Military Cross, one *Croix de Guerre*, four D.C.M.'s, five Military Medals and fourteen have been mentioned in despatches.

To come next to the question of money. The first cause to enlist the sympathy of our staff was the *Post Office Relief Fund*,

and I find that their last year's subscriptions to this fund reached the splendid total of £2,506 10s. 4d.

Perhaps even more satisfactory is the response made to the country's appeal for saving. A *War Savings Association* was formed in June last and up to date the total amount invested reached £6,284 9s. 6d. This amount is of course in addition to any sums which may have been invested by members of the staff in their individual capacity.

The other war activities of the London Telephone Service staff are amazing in their extent and variety, so much so that it is impossible to give you any complete list of them, but I am indebted to Miss Fairburn for the following notes which she has laboriously compiled from the great mass of material which we had to draw upon.

Another good cause which is receiving widespread and general support in this Department is *Queen Mary's Needlework Guild*, two branches of which have been formed, one amongst the Controllers' Office staff and one amongst the staff of the exchanges. The Office branch of the Guild was started in August last, and up to Dec. 31 the total amount subscribed was £69 14s. 5½d. In addition to this, a concert was held which realised the sum of £28 5s., so that nearly £100 has been raised during the five months of the existence of the branch. With the money subscribed materials have been bought, and 693 articles for hospital use have been made and despatched to the Guild headquarters.

Detailed particulars as to the amount subscribed by the exchange staff to the Guild were not readily obtainable, but the total reached by the Controller's Office branch must no doubt, be multiplied many times in order to arrive at the correct figure.

A collection was made before Christmas in 1915 and 1916 with the object of sending a parcel for Christmas to every member of the L.T.S. staff on active service. The appeals met with a good response on both occasions. In 1915 the sum of £233 8s. 8d. was collected and parcels were despatched. In 1916 the amount raised was £153 12s. 10d. and the parcels sent numbered.

A general collection was organised in all the exchanges in aid of the *British Women's Star and Garter Hospital for Disabled Soldiers*. This was taken up with great enthusiasm, and by means of sales of work, garden fetes, &c., the collection was augmented so that the splendid total of £601 10s. was raised.

Besides these large and organised collections, subscriptions have been raised for a large variety of causes, of which the following are the chief:—

- Belgian Refugees' Fund.
- Prince of Wales's Fund.
- French and Belgian Post Office Relief Funds.
- Serbian Relief Fund.

* A paper read before the London Telephonists' Society on Jan. 16, 1917.

Red Cross.
 Blue Cross.
 St. John's Ambulance Association.
 St. Dunstan's Hostel for Blinded Soldiers.
 Lady Jellicoe's Fund.
 Deep Sea Fisheries.
 British and Foreign Sailors' Society.
 Y.M.C.A. Huts and Canteens.
 Y.W.C.A. Canteens for Girl Muniton Workers.
 Various Newspaper Funds.
 Norfolk Relief Fund.
 Roll of Honour Fund.
 Nurse Cavell Memorial Fund.
 Special Appeal for Wounded after the big advance.

Funds for the supply of various articles for use at the front, such as

Periscopes.
 Respirators.
 Chloroform.
 Footballs.
 Mouth Organs.
 Shaving Kits, &c. &c.

Systematic weekly collections have been made in a number of instances, and though the total subscribed to these various funds cannot be given, it would be quite safe to say that they would amount to at least £250.

But in addition to all this, a far larger amount of money has been expended in a variety of ways upon gifts in kind which have been sent far and wide, and which represent, besides their money value, much time and thought, hard work and ingenuity. A very great deal of needlework has been done and large numbers of war garments and hospital requisites have been made and despatched. It is impossible to enumerate all the activities in which our indefatigable operating staff have been engaged, and moreover, it must be borne in mind that all the work here spoken of has been done by the exchange staff *as a body*, and no note is made of the individual work and interests of the staff apart from the exchange. The following will give some idea of the various objects which call forth the sympathetic interest and help of the telephone staff:—

Large parcels of *hospital requisites* of all kinds, for the most part consisting of articles made by the staff, have been sent to the Red Cross Society in Malta, to Mrs. Hobhouse for the Post Office Hospital, to Queen Mary's Needlework Guild and also direct to numerous hospitals, central or local.

Garments have been made and given to Belgian Refugee Committees.

Dependents of Post Office servants on active service.

Widows and orphans of Post Office servants killed in action, and in the early days of the war, to Queen Mary's Needlework Guild for those in necessitous circumstances due to the outbreak of war.

The *men on active service* have not been forgotten and parcels containing woollen comforts, sweets, cigarettes, pipes, tobacco, books, &c., have been despatched in large numbers to individuals and to organisations both for the Army and the Navy. A special feature of this branch of the activities of the exchange staff is the kindly personal interest taken in members of the Night Operating and Engineering staff now serving with the Colours, and many exchanges have kept their representatives at the front well supplied with comforts all of kinds.

In addition to this a warm interest has been taken in the families of the men, particularly in those cases where the father has laid down his life at the front, and many gifts of clothing, food, toys, coal and even, in one instance where the widow's health was impaired, four bottles of cod liver oil have found their way to these homes.

The exchanges in the Carter Lane building have looked after the creature comforts of the men of the *National Reserve* who guard the building, and other members of the *National Reserve* guarding

the railway lines have been supplied by several exchanges with sun shields made by the staff.

Needless to say, the *Prisoners of War* in Germany have not been forgotten and parcels have been sent to Miss Loch, the Lady Superintendent of the Money Order Department, who undertook to forward them to the proper quarter.

Then the hospitals have been generously supplied with all kinds of luxuries:—

Fruit.
 Flowers.
 New Laid Eggs.
 Sweets.
 Cake.
 Jam made by the staff.
 Cigarettes and tobacco.
 Books and magazines.
 Wheeled chairs.

A gramophone and records (from Central Exchange) and many other articles too numerous to mention.

In very many instances, men from the hospitals have been entertained to tea, or to supper, to garden parties, matinees, sports and in other ways, and the entertaining seems to have been done on the grand scale in some cases, with taxi-cabs to convey as many as 40 or 50 wounded men from the hospital and back again.

In order to find money for these entertainments and also in aid of the various good causes mentioned in the earlier part of this account, the exchange staff have organised numerous sales of work, concerts, socials, whist drives, hockey matches, &c., by means of which large sums of money have been raised, and smaller efforts have been made by means of bran tubs, the sale of home-made sweets, mascots, &c.

Egg days, pound days and cigarettes days have been held, and have resulted in large collections.

All this represents a tremendous amount of hard work, enthusiasm and ingenuity, and where everyone has done so much it is difficult to pick out a few for special mention. But there are one or two instances to which I may perhaps be permitted to call attention, as the results achieved are so exceptionally good, and the means of obtaining them so well contrived.

Gerrard Exchange.—£135 raised for the Star and Garter Hospital Fund by sale of work and collection.

Over 1,200 articles made and sent to Mrs. Hobhouse for the fitting up of the P.O. Hospital.

London Wall.—£15 raised by a *farthing fund* and spent on luxuries for soldiers at the front.

City.—Central and trunk staff Christmas dinner abandoned and £75 devoted to parcels for L.T.S. staff on active service as a result.

Avenue.—£50 by sale of work and collection for Star and Garter Hospital.

£24 by sale of work for tea for wounded soldiers.

Paddington.—£44 by garden fete and collection for Star and Garter Hospital.

Victoria.—£70 by sale of work and collection for Star and Garter Hospital.

Trunk.—£70 10s. for Star and Garter Hospital.

Walthamstow (a small exchange).—Ten guineas raised by whist drive for Lady Jellicoe's fund.

Tottenham.—Another small exchange have four times entertained large parties of 50 to 70 wounded soldiers.

Staff of the Superintendent, Female Exchange Staff, have themselves made 580 articles for the P.O. Relief Fund and the Star and Garter Hospital.

Western Exchange evidently has a good concert party and seventeen concerts have been given at various hospitals and camps, irrespective of the occasions on which wounded soldiers have

been entertained as invited guests, and at each place gifts of fruit, sweets or cigarettes have been distributed to the audience.

Pirley.—At this small exchange a needlework exhibition was held before Christmas in 1914 and 1915, and on the first occasion 220 garments and toys made or collected by the staff, and on the second occasion 180 such articles were distributed amongst the poor of Islington.

So much for what I have called the way in which we as a staff have entered into the struggle; now a few words as to how it seems to me it will react upon the Service, upon its system and upon its administration.

This war is a struggle of ideas and I think it would be useful to us as a society representing one of the most important of the State industries to see how these ideas affect us as a staff, what lessons we may learn from them and what, if any, hope we may derive from a study of them.

I say it is a struggle of ideas. I mean by that the opposing forces represent two distinct and in many respects antagonistic principles always existing and always opposed in all phases of human life from the beginning of things.

Those of use who read the papers are not left in any doubt as to what those ideas or principles are. Every paper and every review has been full of discussions and countless books have been written since the war began on these subjects. Put quite briefly I think the two antagonistic principles may be said to be mechanism and humanism or the highly organised and mechanically efficient state with a rigidly disciplined people on the one hand against the more or less unorganised and chaotic system of individual initiative accompanied by free development on humanistic lines on the other. I propose to discuss these principles under the three categories: organisation, efficiency and discipline. Very familiar words they are. Since the beginning of a telephone service I suppose no three words have been more used, more written about and more discussed. Perhaps I had better say the first two, organisation and efficiency; discipline we have not talked about so much though it has been an ever-present thought with the administrators of the telephone system.

(To be concluded.)

LONDON TELEPHONISTS' SOCIETY.

COLONEL A. M. OGILVIE, C.B., Second Secretary of the Post Office and Director of Army Signals (Home Defence), honoured the London Telephonists' Society by his presence at the final meeting of the society for the current session which was held on March 20 last. After presenting the prizes which had been gained by members of the society, Colonel Ogilvie said that he had a high opinion of the valuable work which societies, such as the London Telephonists' Society, performed in promoting free discussion of the many problems affecting their daily work. In such a great public service as the Telephone Service, the greatest good could only be achieved by all officers, whatever their rank, making common endeavour to improve the efficiency of the service.

Colonel Ogilvie also said that the War Office had informed the Postmaster-General that they proposed to employ women telegraphists and telephonists from the Post Office at various military stations in France, and that the Postmaster-General had concurred in the proposal. Some details of the scheme were not yet decided, and the number of women required was not yet definitely settled, but the Postmaster-General felt sure that the women of the Post Office would respond in large numbers to this call on their service. He believed that when the conditions of service were published they would be found to be satisfactory, although he was confident that such considerations would not in the least interfere with the desire of the women of the London Telephone Service to take this opportunity of performing work so closely associated with the success of the British Arms.

THE GRIEVANCES AND SENSITIVENESS OF GERMAN OFFICIALS.

BY W. H. GUNSTON

Blätter für Post und Telegraphie, with which by now readers will have some sort of familiarity, even if only at second hand, is usually instructive, and the numbers for the last half-year are, I think, no exception to the rule. Apart from the purely technical articles, and those dealing with such subjects as the responsibility of subscribers for damage to their instruments, History of the Posts in Mecklenburg Strelitz, and so forth, there are two main themes which are frequently handled in this latest series, viz., the grievous condition of German Postal officials—especially in the higher ranks—and criticisms and complaints of the iniquities of the Allies. We learn, for instance, from an indignant article on the Anglo-French "Post robberies" that between December 1915 and September 1916, 24,200 outward German letters and 16,800 inward German letters were victims of the postal depredations of the hostile sea-powers.

In another article "English and French Postal Journals during the World-War" are reviewed. The French papers—*La France Postale*, *Le Professionnel*—are first dealt with. The latter, it is complained, never uses the word "German," which seems to have disappeared from its vocabulary, but always applies the word "barbaric" in childish wrath to that people. What has the postal world to do with war affairs? the *Blätter* asks. *Ne subor supra crepidam*. It finds *Les Annales des Postes* better. Here reasonable people are met with whom the word "German" does not immediately throw into a fury. The TELEGRAPH AND TELEPHONE JOURNAL, which was not started until after the commencement of the war, does not seem to have come into its ken, but of *St. Martin's le Grand* it says:

Like the *Annales* in its form and contents, although serving more for amusement, *St. Martin's le Grand* was before the war a striking-written, well-edited journal confined to actualities. During the war, however, it has frequently left the path of objective discussion, to trench on the domain of politics and has been moved to join in the general cries of hate and revenge to which we are accustomed in our enemies. We are not therefore surprised when we find in a description of the travels of an English postal official sent to Alexandra, the genial remark that there are naturally amongst Prussians some who are better than others, but that the best are those who are dead. In another place where the issue of the New Belgian postage stamps is discussed, the reason for this action is given "that probably the 'Huns' had stolen the bulk of the earlier issues." In reviewing the report of the Postmaster-General it is said, "It is a surprising result that in a war with a people who have openly scouted the holiest obligations and duties of humanity and have thus ensured that their name for all time shall be a standing example of all that is common and contemptible, the World Postal Union and Hague Conference can so use their influence as to lessen the sorrows of war." One must be an Englishman to understand this, an Englishman with his own peculiar strain of selfishness and hypocrisy. In a historical review (Tsingtau 1914, Port Arthur 1904) the author, who served in Turkey and later in China, cannot refrain from bringing all sorts of hateful charges against the Germans. Certainly he praises Müller the captain of the *Emden*, especially his sporting spirit, and says of him "Müller was only playing the game," a recognition with which our sea hero would hardly agree. The praise that he is "a right good sort," which he graciously allows him, can hardly be accorded to the author after his flowers of style, which are not one whit behind the well-known expressions of the hostile daily press. One would expect from an official with long experience in the foreign service a more highly developed spiritual outlook. We wish to him and to his fellow-countrymen that they may come to personal knowledge of that "yellow peril" to which he mockingly refers at the conclusion, while he holds up the Japanese as a pattern to the "Kaiser and his horde of wild beasts."

But enough of these excerpts which we could multiply indefinitely. They will suffice to show to what degree the war has coarsened men and disturbed their sound judgment. We could refer to some very informative articles and papers in this journal, e.g., "Continuation of the Series of celebrated English Postmasters," and "Life of Sir Henniker Heaton," the postal reformer. But we prefer not to do this journal this honour until its tone alters and reason is permitted to come into its rights."

All this is very edifying; that "War has coarsened men and disturbed their sound judgment" is very true, and expression has been given to similar views in these pages, but we cannot hold the *Blätter* altogether blameless in the matter. The Allies are referred to by it as "Enemies and Envisers" with a tedious and

unrefreshing regularity; the English are termed "the Baralong folk" and the "English Post-robbers"; and if to animadvert unfavourably on the character of the enemy is *ultra crepidam*, that journal frequently ventures in that direction. One is perforce reminded of Satan reproving sin.

After giving the debate on the Postal Budget in full, an editorial comment deals with this subject, saying that it was demonstrated in the debate that the position and prospects of almost all official classes has been worsened by two years' postponement of the creation of new positions. On the other hand the ever-increasing cost of living presses continually on them. In order to improve the economic condition of the staff, the united parties have put forward a common proposal, No. 283. This demands extension of war assistance, introduction of war increases, and increase of the pay of the unestablished. It requests further the introduction of the remuneration proposals wrecked in 1912.

The withholding of the new positions for two years is said to have deprived postal officials of about six million marks, while at the same time a special war tax of corresponding amount was laid upon them, which would have an injurious effect on many during their whole lives. It was hoped, if even only for the sake of the officials in the field, that the improvements would have taken effect in this year's budget.

The article goes into details of the grievances suffered by the staff in the long waits for promotion, especially by the higher officials (the subject of strong annual complaints in this journal for many years past), and concludes:

"It is our united earnest wish that the Government will give effect to the present motion of the Reichstag, and also include the higher officials from henceforth in the increase of pay expressly projected at this sitting. In our opinion this is the only possible way radically to remedy the unfavourable conditions of pay of the higher staff.

It is gratifying that the Secretary of State for the Post Office assured several officials on May 19, upon a general request, that an opportunity should be afforded them to lay their common wishes before him orally for earnest discussion.

We speak the mind of all when we express the hope that the Secretary will now introduce the new regulations, which certainly must come within reasonable time, as they are necessary to free us from our present condition. In his hand lies our fate."

These aspirations were doomed to disappointment for we learn from later issues that though proposal No. 283 was accepted unanimously by the Reichstag, unhappily the Government again brought in its own proposals, and the lot of the higher officials was not ameliorated.

It is interesting to note from an article on the "Commercial Spirit," that also in Germany "actual or supposed mistakes in the Administration, or in one of its branches, are often deduced by the public to lack of 'the business spirit' on the part of officials." The writer discusses the difference between a national economic point of view and a trader's point of view in administering public services.

No 7 gives particulars of the pay of the New War Assistance. The following payments were to be made from July 1 :-

(1) To established officials and under-officials.

(a) With a salary up to 2,100 mks. (£120), unestablished up to £135.

	A & B Marks.	C & D monthly. Marks.	E Marks.
I. Unmarried officials with no children under fifteen years of age ...	5	6	5
II. Officials with one child under fifteen years of age ...	12	10	8
III. Officials with two children under fifteen years of age ...	14	12	10
IV. Officials with three children under fifteen years of age ...	18	16	14

For each additional child under fifteen, 4 marks more.

(b) With salaries above £120 up to £150, unestablished up to £165.

	A & B Marks.	C & D monthly. Marks.	E Marks.
I. Unmarried officials with no children under fifteen years of age ...	0	0	0
II. Officials with one child under fifteen years of age ...	8	6	5
III. Officials with two children under fifteen years of age ...	10	8	7
IV. Officials with three children under fifteen years of age ...	13	11	10

Each additional child 3 marks more.

It is not stated to what A, B, C, D and E refer, but they relate apparently to the locality and classification of the staff concerned.

Another strongly expressed article complains that the cost of living in food alone has risen to 73—115 per cent. for families of four heads, not to mention heat, light, washing, clothes and shoes, and states that the economic position of the higher official is approaching the unbearable. Numerous letters of complaint have been received from correspondents, and the Government is pressingly urged to afford satisfactory relief. The following issue announces that a single payment to officials in receipt of a salary up to £225 (unestablished up to £240) will be made as follows: Unmarried £2; married without children £3; with one child £4 10s.; with two children £6; with three children £7 10s.; with four children £9; with five or more children £10. This is not unnaturally described as quite inadequate and disappointing.

From amongst the incidental paragraphs we learn that over 36,000 women were employed on railways at July 1916.

In another number appears an article entitled "The Transformation of officials" which states that the type of official has changed greatly during the last decades, a notable feature being continuance of education after appointment. Their thirst for knowledge goes far beyond their technical or official requirements. Universities and high schools contain a high percentage of voluntary students of the official classes. The official is a dual personality; his individual personality subjects itself willingly to the duties of his service and to official requirements, his collective personality fights bitterly for a new order of things and rights. The official of to-day is a fighter, a patient but strenuous fighter. He is no longer merely a passive but an active organ of the State.

It will be observed on the admissions of his own organ that his patience is poorly rewarded. Even his enemies will not begrudge him the day when his just demands, endorsed by his Parliament, shall not be ridden over roughshod by his Government, as we see them done under present conditions.

GUERNSEY TELEPHONE SYSTEM, 1916.

The accounts of the Guernsey States Telephone Department show a profit of £396 after allowing for depreciation and redemption of sinking fund. The number of subscribers' stations increased during 1916 from 2,197 to 2,235 despite the war. The local calls numbered 1,436,153 during the year and the trunk calls (to Sark) 2,800.

ENTERTAINMENT TO WOUNDED SOLDIERS, NEW CROSS.

The staff of the New Cross Telephone Exchange again entertained a party of sick and wounded soldiers on March 3, when 50 "shell-shock cases" from King's College Hospital and the Maudsley Extension were their guests at the Hanover Park Conservative Club, Peckham. Nothing that sympathy could suggest or care could provide was lacking, and all went merrily. The arrangements were in the hands of a committee, consisting of the Misses Epps (chief supervisor), Ferrier, Painter, Measures, Maynard, and Gillam. Two former comrades in C.P.O., Stockwell and Driver J. Hart, R.F.A., were present to renew old friendships. The toy symphony, which was rendered by a large party of the staff, was even "funnier" than when we last heard it; it was a scream, and the hat-trimming competition, with its subsequent parade of competitors, ran it close. Humorous recitations by Miss H. C. Waddington and Miss O. Young, humorous songs by Messrs. T. Kerwin and T. Quaipe, pianoforte solos by Miss N. Gillam, a duet by the Misses Townsend and Blackwell, a dance by Miss E. Brubach, concertina solos by Mr. H. Dapp, musical monologues by Mr. H. Smith, and songs by the Misses Esther Telling, D. Ely, A. Harrison, F. M. Smith, R. Strevens and D. Vining, and Messrs. G. Bourne and H. Hawkins, made up a well-diversified programme. In addition there was tea, with charming hostesses anticipating every wish, and—what more would you?—(Kentish Mercury.)



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dreaded War Office announcements herself answered the door to a bright little chap who came whistling up to the house. Giving in the fatal buff-coloured envelope, he waited as usual for a possible answer. With just an ill-concealed tremor in her voice the lady as she opened the telegram said, "There is no answer dear, I'm afraid I know what it is." With sudden intuition probably educed by the sadness of these grave times he seemed to realise the whole story, and, with evident feeling and gravely raising his cap he simply said, "I'm so sorry ma'am," and walked quietly down the path.

J. J. T.

TELEGRAPH APPARATUS.—AN INTRODUCTION TO THE STUDY OF TELEGRAPHY.

BY A. SIRETT.

(Continued from page 77.)

THE Wheatstone A.B.C., Fig. 10, is the simplest form of all telegraph instruments to operate, but its construction is most complicated and in parts very delicate. It is, however, from an engineering point of view, a very cleverly designed piece of mechanism. Wheatstone dispensed with battery power. The

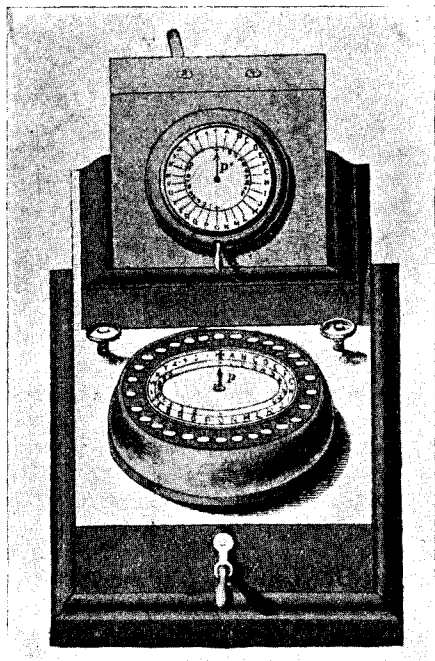
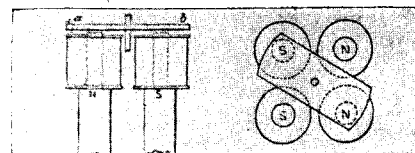


FIG. 10.—WHEATSTONE'S A B C.

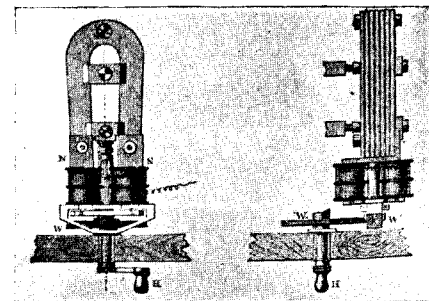
currents employed to move the indicator are produced by a magneto generator. Keys representing the alphabet are arranged in a circle on the base. To send a message the operator turns the handle and depresses the necessary keys. The receiving part is shown at the top. The pointer of the receiver rotates in synchronism with the pointer on the sending dial and indicates the letters sent. With a few hours' practice a child or aged person could send messages.

This instrument requires very little attention in the way of maintenance but when it is out of gear it requires a skilled man to put it right. The generator (Fig. 11(A)), is made up of a number of thin horseshoe magnets clamped together. At the poles, four electro-magnets are fixed. These magnets are wound with a fine covered wire which is connected to the receiver and to line. A soft-iron armature (Fig.11 (B)) rotates past the electro-magnet poles. Four currents are generated with each complete revolution of the armature. The motion is so adjusted that with each of these currents the pointer moves through one space, and thus

for one revolution of the armature the pointer moves through four spaces and four distinct currents are sent in succession along the line to the distant station. When a key is depressed the motion of the pointer is arrested on coming opposite to that key and the currents, instead of going to line, are cut off. This is effected by means of a carrier arm fixed spring-tight on an axle which revolves conjointly with the pointer, but which is thrown out of gear immediately the pointer is arrested by the depressed key. It remains so until the key is raised by the depression of another.



B



A

FIG. 11.—A B C GENERATORS.

The contact maker is shown in Fig.12 (A). "L" is a spiral spring holding it against the stop "m" in its normal position of rest. As soon as the handle is turned and a key depressed to admit of the carrier arm revolving, "K" is drawn against "N," which is in connexion with the line, and so held until the carrier arm is again stopped. The keys are surrounded by an endless chain (Fig.12 (B)) so adjusted that when one key is depressed the chain is tightened and as each subsequent key is depressed the chain

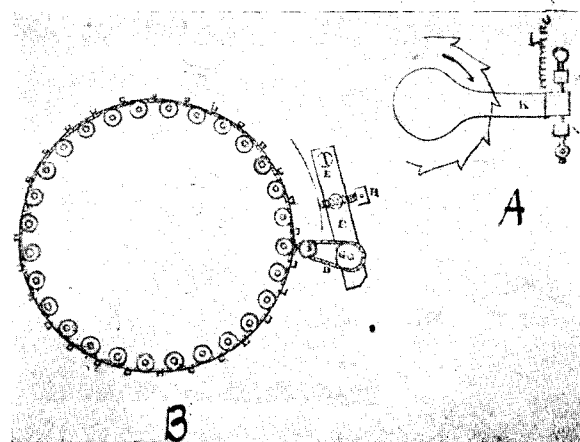


FIG. 12.

draws the key previously depressed back to its normal position of rest.

The receiver, Fig. 13, consists of a permanent magnet "N," two electro-magnets "E.E" wound with very fine wire and a soft-iron armature "m" movable on the axis at "m." This armature is kept magnetised by the permanent magnet "N." Therefore, each alternating current received will make the armature move to and fro. On the ratchet wheel "W" is fixed the pointer which indicates the letters sent. Each movement of the armature

brings the teeth of the ratchet wheel in contact with the springs "s.s." and the screws "P.P." and causes the wheel to rotate, carrying the pointer with it.

This instrument is still in use in village offices where there is not much traffic and where the demand for the telephone has not been

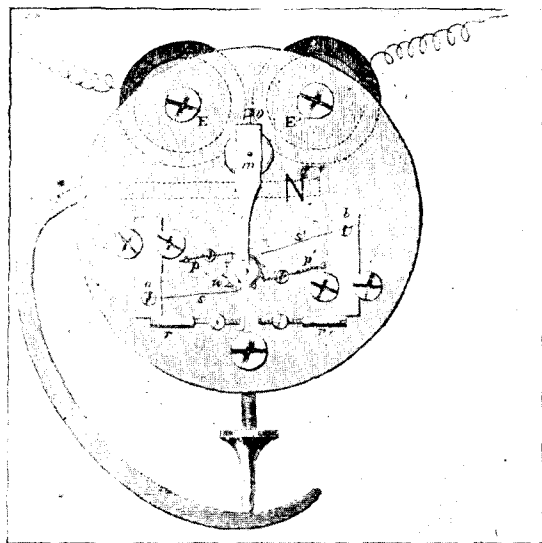


FIG. 13.

great enough to warrant the Post Office converting the circuit to telephone working.

About fifteen telegrams per hour can be sent over an A.B.C. circuit.

Morse.—We now come to the telegraph apparatus invented by Morse. Morse was an American and is said to have devoted his time to painting until he was 40 years of age. He visited Europe and on his return voyage to America he made the

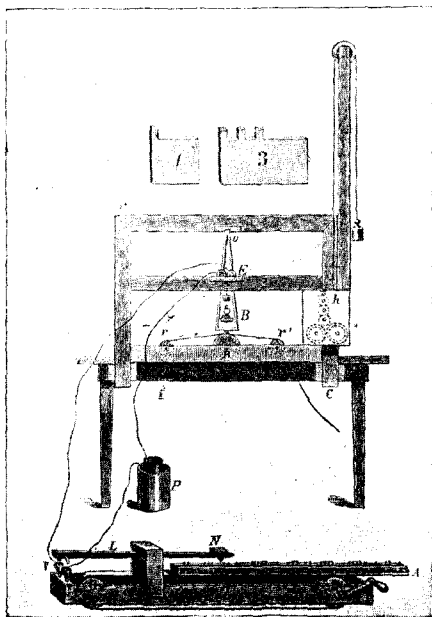


FIG. 14.

acquaintance of a Professor Jackson. On board ship he saw some of Jackson's experiments in electricity, which suggested to him the possibility of using electricity for the transmission of signals. He appears, however, to have continued his painting and it was two or three years after his return to America before he obtained

any good results from his experiments in telegraphy. He is believed to have lacked a knowledge of electricity, but in 1836 he had the assistance of a professor of chemistry who afterwards became his partner.

In 1837 the apparatus shown in Fig. 14 was constructed by Morse. The ideas embodied in this have been developed and from them have come some of our present-day most delicate telegraph instruments. The vertical frame "C.C." carries a pendulum "O.B." suspended at "O," and an electro-magnet "E." Attached to the pendulum is an armature near "E" so that when the current passes through "E" the pendulum will be attracted. At the lower end of the pendulum is a pencil and under the pencil paper tape is drawn by means of the clockwork "h" over the rollers "r.r." When the pendulum is in its normal position the pencil traces a line parallel to the direction of the length of the tape. As the pendulum is attracted and set free, a slanting line is traced on the tape. By the movement of the pendulum to and from the electro-magnet "E," "V"-shaped lines are formed; one "V" represents the figure 1, two "V's" the figure 2, and so on.

These deflections were produced by the make and break contact arrangement shown below the receiver. The circuit runs from the battery "p" to the electro-magnet "e" and back to a mercury cup "V"; the other cup is connected to the second pole of the battery. The lever "L" has an inverted "U"-shaped connecting link which dips into the two cups and so joins up the circuit in the same way that Wheatstone's relay (Fig. 8) was joined up.

At the other end of the lever there is a weight "N" with a pin below. This pin rides loosely over a set of type fixed in the wooden frame "A." The type shown at the top of the picture represents the figures 1 and 3. As the lever is made to rise at "N"

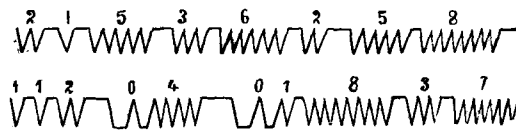


FIG. 15.

over the points 1, 2, 3, as the case may be, so the other end dips into the cups and joins up the circuit, sending a current through the electro-magnet "E." This causes the pendulum to swing and mark the tape to correspond with the number of points passed over.

The type had to be set up in a frame and the frame was propelled by means of the conveyor band "G.G." and the handle. This was obviously too slow a method to be of any practical use, but it was a step towards both the Morse dot and dash sending key and the tape-receiving machine of to-day.

About the time this apparatus was in hand, Morse made the acquaintance of Alfred Vail, a young American engineer, who helped him considerably and afterwards joined him in partnership. They appear to have arranged a telegraph code by means of figures, and on Sept. 4, 1837, they sent the message shown in Fig. 15, which is made up as follows:—

215, 36, 2, 58, 112, 04, and 01837.

According to their code, it represented the words "successful attempt with telegraph, Sept. 4, 1837."

Through the assistance of a member of Congress, Morse was able to visit London and Paris, but the journey proved useless as regards finding means for putting his invention to practical use. In 1839 he returned to New York, and again took up painting to earn a living. In 1840 he was within sight of death by starvation. In 1843 Congress voted the sum of \$30,000 for the construction of a trial telegraph line. This was erected between Washington and Baltimore—a distance of 40 miles—in 1844.

Meanwhile Morse's apparatus had been so greatly improved as to resemble closely that now in use, and after eight years of poverty, fortune was assured. At the age of 53 he had gained world-wide fame.

(To be continued.)

The Telegraph and Telephone Journal.

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Editing and Organising	{	MR. JOHN LEE.
Committee - - -		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. 1. The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.

VOL. III.

APRIL, 1917.

No. 31.

HOW THE TELEPHONE SAVED RUSSIA.

THE telephone and the telegraph have been much in evidence during the Russian Revolution. From the oddly fragmentary information which has appeared in the newspapers it seems that the telegraph and telephone services worked almost without interruption throughout the stirring events; in fact, full communication was restored before the railway and train services were re-organised. It seems, too, that had it not been for the telephone there would have been a fatal lack of co-ordination between the movement in Petrograd and the movement in Moscow. At the critical moment, M. Rumanoff, the Petrograd correspondent of the *Ruskoe Slovo*, rushed to the telephone and had a prolonged conversation with Moscow. All we know about that conversation is that it lasted for an hour, in which time M. Rumanoff succeeded in conveying sufficient information to Moscow as to enable the leaders there to direct the Revolution in accord with the movement in Petrograd.

This is of more moment than appears at first blush. One newspaper puts it pictorially. "Last but not least, let us record that Moscow, the heart of Russia, with all its forces, had been won for the popular cause in an hour and a half without the shedding of a drop of blood." To call Moscow "the heart of Russia" is an understatement. It is the very centre of Russia's religious life, and the curiously close connexion between the Church and the State since the time of the schism in the Eastern Church made the position of Moscow of vital importance. Had there been conflict between Moscow and Petrograd, it would have been an issue between the whole ecclesiastical forces of Russia and the revolutionary movement. For a time, apparently, the issue was in doubt.

What tragedies would have been enacted had all the forces which emanate from the great cathedral in Moscow been exercised on the side of the forces of reaction we can only conjecture. Who is it does not know of that wonderful gate of the Redeemer, above which is the Eikon, carried before the historic victorious armies of Russia in the past? Whoso passes under this gate, be it Czar or serf, makes his profound obeisance. Moscow has been called the "Holy Mother of Russia": she would have been in opposition to the great democratic forces had it not been for the telephone.

And yet we read with some astonishment that not only has the method of government in Russia been changed but telephone manners have been revolutionised. The *Times* correspondent says he was "privileged to overhear a telephone conversation" from Petrograd to Moscow. It is a new privilege. Probably the meaning is that the proprietor of the *Ruskoe Slovo* wished the *Times* to be able to tell its English readers what that great Russian journal, with its million of readers, had achieved in uniting forces in Russia which showed too many tendencies for a time to be in disruption. Probably, in the great task of uniting Russian democracy to a moderate and practical policy, the *Ruskoe Slovo* was the greatest force, but it would have been utterly ineffective had it not been for M. Rumanoff's timely, if prolonged conversation. And then, as if to prevent jealousies, the news comes along that the Czar's abdication was written on a telegraph form! Amid our many conjectures of the influence of the telephone and telegraph on social reconstruction we should never have dreamed of these great forces in Russia finding it their bond of union at a time when the largest section of the Christian Church might easily have turned its back on its country.

HIC ET UBIQUE.

WE are sure that the sincere sympathy of our readers will be felt for Mr. J. J. Tyrrell who has made himself a host of friends as the contributor of "Telegraphic Memorabilia." We regret to record that his eldest son, Second Lieutenant A. J. TYRRELL, fell in the glorious advance which led to the taking of Bagdad.

AMONG the names announced in a recent *Gazette* as having been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the war, appeared that of Major G. Hooper, R.E., District Manager of Telephones, Reading, now on active service.

GREAT credit is due to Miss Carlton, the Supervising Telephonist of the Margate Exchange, when enemy destroyers bombarded the towns of Margate and Broadstairs on the night of Feb. 25. Miss Carlton, on hearing the firing, thought an air raid had begun, and proceeded to the exchange, accompanied by her father. Shells in the meantime whistling overhead and bursting in the neighbourhood. There was a tremendous rush of traffic at the exchange and Miss Carlton's timely arrival prevented what might have been chaos. It was also a relief to the Traffic Superintendent, who, failing to obtain communication with Margate by all the available routes, was on the point of deciding that the exchange had been struck by a shell, and was about to take steps accordingly.

SOME idea of the rapid development of the telephone in America can be gathered from the number of stations in towns served by the Pacific Telephone Company alone. San Francisco had 126,016 stations on Dec. 31, Los Angeles 70,064, Seattle 56,072, Portland (Oregon) 48,402, Oakland 34,559, Spokane 23,886, San Diego 15,545, Tacoma 14,694, Sacramento 13,451 and Berkeley 11,559. One may safely say that the names of some of these places, Berkeley for instance, are known to few Englishmen (and still less on the Continent), and yet they have a greater number of telephones than large, world-renowned cities such as Rome, Marseilles, Lyons, Madrid, Antwerp, Dublin, Belfast and Bristol had before the war.

TELEPHONE ACCOUNTS FOR 1915-16.

BY W. E. WESTON.

THOSE who are interested in the financial results of our Telephone Administration and have followed the trend of telephone events during the abnormal times through which we are passing, will not probably be surprised, though they may be disappointed, to find on turning to the Telephone Accounts for 1915-16, House of Commons White Paper No. 138, that there has been a net deficit on the year's working of £118,000, a slightly higher figure than that of the previous year.

For the benefit of those who have not the means of sifting the accounts, I propose to throw a little light on the position by drawing attention to and explaining one or two of the larger items; after which I think it will be seen that not only are things better than they seem, but that there is reason for gratification and encouragement.

In the first place, the debit side of the account includes a sum of £204,000 for the civil pay of staff serving with His Majesty's Forces. Whilst the value of this expenditure to the country generally is possibly beyond calculation, as a charge to the Telephone Account it is absolutely non-productive, and allowance must therefore be made for it in any criticism of the result of the year's working. Eliminating this item the apparent loss becomes a profit of £86,000. The corresponding balance in the previous year was a deficit of £41,000 so that, notwithstanding increased wages and the continually advancing prices of materials, a loss in the year 1914-15 has been converted into a profit in 1915-16, and the question naturally arises as to how this has been accomplished. Strange as it may seem at first this improvement is chiefly attributable to conditions brought about by the war, and, whilst it is to be regretted that where economies have been effected they were largely forced upon us, it is to be hoped that we shall have profited by our experience and that some at least will be permanent.

Obviously with the release of large numbers of the engineering staff—trained men and impossible to replace—for Naval and Military Service or for other urgent Government duties, ordinary and normal telephone work has had to be dropped or postponed, and although this may result in a deterioration of plant, involving a general tuning-up at some future date, it is possible that here and there it may be found that the standard of perfection was in the past unnecessarily high.

Also in the clerical and traffic departments a great deal of work in the way of records and statistics, highly desirable or necessary in normal times for the efficient conduct of the service and as a basis for measures of development, has been temporarily abandoned; and here again a survey of the position at the end of the war may lead to economical modifications of former methods.

Side by side with these reductions in expenses, an increase of revenue has occurred as a result of the Budget alterations in telephone tariffs and the levy of a special installation charge in the case of new orders. The additional revenue in 1915-16 on this account is estimated at £150,000 approximately. On the other hand the war has caused a loss of revenue due to (1) the falling off in the number of new orders that the Department was in a position to accept, (2) the increase in the number of cessations,

and last—but not least—the reduction in the average user of existing limited rate subscribers. In fact whilst the total number of measured rate subscribers actually increased by over 600, the total fee revenue decreased by nearly £2,000.

Taking the trunk and exchange services separately and eliminating the civil pay of staff with the Forces, we find that the exchange service shows a profit of £166,000 and the trunk service a loss of £80,000 as compared with a profit of £202,000 and a loss of £243,000 respectively, in the previous year.

In the case of the exchange service, it was to be expected that, with the loss of revenue due to the net reduction of nearly 10,000 in the total number of subscribers' stations during the year, and no possibility of effecting a corresponding reduction in the annual charges for interest and depreciation on capital, there would be a diminution in the profit, and it may be of interest to mention here that it has been estimated that the war has affected the normal revenue that would have accrued to the exchange service in the year 1915-16 to the extent of over £500,000.

As regards the reduction in the loss on the trunk service from £243,000 in 1914-15 to £80,000 in 1915-16, the Budget increase of 33½ per cent. in the tariffs on Oct. 1, 1915, is responsible for nearly £100,000 of the difference, but this still leaves a reduction of £63,000 in the deficit which has been effected by other means. The fundamental reason for the trunk service being run at a loss is that a very large amount of expensive plant laid down with a view to expansion at the normal pre-war rate is not fully utilised in present conditions, though it has to be maintained and the charges for interest and depreciation have to be met.

Taking all the special circumstances into account, particularly the payment of over £200,000 in salaries and wages to men with the Colours, I think that the net result of the year's working may be regarded as fairly satisfactory.

NEW FRENCH TELEGRAPH AND TELEPHONE RATES.

ACCORDING to the *Bulletin Mensuel des Postes et des Télégraphes*, the following rates came into force on Jan. 1, 1917:—

TELEGRAPHS.

The minimum charge for ordinary telegrams (10 words) is raised from 50 to 65 centimes. Telegram with acknowledgment of receipt 65 c. additional. Telegram with reply paid, 65 centimes for 10 words.

Above 10 and up to 50 words 5 centimes per word, plus 25 centimes. Over 50 words, 5 centimes per word, plus 50 centimes.

Press telegrams, 65 centimes, up to 20 words; 20 to 50 words, 2½ c. per word, plus 25 centimes; above 50 words, 2½ centimes per word, plus 5 centimes.

Telegrams with priority, 1 franc 50 c. up to 10 words; 10 to 50 words, 10 c. per word plus 50 c.

TELEPHONES.

Unlimited rate, Paris and provinces. Increase of 12 francs 50 c. per hundred. Installations placed at the disposal of clients or of members of the public increased by 100 per cent. Supplementary lines and trunk installations, increases of 25 per cent.

Message rate. Main installations, increased by 12 francs 50 per 100. Supplementary lines increased by 25 per cent.

Local calls, Paris. Increase from 15 to 20 centimes.

“ ” Provinces. “ ” 10 “ 15 “ ”

Trunk calls. Calls now costing 25 centimes, raised to 30, 40 centimes to 50, 50 to 65, 75 to 95, and so on up to calls now costing 3 francs which are raised to 4 francs 50 c.

The telephone tinkered. “ Is this the office of the *Daily Squawk* ? ” a voice asked.

“ It is.”

“ Well, then, I want you to insert this death notice: ‘ Colonel Jones has gone to rest,’ in an appropriate place.” The next morning it read: “ Colonel Jones has gone to rest in an appropriate place.”—*Exchange* (American).

SOME PHASES OF THE INTERCOMMUNICATION SWITCH.*

BY MARY TYNAN (C.T.O.).

THE intercommunication switch of the London Central Telegraph Office being possibly unique in character in this country, it was thought that a few notes on its working might prove of some interest to the members of the Telegraph and Telephone Society, as by nature of its construction it combines principles common to the work of both branches of the Service represented here.

The idea of the originators of the scheme was to link the London offices together in a system analogous to that of a large telephone exchange, and by enabling all offices in the London telegraph area to communicate directly with each other, to save the work entailed in the re-transmission at the Central Office of some 27,000 telegrams daily, involving 54,000 transactions (as each message must be received at and forwarded from the central point).

The main objects to be achieved were:—

1. Economy of labour at the Central Office.
2. Economy of space at the Central Office.
3. Saving of time in transmission.
4. Greater accuracy, by reason of the minimising of the number of hands through which each message must pass.

Let us review as to how far these results have been attained.

1. The 54,000 transactions at the Central Office would, at an average of 25 per hour, mean the services of 270 telegraphists, and after allowing the liberal measure of a full complement of board operators for each hour of the day (a figure that has never been reached), the net economy in staff amounted to 216.
2. The floor space saved amounted to about one-third of the Metropolitan Gallery, and two large divisions of outer London and Home Counties circuits were accommodated therein, thus relieving the congestion which existed elsewhere.
3. The saving of time in transmission goes almost without saying when it is considered that a telegram normally passes through eight hands at the Central Office, and the consequent inevitable but accumulating delay involved, was eliminated by point to point working. On normal working days many hundreds of connections are made on the first call, that is to say, with no delay beyond the time occupied in receiving the message.

Thus the aims set out for accomplishment were achieved (the increase of accuracy cannot be gauged, and it can hardly be expected of a member of the Central Office staff to emphasise this possibility) and a quicker and cheaper local telegraph service installed, yet for some reason or other the success of the work has always found numerous debaters.

The general arrangement followed in the construction of the switch is that of a large multiple telephone exchange, and it was estimated that 1,150 circuits would require accommodation, viz. :—

300 to offices which collect but do not deliver telegrams.

650 to offices collecting and delivering.

200 working sets in the Central Office to carry foreign and provincial work from and to the smaller London offices (the larger offices being served by 130 direct duplex circuits outside the switch).

To accommodate the different requirements of these offices, two systems of switch working were brought into use.

For the collecting offices, the type used was an improvement on the old concentration system, each office being connected directly to a peg and cord on the board, by means of which extension can be made to any number required.

In the case of delivery offices the lines are connected to a "home section" and also to the multiple strips (of which there are twelve to each number). The engaged indication is given by the glow of a green tinted lamp situated immediately below each multiple jack. The operator has a telegraph working set which is brought into circuit by means of a lever in front of the cord used, and connection between delivery offices is effected by pairs of cords as on telephone boards.

These two types are known simply as single cord and double cord positions respectively.

The multiples are divided into panels carrying strips of 25 jacks and each operator is in front of two panels, and three operators' positions constituting one complete multiple, provision is thus made for 36 operators, each of whom is theoretically able to reach any number on the multiple; but the arm of the average telegraphist being not quite so long as that of coincidence, it is found necessary to pass to one's neighbour the cords for connexion to the more distant numbers.

The attention of the operator is called by the depression of an electromagnetic plunger, or of the Morse key, either of which, by short circuiting certain resistances in the apparatus, increases the current on line and actuates the relay of a lamp placed in the line circuit.

A cut-off relay which is brought in when connection is effected, prevents the actuation of this lamp-relay during the process of signalling. The clearing signal is given by the plunger at either station, which now causes (the line lamp being cut out) a light on a lamp in the cord circuit, situated on the keyboard immediately in front of the cords.

In the early days of the switch, all work from London offices for foreign and provincial places, or for addresses in the City area, were sent irrespectively to one point at T.S. An experiment was tried later, by which working sets were installed on each of the four floors of that building, to receive the switch work proper to the stations working on such floor, and division of the work was made at the outstation in accordance with specially provided book lists; but in the case of busy offices, the delay occasioned by the necessary constant re-switching and clearing was not compensated by the economy in time effected in circulation at T.S., and the system has, with one exception, been abandoned.

The work of building and joining up lines to the switch was started in 1902 but, owing to many causes was not completed till 1907. The system called for an almost perfect insulation, inasmuch as it depended for its effective working on the uniformity of the resistances cut out by similar transactions at any point of the system. A great number of the lines were wholly or partly on the overhouse system and were composed of iron wire, and it was found that the insulation was much too low for satisfactory switch working. It was therefore necessary to re-wire these circuits with copper, and advantage was taken of the change, to introduce the then new cables of paper-insulated copper conductors throughout London, a work which naturally took a considerable time.

Experiments being the order of the day when a new system is launched, a novel one was tried in connexion with the switch while it was yet extremely young. This was the introduction of women as test officers. A few were trained in the work and the result proving satisfactory, the entire testing of the switchboard and its lines were handed over to them in 1903, and later they took over the whole of the Metropolitan Gallery, with the provincial lines which were removed thither. In the stirring times in which we are now living such a change would be taken as a matter of course, but fourteen years ago the idea of its success was received with derision, and the pioneers had to encounter some opposition and much pessimistic prophesy; but they quietly held their own, applied themselves to the study of their new work, were approved by the powers that were, and they and their successors have kept the women's flag flying there to the present day.

Few spheres of labour find themselves unaffected by the exigencies of the war; and in this the intercommunication switch is no exception. The great number of telegraphists called to the Colours (1,150 from the C.T.O. alone) has created a demand at the larger centres for the services of the small-office clerk, and it has been found expedient to rely on the telephone for the transmission to T.S. of telegrams from a great and increasing number of collecting offices in the London area.

Other causes have also led to the diminution of London telegraph traffic of late years, foremost among them being the extension of the telephone system and the growing number of subscribers. The increased tariff has also had its effects, and comparing the figures of to-day with the period immediately prior to the inauguration of the switch we find that against 48,000 messages from and to foreign and provincial offices in 1902, we have to-day 38,000, a decrease of roughly 20 per cent. This falling off has resulted in the closing up from time to time of section after section of the board, so that little more than half the installation is now in use; and as the whole must be efficiently maintained (for a fault in any part may seriously affect the whole) it has come to be regarded in some circles as a white elephant. But even white elephants may be useful for other than merely ornamental purposes, and the tendency that exists to regard this great piece of mechanism as a thing of the past, is indeed somewhat ruthless.

The suggestion is made here, with much temerity and from a purely amateur point of view, that on account of the many improvements that have been made in central battery working on moderately long lines, it might perhaps be found expedient and possible to put the outer London and Home Counties offices in intercommunication by the introduction of the necessary modifications on the existing switchboard, or they might at any rate dispose of their London work direct to the delivery office, and so repeat the economies already effected in the application of the system to the Metropolitan area.

One word in conclusion as to the effect of switch working upon the staff. The work of the board operator is exacting, and calls for great accuracy and celerity, and at busy periods is not a little trying when every office regards its calls as the only ones to claim and hold the attention of the operator. Telephone operators doubtless experience like difficulties, but whereas a softly modulated answer can smooth the ruffled feelings of an irate subscriber, it is not possible to alter the tone of the tic-tac of the sounder, the iteration of which has the opposite effect than the turning away of wrath. The board clerk has moreover the responsibility of making good all required connections for which three ineffectual calls have been made, a record of which she must keep. Nevertheless the duty is a popular one with the switch staff. The same cannot be said of the work incident to the working sets. It is an undisputed fact that the telegraphist has yet to be found who enjoys such, and the reason is perhaps not far to seek. The many stations on the switch comprise among their staffs the good, bad and indifferent telegraphist, and the recipient has to attune her brain afresh to each style of sending (and the differences may be as numerous as the sands of the sea). Now a good telegraphist may read the signals of a very indifferent or even bad sender with great ease, if working to the same for any considerable time; the faults in signalling are more or less stereotyped and the mental exercise called for in translation, becomes a habit. But with the constant change of style, as one office succeeds another, and the varying degrees of excellence and of badness encountered, the brain is in a constant state of re-adjustment and its works become somewhat worn and weary, and without the relaxation provided by change of work, the almost inevitable result is nervous strain.

* Paper read before the Post Office Telephone and Telegraph Society of London on Feb. 19, 1917.

That such relaxation is provided by the alternation of board operating duties would seem to be evidenced by the fact that the switch staff as a whole, far from being victims of nervous decline, display an activity and vigour which is second to none in the women's divisions of the C.T.O., and are always ready to attack with enthusiasm any new branch of work which is introduced into the office. A fine spirit of *camaraderie* exists which has found expression in a very successful social club which caters for the intellectual, musical, histrionic and other tastes of its members, and which has, incidentally, been able to raise £120 for different war charities by entertainments given since 1914.

It is hoped that these few details of the working of one small section in the vast organisation of the C.T.O. may not have wearied those who already knew them and bored those who did not, and may possibly have proved of interest to some if only as a record of a passing phase in the history of telephony.

TRUNK LOADS.*

BY MARY VIOLET BALDWIN.

WHEN we speak of trunk loads we refer to the amount of calls effected over the circuits on each switchboard in the trunk and toll exchanges. It is interesting to note how much busier some boards are than others, and it is this unevenness in the distribution of work that makes telephony a far more trying business in the trunk exchange than in any local switchroom. Team work, such an important item in local working is, in a great many instances, quite out of the question in trunks. For example, the Canterbury telephonist may have 40 minutes' delay on her work with every circuit in use, while the Eastbourne operator on her left may sit for five or six minutes in succession without any work whatever, and yet be unable to give any assistance to her neighbour. Needless to say, telephonists on the busy sections complain of being overworked while others complain of tedious slackness. As this arrangement is detrimental to the staff both physically and morally, it becomes the urgent duty of the Department to take immediate steps to counteract this uneven distribution of work. There are, of course, many points to be considered before anything like an ideal system of uniformity can be put into practice, even supposing that possible, but we earnestly hope before long for some definite outward sign of improvement in the working.

The amount of calls effected varies with each switchboard, but it does not mean that the telephonist who has the heaviest loaded section does the most work. On incoming boards, where the distant stations control their own calls, the method of operating for the London telephonist is similar to that used in local exchange. Connexions have simply to be made and disconnected when the clearing signals are given. The outgoing sections, however, require a great deal more care as telephonists are held responsible for the correct timing and satisfactory conversation of each call, which means that they must have less circuits to attend to, in order to fulfil their task as controlling operators. On sections where the outgoing work is very straightforward the trunk loads will be heavier than on the more complicated ones, e.g., Liverpool local operators deal only with calls in the Liverpool local area, whereas the telephonist in charge of a Liverpool trunk board has to wait for intermediate stations before her work can be effected and should, in consequence, have less circuits to control. In many cases a re-arrangement of lines would be beneficial to all. When three or four circuits work on one section it is desirable that they should also terminate on one section in the distant exchange. This would enable the controlling operator to pass and refer to calls with the minimum loss of time. In many instances, however, one finds oneself at the mercy of two or three telephonists working in different parts of the room in the distant exchange. Hence the delay in getting attention, should there be a slight fault with the calling or clearing signals.

When we realise that our trunk circuits extend not only over the British Isles but even enable us to communicate with the Continent, we must have some idea of the enormous expense that must be incurred in fitting up and keeping these lines in repair, a fact which accentuates the extreme importance of using the trunk lines to the best advantage by reducing the actual time spent in the process of operating to a minimum. To do this several items must be considered. One must first of all have sufficient apparatus at hand. A glance at the concentrated sections in both the trunk and toll switchrooms shows a deplorable deficiency in this respect. Twelve circuits require twelve pairs of cords in good condition, but the latter are in most cases arranged in one row instead of two, which only enables seven pairs to be attached to each board. The result is, after 6 p.m., a telephonist in charge of several stations such as Liverpool and Hastings, Margate, Ramsgate and Deal, finds herself considerably handicapped when these various towns require her attention at the same time. Neither can she hold herself responsible for complaints of inattention or undue delay on her work. Many calls are unavoidably cancelled and subscribers complain of inefficient service because they are not connected within the fifteen minutes stated at the time of booking the call. The rule in force which allows three minutes to be extended to six for the same fee further increases this difficulty of deficiency of cords.

The present arrangement or order wires and junctions is another drawback to the work, especially to those operators who have hitherto been accustomed to the up-to-date alphabetical system of the more recent local

exchanges. It is not at all gratifying to think that the only trunk exchange working in London should be so much behind the times, and so we hope the day will come when we shall be able to take more pride in our switchroom than we do at the present moment.

Our authorised expressions which are used to reduce the process of operating could still further be curtailed. That very lengthy and inconvenient expression "Your time is up. Will you have another three minutes," can be, and is, in spite of all efforts of the supervisors, abbreviated into "another three minutes?" with a rising inflection in the voice. The first phrase makes a serious interruption in the subscriber's conversation and he frequently answers in the affirmative or negative before it has been completed. The result is, one is reduced to repeat it in a more decided tone before a definite answer is understood. We presume that a subscriber will understand he has already had three minutes before we offer him another.

Trunk loads on most of our switchboards vary from hour to hour, but they will be found to be fairly regular on those sections which deal with our great commercial centres such as Birmingham, Manchester, Leeds, Liverpool, Cardiff and Bristol. Here the operators are kept hard at work during the greater part of the day, while those in charge of minor towns such as Sevenoaks, Dartford, &c., are very slack for hours in succession. As the amount of traffic in such cases cannot be altered, it is only fair to make some change in the duties of all concerned. The whole staff would thus become acquainted with the various kinds of working which exist and their efficiency would become more general. In times of pressure this is a very great point, for one cannot be expected to operate with the same confidence and skill on a section one little understands.

It is desirable, when considering trunk loads, to complete every call as far as possible at the switchboard, and there is no reason at all why every white ticket should not be priced by the controlling telephonist. Such an arrangement would save hours of labour every day besides drawing more careful attention to the timing of calls. In France and Belgium an alphabetical list of towns and prices is placed at the head of each section for the benefit of the operator. This system has been in use for some years although the staff has many more circuits to control than ours and it would be much to our advantage to adopt the same plan of pricing. It would simplify matters when tracing calls which have been collected.

The time of year makes a great difference in the distribution of traffic. During the summer time our heaviest loaded sections are the seaside towns such as Southend, Margate, Ramsgate, Dover, Brighton, Eastbourne, &c. Telephonists on these boards have an especially trying time, as a great number of the calls deal with hotels where people have to be fetched to the telephone. It becomes the duty of the operator to note when the person required came to the telephone in order to satisfy any complaints from subscribers of insufficient time, as it is no uncommon occurrence for three minutes to elapse before the actual conversation with the person was established. A midday change of duty would considerably relieve the strain on such telephonists especially when there is such a large amount of less arduous work to be done in the clerical and ticket departments.

Weather conditions play a very important part in the history of trunk loads. A heavy fall of snow or a strong wind can completely disorganise the communication, and the heaviest work falls on the shoulders of the record operators and inquiry staff, to say nothing of the enormous loss incurred through cancellation of calls and damaged trunk lines. In some cases it takes months to repair our long-distance wires and it is not an unusual thing to be obliged to work one noisy line hour after hour. In cases where the direct route to a certain area is thrown out of order it is the practice, where possible, to effect those calls via another centre. This system of using a secondary route is only satisfactory when the circuit is particularly good, and much time which is now wasted in attempting to effect the indirect work might be more profitably spent in using the circuit for direct calls only. The rule which only allows three-minute calls after 40 minutes delay is registered is another point worthy of discussion. It is surely more satisfactory for a subscriber to be allowed six minutes in any case, if he requires it, besides minimising the amount of time wasted between one call and another.

The personality of each individual telephonist has a great deal to do with trunk loads. Each operator is so entirely at the mercy of the telephonist at the distant exchange that unless both are efficient and hard-working a good result will not be obtained. It is useless to pass three or four numbers for three or four circuits if the controlling telephonist is unable to take up the calls simultaneously. Besides the inconvenience which results in ringing subscribers several times before establishing the call, one must bear in mind the fact that time is being lost over the circuits. Thus do we see to what a great extent it lies within the power of the operators themselves to make the work a failure or a success and every encouragement should be given them to enable them to take a personal interest in their work.

As no telephonist can be considered efficient without a thorough knowledge of the details of her daily work it is only just that she should be allowed to use this knowledge to the advantage of the world in general. At present we are expected to accept any innovation the Department thinks proper to introduce into the exchange without the slightest comment, whether that innovation is for the better or for the worse. My recent experience and that of many others who have worked on the phonogram board is a splendid example of what can take place on a section. A rule was made which stated that three calls should be passed at a time to follow in succession on the same circuit. The idea was that we should have the second call waiting by the time the first was finished. In theory this sounded very well, but as there was no time limit to these calls and the line was held up from three minutes to one and a half hours the whole suggestion of passing in advance

* Paper read before the Telephone and Telegraph Society of London, Feb. 19, 1917.

was useless. It became no easy matter to keep the required station waiting indefinitely in circuit until the phonogram operator found it convenient to take up the call, and no one but a telephonist can have any idea of the complaints and confusion which took place over the lines night after night and week after week. The distant post offices complained of being rung and not connected, and stated that they were too busy to hold on indefinitely, the various operators who had calls to these post offices complained of undue delay, and subscribers complained and in many cases cancelled their calls because they could wait no longer, and yet the trunk line was not being used. No wonder the telephonist in charge of such a section should be reduced to tears and be at her wits' end to know how best to act. Whatever she did it was quite impossible to satisfy everyone. Had the staff been allowed in the first place a free discussion of this system, I feel quite sure that even the most junior telephonist would never have been in favour of it and the weeks and months of discomfort and waste of trunk lines which have taken place in the past would never have existed.

Again, the new codes now in force in the exchange have become a frequent topic of conversation, and although we are expected to use them we are not given the reason for the change. Had they been an improvement on those formerly in use we should have been satisfied, but our intelligence requires a little enlightenment on this point. The present despotic attitude of the Department recalls the unsatisfactory state of affairs which history tells us existed in the days of Charles I, who had such implicit faith in the Divine Right of Kings. Surely the rapid advance that has been made in education during the last 40 years has its effect in developing the intelligence of the general staff, and is it to be marvelled at that, as time goes on, we realise more and more what is due to us and our capabilities? How much longer shall we wait before the Department will take us more fully into their confidence and thus reap the benefit of our knowledge and experience?

The intelligence of the public is another item which affects trunk loads. We have all experienced at some time or other difficulties with people who do not understand the use of the telephone and occasionally several minutes elapse before the call can be satisfactorily established. Switchboard operators and small boys are often a source of trouble because of the inattention and carelessness in taking up a call, and one often has difficulty in getting the distant subscriber to hold the line until the required person is fetched. Such things are, however, endured without much comment because we know how impossible it is for the public to understand our work.

Sufficient has already been said to point out how many things affect the traffic on the trunk circuits in normal times, but the most important point at present is the war. All places of military importance stand first and the Government reserves the right to monopolise the lines for any length of time, all ordinary business calls being held over indefinitely. When it is realised that three telephonists and two circulators are engaged in booking Government calls, and that there is scarcely a section in either the trunk or toll exchange without its share of Government work, one can form some idea of the effect this must have on trunk loads even in the course of one day. It further convinces both the public and the telephonist that the trunk exchange does its full share of national work, and it is hoped that our efforts will find their appointed place in history.

The air raids to which our country has been subjected in the past have played an important part in the traffic, particularly after 7 p.m., and I am sure the Department can never sufficiently express its appreciation of the abnormal amount of work that has been effected so successfully by our female night staff—which has only been in existence since the war.

The Department owes much to the day staff when it is considered that they have worked the so-called voluntary duty of 2.45—10 p.m. for eighteen months at least without much opposition. We know it was introduced for purposes of economy but we also know what effect it has on our work from 12—2.45 p.m. every day. Even a moment's consideration will convince one that the absence of 18—24 telephonists during lunch hours will have some serious result to the traffic. It is often too much to do to take charge of two sections at midday, and even if one is fortunate enough to have temporary assistance from the recording staff one cannot help noticing how soon the trunk transfer becomes a blaze of signals which adds to the general confusion and overwork for the recorders. One can imagine the complaints from the various local exchanges which must take place between 12 and 2.45 p.m. However, the Department must have eighteen telephonists per week to perform this late duty, and so it considers itself perfectly justified in forcing it upon us when eighteen volunteers cannot be obtained. The mere fact that any person so compelled may not be able to arrive home till 12 p.m. is not considered in the least. If she protests she is accused of being unpatriotic or some such trumpery. Is not the health of the staff a matter of paramount importance? The severe colds which have been the cause of so much sick leave have been caused in several instances through being out in the night air waiting for some means of conveyance to return home. The further restrictions regarding the train service together with the darkness in the streets have added to our difficulties, and those of the staff who live at a distance from the office will be pleased when this duty has been taken off the list.

The Early Closing Bill has had the effect of reducing the traffic after 7 p.m., as has also the rise in trunk fees which has taken place since the commencement of the war, but one feels that this reduction of work is only temporary and that, after the present crisis has passed the evening service will increase.

It is known that the longer a telephonist remains in the Service the greater is her value and proficiency. The war, more than anything else, has brought this truth home to us, for never before have we had so many resignations among the skilled staff, and unless some immediate step is taken

by the Department to counteract this state of affairs, it is feared the trunk service will be seriously affected. Is it not a pity to allow other people to have our skilled workers, when, by paying them a reasonable wage we can retain their valuable services? We cannot really afford to lose an efficient staff. Beside this, trunk working is very complicated and responsible, and it takes some time before one telephonist can be considered proficient enough to replace another. Again, before the war the junior staff consisted in a large measure of educated girls who had not been fortunate enough to get into other branches of the Service. To-day there is not this difficulty to contend with and one is conscious of a lack of tone that may exist in the new staff which did not exist before. The present method of the Department to obtain learners by means of advertising and widening the age limit, further points out the difficulty that is being experienced in getting a new staff at all.

But the effect of the war on our work does not end here. Our very switchboards seem to have undergone a change. It is the usual thing now to find improvised boxes of all shapes, sizes and colours dotted about the sections and ticket racks containing Government dockets, to say nothing of the untidy display of torn tickets suspended from the time checks indicating that the circuits below are out of order. The number of inverted out of order cords further points out a deficiency in the correct out of order apparatus.

However, we do not anticipate a lengthy continuation of the war, and it is hoped that when such things as shortage of labour and material will no longer hinder our progress, that the trunk exchange will undergo such a thorough system of improvement that it will hold a high place in the estimation of the public, the Department and the telephonists themselves. But not until the whole staff is allowed to have a voice in the administration of its own work, can one feel confident that the trunk traffic will become anything like a financial success.

CORRESPONDENCE.

STAFFING OF PHONOGRAM ROOMS.

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

THE writers of the two interesting papers upon the above-mentioned subjects seem to have missed one very important, though simple point in connexion with the question of the transmission of phonograms, which may be bluntly expressed in a single word, viz.—Spelling. I speak from experience of the work as performed by telegraphists, telephonists, temporary S.C. & Ts., and the sub-office official, but I cannot express an opinion of the work performed by the subscriber's office boy and girl, the friend left to take charge of the telephone in the subscriber's absence, be that friend a calling acquaintance or a person whose vocation lies along the hard-beaten track of toil which brings sweat to the brow. Spelling, which is doubtless an acquirement of the eye as much as of the brain, meets with a variable treatment at the hands of the several persons at the present time dealing with phonograms, and in this respect I am inclined to think that a telegraphist receiving a telegram by sound from a sounder instrument has a distinct advantage over the telephonist who from the spoken word is called upon to transform the sound into letters representing the word. Analogy cannot, for many reasons, be used at all times. It is not, however, a question of the comparison of reception by telegraphic means and by telephone, but a question of the class of officer best suited to convey to paper and over the line, the contents of a telegram.

Instances may be quoted to show that a good telephonist can mutilate a telegram, and that a telegraphist with purely telegraphic experience may in transmitting a telegram to a subscriber, introduce something extremely puzzling. A telephonist who had recently passed the examination for C.S.C. introduced the word "Suffock" into a telegram, and a subscriber inquired what was meant by the word "Fitwoff." Further a telephonist wrote "In Ex Plicable" in three spaces of a telegram form, and assured the telegraph supervising officer that the sender wished the words written so, i.e., in other words, he wished to have his expression charged for as three words instead of one. We find very skilful telephonists who spell badly, and the reason is that though expert in connecting 2501 after putting the query "Number please," they lack the opportunity for acquiring thorough practice, particularly when young, the art of detecting at glance whether a word appears to be properly balanced.

It appears, therefore, to me to be a question of competition between the telegraphist who is called upon to pass a most stringent C.S.C. test, but lacks the telephonic voice and ear, and her sister in the Service who passes a C.S.C. test sufficiently rigorous to carry her through, putting the same query hour by hour and day by day. It may be that a telegraphist would fail if it were not that each word is spelled letter by letter, but this spelling hour by hour and day by day enables her to acquire a fair proficiency in spelling even if she lacked it prior to entering the Service.

I am inclined to think that telephonists as a whole are more patient and speak more in accordance with telephonic requirements when dealing with telegrams, but that telephonists display a greater degree of accuracy so far as spelling and the preparation of the telegram is concerned. Of course the former, eventually, is not so well paid as the latter, and the introduction of a stiffer C.S.C. test in spelling would tend to support claims to equality of remuneration. Local operating is mechanical, but the same may be said of reception of Morse signals once they have been thoroughly grasped. Telegraphists often, a minute after a telegram has left their hands, know prac-

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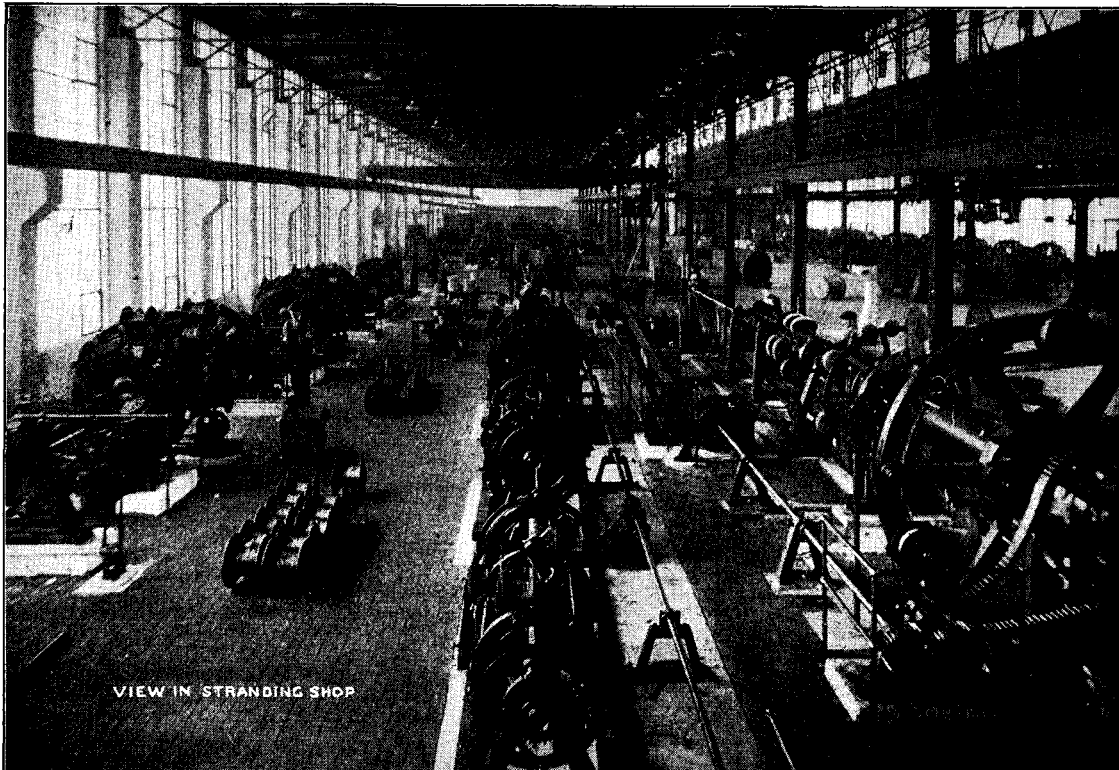
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tically nothing about it, and cannot call to mind a single word of its construction. Each class of officer starting from one point would have the same opportunity of acquiring a knowledge of the rules relating to telegrams, so that in my opinion the question of knowledge of rules may be eliminated from the question as to which class of officer is the best. From her daily practice with telephonic apparatus the telephonist will always be superior to her sister telegraphist in the matter of the telephonic ear, and in the art of plain speaking.

A telegraphist spending a few months reading from a sounder can scarcely attain the same degree of efficiency in detecting the spoken word correctly. The telephonist, unlike the telegraphist, has no aid to spelling, but she soon acquires a knowledge of the manner in which best to speak if she wishes to render a correct version of what she utters. I have heard telephonists speak as though they were afraid to give full value to the sounds which go to make up uttered expressions, but additional repetition caused thereby, if persisted in in connexion with phonogram work, produces the necessary cure. The telephonist then, possessing as she does the practised voice and ear, occupies a position ahead of the telegraphist if she can but place on paper a correct rendering of what she hears.

In my opinion there is nothing like reading good sound literature for unconsciously acquiring sufficient proficiency in recording the spoken word, and if telephonists read such works as *Pet Marjorie* by Lachlan MacBean, they will be both interested and instructed.

R. BAXTER.

Assistant Superintendent Cl. I (Telegraphs).

Carlisle, Feb. 16.

POST OFFICE RELIEF FUND.

A very successful musical and dramatic concert was given under the auspices of the Central Telegraph Office in aid of this fund on March 12. The St. Paul's (Brixton) Male Voice Choir gave several rousing numbers and part songs, and amongst the vocalists Miss Grace Selwyn, Miss Florence Cowling, Miss Christine Gordon, Mr. Chas Easton, Mr. Fredk. T. Harry and Driver W. Spencer earned well-merited applause for the songs which they rendered, while Mr. Ducker gave an excellent violin performance. The programme was further enriched by some excellent selections given by the Gresham Glee Singers, who had a most hearty welcome, and by Mr. Frank Hudson's anecdotes. Of course, a great feature in the programme was the performance of some scenes from *As You Like It*, by the members of the Interkom Club, which is recruited from the C.T.O. This item was altogether excellent, and amongst those who bore the principal parts may be mentioned Miss Reading as Jacques, Miss Nichols as Orlando, and Miss Murdoch as Rosalind, whilst Miss Mathieson sang Amiens' songs with considerable charm. Mr. A. G. Ferard, the hon. secretary of fund, gave in the course of the evening some interesting facts and figures. The number of Post Office men serving with the Colours is now about 80,000 of whom 3,600 have laid down their lives. As indicating the rate at which the work connected with the fund increased, Mr. Ferard said that recently 23 widows and dependents and 15 orphans had been added to the books of the fund in one week, making the totals 1,779 and 2,050 respectively; 150 war widows had been found work in the Post Office, and over 60 had re-married.

It only remains to be added that the musical arrangements were directed by Mr. C. E. Daggett and that the stage director was Mr. F. J. Sainsbury.

GLASGOW COMFORTS FUND FOR MEN AT "THE FRONT."

The Committee of the Comforts Fund of the Maintenance section, Engineering branch, Glasgow, take this opportunity of acknowledging the numerous woollen and other gifts which the ladies in the various Glasgow exchanges, and outside friends, have been so good as to hand over for transmission to those members of the Engineering staff who are on active service. The fund which was started over a year ago was materially augmented during the last two winters by the proceeds derived from a series of particularly enjoyable whist drives which were for the above-named purpose. A sum of approximately £31 was handed over as the result of functions which were held by the exchange staffs at "Douglas," "Central," "Western," and "Queen's Park" during the past few months, and the committee are indebted to the ladies in charge of these exchanges, viz., Misses Smith, Cameron, Miller and Thyne, respectively, for such a handsome contribution to their somewhat depleted fund.

A highly successful whist drive and dance was held by the Maintenance staff in the Royal Halls, Sauchiehall Street, on Dec. 2 last in aid of the comforts fund of the section. This also provided a very enjoyable entertainment during these dull times and appeared to be much appreciated by the representative company consisting of 170 guests. The proceeds enabled a satisfactory sum to be handed over for the benefit of those on service.

About 200 parcels, each costing approximately 10s., have been forwarded during the past year, and as the number of "exiles" is still increasing any further assistance will be gratefully accepted, and acknowledged by Mr. Jeary, the secretary to the committee.

LONDON TELEPHONE SERVICE NOTES.

IN the last number of this JOURNAL there appeared a picturesque editorial on the subject of "Hope," and we learned therefrom that "the new day is dawning and the ivory gates of Hope are moving on their hinges." Unfortunately this statement leaves us in some doubt as to whether the "ivory gates" are opening or closing and in the absence of a specific statement on the point the telephonists are inclined to fancy that the gates are closing, and it is written that "Hope deferred maketh the heart sick." Even the glitter of the ivory gates in the warm glow of a new day's sun does nothing to relieve the heartache until such time as the gates open sufficiently wide to allow of approach to the golden treasure within! It seems to the telephonist that no "Hesperian Tree" was ever more jealously guarded by "Dragon watch" than is this golden treasure.

We were much interested too in reading the paragraphs in the pastorly phraseology of that polished penman, J. J. T., which were provoked by a perusal of Miss Heap's paper. We were surprised to find Miss Heap putting in so strong a plea for the segregation of the sexes, as it is difficult to reconcile such an attitude with a claim for equal opportunities for men and women, but possibly there is more in this point than appears at first sight, for only recently in a Traffic Instruction (No. 248), issued by the Traffic Staff and Building's Division, we find most exact directions set out as to the particular shade of colour which is to be used when decorating quarters which are to be in the exclusive use of women. The position taken up in the Traffic Instruction is quaintly summarised in some lines which reached one of the outlying exchanges. The lines ran

If you are a lady as haply you may be
Your room must be durescoed in tint marked "C."
But should it just so happen that you are merely men
Your eyes shall search duresco of a tint marked "N."

Presumably past experiments have established the fact that under the benign influence of tint "C" the feminine mind is at its strongest, whilst the male energies are reinforced by surroundings of tint "N." We cannot claim definite knowledge of either of these shades, but certain it is that the combination of colours on the walls of our present official home have always appeared to us as hideous. Possibly, however, they represent an earnest attempt to secure an appropriate combination of colours suitable for a staff of men and women.

At the February meeting of the Telephone and Telegraph Society two papers were read. One was by Miss Baldwin of the Trunk Exchange under the title of "Trunk Loads," and the other was written by Miss Tynan, of the C.T.O., and dealt with "Some Phases of the Intercommunication Switch." The latter lady was unfortunately prevented by illness from being present but she had secured a most efficient substitute whose nicely modulated voice made one regret the shortness of the paper. The views expressed by Miss Baldwin were of that "downright" character which is now familiar to all who attend the meetings of this society and the London Telephonists' Society. On March 12 the members of the T. and T. Society had the pleasure of listening to a paper by Mr. A. E. Powell on "Problems in the Design and Equipment of a Modern Central Telegraph Station," and a week later Mr. Greenham, one of the Assistant Superintending Engineers for London, read before the Institute of Electrical Engineers a most interesting paper on the "Provision of a Telephone Exchange." Unfortunately all the meetings of these societies have this year been poorly attended, although the papers read have been maintained at a very high standard. It will be extremely difficult to carry on some at least of the societies if the present was conditions continue throughout another winter.

We offer our heartiest congratulations to Miss Brennan, First Class Assistant Supervisor in the Trunk Exchange, who has left to be married. She went away loaded with presents, tokens of the

goodwill of those amongst whom she has worked in the Telephone Service,

The usual occupation for the telephonist is still to entertain wounded soldiers, and on March 3 *officers* (we refrain from referring to them as "nice girls" in deference to the author of "Telegraphic Memorabilia" although we still think they are fully entitled to such a description) from the Holborn Exchange gave a right royal time to a party of our *boys* (this is still permissible we believe) at the Memorial Hall. If smiling faces and rippling laughter are any indications of happiness we may affirm that these wounded heroes were indeed happy. The ensuing Saturday found the Dalston staff acting as hostesses at a gathering of which the following account has been contributed:—

A party of 50 wounded soldiers from Bethnal Green Hospital were entertained by the Dalston telephonists and friends at the Down's Baptist Chapel, kindly lent by the Rev. Lindsay for the occasion.

The soldiers arrived at 2.30 in motor vehicles supplied and manned by the Middlesex Volunteer Corps, 5th Squadron, and were welcomed by the waiting hostesses who at once proceeded to partner them by an ingenious arrangement of advertisements and their catch phrases.

After a series of popular choruses, the entire company sat down to a well-spread tea, the dainties being mostly prepared by the ladies.

Before rising from tea each of the guests were presented with either a pipe, pouch or cigarette holder with cigarettes and matches. After tea had been partaken of songs were rendered by the telephonists and friends. They were well received and accorded hearty encores. One of the soldier guests then gave us an unexpected treat in singing a couple of songs in the best style. Needless to say he was well applauded.

A number of parlour games were indulged in with a few more songs following, during which coffee, sandwiches and cakes were passed round.

Hearty votes of thanks were then accorded to Rev. Lindsay, the transport workers, and with cheers by the guests for the telephonists, Auld Lang Syne and God Save the King concluded a merry entertainment.

ENTERTAINMENT TO WOUNDED SOLDIERS AT BRISTOL.

The clerical staff of the District Manager's Office, Post Office Telephones, once again had the pleasure of entertaining about 100 wounded soldiers at Brunswick Lecture Hall on Jan. 27. The proceedings opened with a brief speech from Mr. Bates—District Manager—who welcomed the guests and expressed the hope that a pleasant time might be spent together, after which a musical programme was provided by the following artists:—Miss Agnes Rayson, the Misses Grace Dunn and M. Jarrett and Messrs. Pearse



Clarke, F. Elworthy, Lionel Venn, A. T. Mass and F. A. Wilshire, all of whom ably acquitted themselves, the items being well received. Mr. F. Southby kindly acted as accompanist. The musical portion was divided so that refreshments might be taken, and, at the close, a representative from the Enquiry Bureau returned thanks for the men, who showed their unmistakable appreciation by responding with hearty cheers. Special mention should be made of the most welcome gifts of chocolates and cigarettes supplied by Carsons, Ltd., and Messrs. Ansties (Devizes) respectively, which did much to add to the enjoyment of the boys.

PERSONALIA.

LONDON TRAFFIC STAFF.

Miss ALICE M. BRENNAN, an Assistant Supervisor, Class I, of the Trunk Exchange, has resigned to be married and was presented by the staff with a dinner service and other useful presents.

Miss E. M. GILDING, Assistant Supervisor, Class I, resigned on account of marriage. She was presented by the staff of Kingston and Esher Exchanges with a copper tea kettle and other gifts.

Miss A. L. GLYNN, a Telephonist of North Exchange, has resigned to be married and was presented by the staff with a silver cake basket and other useful presents.

Miss C. C. FELTON, also a Telephonist of North Exchange, has resigned in view of her approaching marriage. She was presented with a tea service and other useful gifts.

Miss EDITH M. WOODHURST, of London Wall Exchange, resigned on account of marriage, she was presented by the staff with a dinner service and other useful presents.

Miss B. LEAH OLDROYD, of the Trunk Exchange, has resigned to be married. She was presented by her colleagues with a silver tea service and other gifts.

Miss N. J. BROOKS, a Telephonist of New Cross Exchange, resigned owing to ill-health and was presented by the staff with a gold brooch.

PROVINCIAL STAFF.

Miss B. M. FRICKER, of the District Manager's Office (Telephones) Canterbury, has resigned after fourteen years' service to be married. Miss Fricker originally joined the late National Telephone Company in the capacity of Fees Clerk and was subsequently promoted to be Travelling Supervisor on the Traffic staff. Before leaving, Miss Fricker was presented with a silver-plated teapot, sugar basin, &c., and with a silver candlestick, the combined gift of the District Office Clerical staff and the Traffic staff of the whole district.

Mr. W. J. SALTER, Telephone Night Operator, on leaving the Service after fourteen years, was presented with a silver-plated teapot by the staff of the Canterbury Exchange.

On the occasion of her resigning to be married after nineteen years service, Miss F. WEEKS, Clerk-in-Charge Telephones, Bath, was presented by the staff with a dinner service and fitted handbag.

POST OFFICE HOSPITAL.

The entertainment given at the Post Office Hospital on March 2 and arranged by Lady Hart and Mr. A. G. Ferard, was rendered exceptionally interesting by the performance, by kind permission of Mr. Frederick Harrison, of a comedy entitled *Postal Orders*. It was performed by the original cast from the Haymarket Theatre (Miss Esther Whitehouse, Miss Mary Clare, Miss Ethel Griffies, Miss Madge Compton and Mr. Gordon), and being in the nature of a skit on Post Office work was much appreciated by the audience. In the musical programme which preceded and followed it the principal vocalists were Miss Margaret Mockridge, Lieut. Hughes-Hughes (Welsh Guards), Mr. Whitney Mockridge, Miss Matheson and Miss Erskine, while Lady Newnes gave whistling and violin soli. Lady Hart acted as accompanist. The whole programme was an unqualified success. In addition to the patients and staff numbering nearly 40, representatives of the Post Office witnessed the performance, at the close of which Mr. Ferard invited Sir Robert Bruce to thank Mr. Frederick Harrison and the members of the Haymarket Company for their kindness in coming to the hospital. Sir Robert in doing so took occasion to emphasise the admirable services rendered by the women staff of the Department in the present emergency.

ENTERTAINMENTS TO WOUNDED SOLDIERS.

The staff of the WALTHAMSTOW Exchange gave a very successful whist drive and Bohemian concert at the William Morris Hall on Feb. 17, to which 50 wounded and 10 nurses were invited from the neighbouring hospitals. Several friends of the staff kindly lent their cars for the conveyance of the guests.

The hall was prettily decorated with palms and plants. After ten games of whist, refreshments in abundance were served which were all prepared by the staff. Cigars and cigarettes were then handed to the wounded and play was finished. Five out of six gentlemen's prizes were carried off by the wounded amidst resounding cheers.

After the whist drive a very good concert was given at which one of the wounded sang two songs and was cheered to the echo. The guests were loth to leave and called for another entertainment at an early date. The proceeds, amounting to about £3, are to be devoted to war charities.

The NORTH Exchange staff again entertained a party of wounded soldiers on Feb. 3. In spite of the freezing atmosphere then prevailing outside, the temperature of the gathering was warm and genial, all coldness being kept rigidly outside the hall. The guests thoroughly entered into every item of the programme and gave equal appreciation to the culinary and musical artists. The musical efforts of the competitors in the whistling competition also met with hearty applause.

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THE Telegraph and Telephone Journal.

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No. 32.

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THE PROGRESS OF THE TELEGRAPH.

By F. W. LIENAU.

(From *The Nation*, New York.)

A CONSIDERABLE portion of the increased load which the telegraph has recently been called on to carry is no doubt the reflex of the general extraordinary stimulation of business during the last two years or so. But paralleling this abnormal increment attributable to the special conditions of the day, there has been proceeding at a constant ratio of increase a growth of traffic of a more permanent and substantial character. To this a number of causes have contributed. The introduction of the night letter and the day letter services some years ago marked a notable step forward in the extension of the utility of the telegraph to the public. The American people are quick assimilators. They cannot afford to waste the proverbial nine days in wondering at any innovation. It is stripped of its newness with very much the same dispatch with which young America removes the nice, shiny paint from a new red wagon, and the novelty of yesterday becomes the commonplace of to-day. So the new overnight and deferred day services, affording the facility of sending (as their names imply) communications of letter length by wire, at low cost, promptly made a permanent place for themselves in our scheme of business and social correspondence. They have had much to do with opening the way to a better understanding of the adaptability of the telegraph to an infinite variety of purposes, for which it had in former years not been recognised as available, and have thus, in conjunction with other elements, to which further reference will be made, played an important part in bringing about a change in the public mind.

We do not have to go so very far back to recall the day when a telegram was commonly associated with the idea of calamity and distress. Though this extremely old-fashioned superstition may now safely be said to belong to a past epoch, there still persisted the conception of the telegraph as an instrumentality to be used only in cases of extraordinary emergency, its employment even for business purposes, though in the aggregate of respectable proportions, being restricted by the limitations of this narrow aspect. This point of view, as has been said, has been undergoing an important modification. The speeding up of modern business processes calls for the quicker handling of transactions. Constantly sharpening competition has brought home to the business man the necessity of keeping in the closest touch with the trade to which he sells, as well as with the market from which he buys,

and with the units of his own organisation. Men of constructive imagination have been quick to discern the value of the attention-compelling power peculiar to the telegram. They have reasoned that a telegram always commands preferred consideration; that it always reaches the man who decides and is not sidetracked by some routine, mail-handling clerk; that its appeal is powerful and its demand for prompt action insistent, and that for these reasons it offers the most effective way of presenting any proposal—and this, whether it be to a single individual or to a number of people. As a result of the experiments in this direction the telegram has demonstrated a quite remarkable efficiency as a sales medium and business builder, and with experience its employment in this capacity has grown. Many concerns throughout the country, whenever they have some special offer to present to their customers, now do so by wire. This may involve only a dozen or so messages simultaneously sent, or it may involve anywhere from one or two hundred to many thousands. Files of five hundred or a thousand telegrams at a time are no longer uncommon. A department store found it a profitable enterprise to announce a special sale by sending 33,000 night letters to residents of the city and the surrounding territory. There have been other occasions when more than 100,000 telegrams were sent simultaneously.

The telegram is being used for buying as extensively as it is for selling. Dealers, large and small, are utilising it most freely to keep their stocks frequently and newly replenished, with a consequent saving of capital tied up and of wastage in dead stock. Again, it has been found to be a most effective agency for bringing in delinquent accounts. Wholesalers and jobbers employ it as a constant encourager of their sales forces. In soliciting orders, it has become a frequent custom to request that they be sent by telegraph at the sellers' expense, a self-addressed telegraph blank being enclosed for the purpose.

The social use of the telegraph has likewise become more general. Travellers have developed the habit of keeping in touch with their families by night letter, probably because a night letter received at the breakfast table on the morning after it was sent has a freshness lacking in a letter from one to five days old. The convenience of telephoning a telegram to the telegraph office from the home has had much to do with the enlarged employment of the telegraph for social and family messages.

The development of facilities for handling the traffic has kept pace with the increased use of the service. The telegraph of to-day is a very different affair from the telegraph of a generation ago. Once upon a time a certain Congressman spread upon the *Congressional Record* a speech in which he made the statement that telegraph companies were not progressive and consistently refused to encourage inventors of new methods. It would be

interesting to lead the distinguished gentleman (now long since retired) through a modern telegraph office and to exhibit to him what has been accomplished in the perfection of automatic telegraph transmission. The Morse operator still holds its place, and probably will indefinitely, as for certain purposes manual operation by means of the Morse key and sounder is most efficient. But the conditions of to-day demand in addition newer methods for handling the vast volume of traffic. The development of automatic telegraph apparatus has occupied the attention of scientists for many years. Many contrivances have from time to time been perfected and have had their day, to give place to improved and more effective mechanisms. There are now in successful operation a number of devices by which messages, written on a typewriter keyboard by the sending operator, are reproduced directly and automatically by a typewriting machine upon the proper telegraph blank at their destination, ready for delivery to the addressee. And invention has not stopped there. The Western Union Telegraph Company has in daily use, over many circuits, with more to be added as conditions require, apparatus by means of which eight messages—four in each direction—are simultaneously transmitted over a single wire, the entire process being automatic. This is an accomplishment which speaks for itself.

In handling telegrams seconds count, and the great object to be achieved is the elimination of every moment's loss of time. Moving belts and pneumatic tubes have been installed in the operating rooms to carry the messages from one operator's station to another. Where boys and girls are employed to carry messages from one part of the room to another they are equipped with roller skates. Numerous other time-saving devices have been provided, and new ones are added as fast as they can be devised. There has been constant improvement in the methods of keeping a check on the movement of the traffic—within the offices by a highly developed supervisory organisation, and between offices by a system of traffic dispatching by means of which dispatchers stationed at certain centres are constantly advised of the traffic condition of every wire in the country and may direct the movement of the business accordingly.

Whether more exacting demands beget improved facilities or whether improved facilities breed more exacting demands is a question as difficult to answer as that concerning the precedence of the hen and the egg. In any event, there is no doubt a reciprocal influence, and it is the telegraph company's task to keep the facilities always a step in advance of the demand.

THE STRUGGLE.

BY H. G. CORNER.

(Concluded from page 87.)

WHAT I would like to do this evening is to consider again the ideas underlying these terms in the light of the new knowledge born of the war.

A little while ago it would have been heterodox even heretical to doubt the universal and everlasting value of organisation, efficiency and discipline; they were accepted as always and unquestionably good, but I suggest that the time has come when we should consider whether we cannot have too much organisation, whether efficiency cannot be purchased too dearly and whether we may not be somewhat astray in our conception of what discipline should be and what it can accomplish.

Do not misunderstand me. I am not prejudging these questions. We may be quite on the right lines, but I suggest that we should try to look more deeply into things as they really are, to put in some fundamental brain work and bring our best thought to bear on all the points at issue.

And about this word "thought" let me quote some words in a recently published book by Professor Bertrand Russell (if I

may quote Mr. Russell without coming under the "Defence of the Realm Act") :—

"Men fear thought as they fear nothing else on earth—more than ruin, more even than death. Thought is subversive and revolutionary, destructive and terrible; thought is merciless to privilege, established institutions and comfortable habits; thought is anarchic and lawless, indifferent to authority, careless of the well-tryed wisdom of the ages. Thought looks into the pit of hell and is not afraid. It sees man, a feeble speck, surrounded by unfathomable depths of silence; yet it bears itself proudly, as unmoved as if it were lord of the universe. Thought is great and swift and free, the light of the world and the chief glory of man."

It is a terrible thing, you see, according to this philosopher; nevertheless I conceive we have to face the duty in the period of immense social reconstruction which must follow the war, to face all the dangers of full and free thought and not least in our own Service. And I believe I am not saying anything with which the administration will disagree when I say we want the staff to think about it too, and that nothing but good can result from our all thinking what is best to be done for this, which, after all, is an important national service.

Let us first think then about this question of organisation. No one knows better than a telephone man or woman that organisation—that is to say, bringing your people together and arranging them so that the work of each fits into the work of the rest and produces a complete result, putting each man or woman to the work which he or she is best able to do and establishing such conditions that the work is accomplished with the smallest possible effort—is the life and soul of the Telephone Service. But so it is of the State, and strangely enough before the war that was very little considered in this country, for a more undeveloped and haphazard collection of atoms than that composing what we call the British Empire it would have been difficult to find. What could be more unorganised than the system of distribution, which indeed was no system, as anyone could see who walked down a suburban street in the morning and saw half a dozen milk carts and half a dozen bakers' carts and half a dozen newspaper boys all bound upon the same errand, some delivering to one house some to two or more, but all overlapping and doing a lot of unnecessary work and expending a lot of wasted energy. And what could be more unorganised than turning our boys and girls out of school at the age of fourteen not even half-educated and each tumbling into any sort of job which in their ignorance they could pick up quite irrespective of their aptitude, or prospects, or the value of the job to the community. I am not going to labour this point. We have suffered from lack of organisation for peace but I understand we are now beginning to organise for war. But now look at the other side. For years past we have been pointing to Germany as a model of organisation, as a country where the State is supreme and has got all its people docketed and ticketed and card-indexed, each one in his proper place with his job to do, and with one common purpose emanating from the minds of the chiefs of the organisation directing all. Yes, Germany is a highly organised country—but organised for what? There is an organisation of heaven as there is an organisation of hell, as Professor Jacks says, and the organisation of hell may conceivably be more efficient than the organisation of heaven, "for the children of this world are wiser in this generation than the children of light." And what is the result, what is the common purpose to which all this organisation has been directed? The answer is writ large in the history of the last two and a half years. The organisation is intended to produce and promote a power and a culture that shall give that one State a mastery over all others, that shall increase its own well-being at the expense of other peoples, that shall in fact establish a sort of contempt for all other civilisations and all other systems. Its end is purely materialistic and inhuman, but it has come up against a principle which is proving stronger than itself, something that it left out of its calculations. What is that? "The organisation of evil is mechanical, the organisation of good is vital." It is just this vital principle which is lacking. The individual soul has been forgotten. The machine has become the master of the man instead of the man the master of the machine. The means becomes the end. The German is fond of comparing his Empire to the Roman Empire and himself to the Roman citizen. It is not so, but there

is one respect in which the comparison may be made. Many reasons have been given for the decline of that Empire, and one which is gaining more and more acceptance as one of the primary causes is the vice of over-organisation—organisation to such an extent that all individuality was crushed and its people came to rely solely upon the State for direction, for security and for life itself. Any system which omits to provide for the free development of the individual is doomed to decay and sterility.

Do not think that in this antithesis between the German and English cultures I am suggesting that in the latter provision is made for individual development. I am not; but at any rate there is a freer play of forces, individuality gets somewhat more encouragement, and if we could combine this with an organisation not on materialistic but on humanistic lines we should indeed be working towards the perfect state. And thus we have much to learn from Germany both as to what to aim at and what to avoid.

And now comes the question of efficiency. Efficiency, a splendid thing in itself, is in danger of becoming the tyrant of the individual. I like to think that in the Telephone Service we aim at an efficiency which does not overlook the welfare and the happiness of the human element, an efficiency which is qualitative as well as quantitative. Miss Baldwin's paper (*vide* page 82 of the JOURNAL), provides me with a good example of what I mean. She accuses the administration of wishing to turn the individual into a machine. I do not think that is true; she mistakes a necessary uniformity for a harassing rigidity. If there is any truth in it, to the extent to which it is true it ought to be remedied. But the mere fact that the matter can be brought up at a meeting of the staff and discussed in the way in which it has been discussed, is destructive of its main argument. I conceive that such a discussion would not be possible in Germany.

But to return to this question of efficiency, which implies the attainment of the most useful ends with the strictest economy of means. It is a commonplace to state that we are far behind our enemies in all that leads to great mechanical efficiency, in all that pertains to the scientific processes of agriculture, manufacture and commercial life. We know for instance that the soil of Germany, although much poorer than our own, produces 50 per cent. more food per acre than ours, simply through the application of thought and science which is nothing but organised common sense. On every 100 acres of cultivated land Germany feeds from 70 to 75 persons per 100 acres of cultivated land, while Great Britain feeds from 45 to 50 persons only for the same amount of land. We know that the average load per diem of a British railway truck is 17 cwts., while that of the German railway truck is 2 tons 11 cwts. But do we know that since the war began and Germany was cut off from all foreign supplies of fertilisers, she set to work to discover a commercial method of extracting nitrogen from the atmosphere, and now she has rendered herself independent of all outside supplies of these compounds of nitrogen without which no country can continue to exist. Great Britain, while still wastefully consuming her irreplaceable coal reserves, has done nothing, is almost the only civilised country in the world which has done nothing, to create fresh supplies of the vitally necessary compounds of nitrogen. The story of the aniline dyes which England discovered and left Germany to develop, so that we were shamefully dependent upon her for one of the most vital requirements of our textile industries, is too well known to need more than mentioning. I quote these instances, and could of course quote innumerable others to show what can be attained by a national recognition of the importance of scientific research. Germany spends enormous sums every year on this aid to efficiency. There is no secret about this, no superiority of brains or cunning. It is simply recognising that scientific research makes for efficiency and not being afraid to spend money on it. Incidentally it is useful to bear in mind that the few poor thousands which this country spent on our research laboratories at Twickenham were immediately cut down as a war economy measure. Yes, and the education grant was cut down and the museums closed, the Government having apparently come to the conclusion that our most useless form of expenditure was that on education, and so acted accordingly, whereby I am informed enough money was saved in one year to pay for nearly two hours

of the war. No wonder that Professor Murray came back from a tour of the neutral countries and tells us that those people have the impression that the English are a "frivolous" race.

It is not a pleasant picture for us to contemplate but here again there is another side to it.

Efficiency is an excellent ideal in business, but efficiency in business so far from being an excellent is an ignoble thing as an ultimate ideal in life. There are greater things to be lived for even than this most excellent thing—efficiency in industry. "What shall it profit a man if he gain the whole world and lose his own soul?" What is the value of this efficiency and the wealth and power it results in if in producing it, if it is gained at the cost of the proper development of the human faculties? I would like to quote here a passage from a recently published essay of Professor Warde Fowler on German thoroughness:—

It (*i.e.*, German thoroughness) means in the first place a steady and continuous individual industry, under guidance until the habit is fully acquired of working according to some approved method, of adapting means to ends in the prosecution of a design. The student has to learn to dispense with recreation, and to occupy all his time, except perhaps an hour or two in the evening, in attacking his chosen subject both by highways and byways; for the gradual increase of knowledge about every possible subject compels him to learn foreign languages, and to be constantly reading and carefully weighing new publications in his own tongue, which is often difficult to follow even for a native, owing to the carelessness of the use of it which prevails in the German learned and scientific circles. . . .

. . . I do not suppose that Englishmen or Irishmen can ever reach the present standard of industry and co-operation; Scotchmen may well do so, for they are by nature more persistent workers. But as we hope that even in England serious work will be taken more seriously than before the war, it may be as well to beware of too servile an imitation of our present enemies. Their great quality of thoroughness has its drawbacks, of which a word shall be said here.

To begin with, it is obvious that this thoroughness, inculcated in all German education, and enforced by State supervision, is liable to discourage the free development of the individual mind; and this the best Germans know very well. It is not a system of cramming and examinations, such as has been hurtful with us, but a steady continuous educational drive, the pressure of which it is almost impossible to escape. Clever boys are not allowed to get on too quickly; my nephews, when they left a German gymnasium for an English public school, found themselves behind the English boys of their own age. It must be said, however, that enlightened Germans have long been criticising this feature in their education—the Kaiser, I believe, among them.

Then again, the habit of continuous industry thus inculcated tends to make the student overdo his duty to his work, and to deprive his brain of the freshness and brightness which is necessary if materials are to be handled with good judgment and results expressed in a masterly manner.

And so while paying a proper tribute of respect to this efficiency and recognising its extraordinary value in our own particular business, let us not commit the fatal mistake in the great social reconstruction which is to follow of establishing our plan of life upon a purely materialistic conception of the universe.

What is it in the German system and policy that has led up to this marvellous organisation and efficiency for ultimately sordid purposes? It is a spirit of discipline such as we can have no conception of in this country, rigid, consistent and exacting, a discipline which dogs every German man and woman from the cradle to the grave. Every schoolboy is taught to think and every professor is made to teach in the same mould and that mould is the superiority of the German race under the inspired and infallible guidance of the Hohenzollerns. This discipline so far as it promotes health and cleanliness and industrial effectiveness has its good points, but in so far as it prevents freedom of thought and intellectual development, it is stultifying and contains the seeds of death and decay.

Everything which should conduce to the development and

happiness of human life, religion, education, patriotism, all are bent and shaped to that one purpose; the creation of docile and obedient instruments of the will of the Kaiser and of the military caste. "There is one desirable kind of discipline, one that comes from within which consists in the power of pursuing a distant object steadily, foregoing and suffering many things on the way" (Bertrand Russell). There is also a certain kind of discipline imposed from without which tends to a certain uniformity necessary for the efficient accomplishment of a common task. But the kind of externally imposed discipline which extends from the actions to the thoughts of men and women, and turns human into mechanical activities, is detestable, and its nemesis if not yet fully apparent will be signally demonstrated in the next few months.

And what has all this got to do with the London Telephone Service. Everything. For those great principles upon which States are administered are precisely the same as those on which any industry or community or department of a State are run; and the same success or the same failure results from this; whether they are applied on purely mechanistic or on humanistic lines. If organisation, efficiency and discipline could have won the war. Germany had won it before it commenced. On the other hand, had we paid attention to organisation, efficiency and discipline in our communal life we should from the first have been in no doubt as to the result. How comes it then that Germany has not won and we have not lost. It is because an organisation directed only to the attainment of power and wealth will fail when it comes up against a higher ideal imperfectly organised. It is because with all our faults, all our stupidities and all our neglect we have at least given a certain amount of freedom to the individual soul, we have at least encouraged individual initiative, however imperfectly, and paid something more than lip-service to the idea of liberty. And by that we shall win through in the end. And I beg of our governors and masters that when they are considering the organisation, efficiency and discipline of the London Telephone Service that they will bear in mind these things.

KHAKI AT THE SWITCHBOARD.

THE days of the war pass on—slowly or swiftly as the mood of man varies. And as the hand of Dawn draws aside the curtains of the night, each day reveals some new phase of the greatest tragedy of all time. But it is a sombre drama—the more tragic, perhaps, because of its relentless avoidance of colour. Purple and scarlet and gold, the waving of plumes and the splendour of armour—these glories were spread across the scene when of old the rage of battle shook the world's stage. And now all is khaki. The War and Science have conspired to kill the poetic god of battle, and to produce a strange monster whose tentacles reach through every faculty of the warring nations.

From its very inception the war made a difference to the ordinary routine of telephone exchange work, but the effects, until recently, were, in a manner, intangible. The voices of commerce and society had become somewhat altered in tone, and there mingled with them a new voice, peremptory and commanding. Now, however, comes a sudden change, and the war grows more palpable. Men in khaki have invaded the exchanges and peacefully taken their seats at the switchboards. The powers that rule our daily lives—that is to say, the military potentates—have decreed that the soldier shall be trained in the gentle art of telephone exchange operating, and, lo, the steel helmet gives place to the head receiver, and the bandolier to the breast transmitter.

With a careful solicitude for the suitability of things in general and for the susceptibilities of the great British public in particular, the Department lays down certain laws as to the class of men that may be admitted to training. Naturally, they must be intelligent, but they must also keep their buttons and their boots clean, and they must not have pronounced accents—either Welsh or Scotch. There is no known case of a Welsh accent; but somewhere on the north-east coast of England, the sensitive ears of subscribers will have to bear with the polite request of "Number please?" rendered in accents reminiscent of the charmed land beyond the Tweed. Surely the Department must know that the ubiquitous sons of

Caledonia are difficult to suppress. Whether this Scotsman's accent is pronounced or whether the local ear is quite as sensitive as might be is a problem perhaps involving undesirable comparisons, but one thing is certain, there has as yet been no complaint received, so the matter may conceivably be allowed to rest.

Alike in one way—that they have fought and bled—these soldier-men who have come to be trained in exchange working are drawn from a wonderful variety of walks in civil life. Clerks there are, not a few; and miners, hairdressers, bricklayers, school-teachers, a hotel-keeper, a solicitor, and a policeman may walk in procession into an exchange.

The military authorities seem to have a strong predilection for ten-days' courses of instruction, whether the subject be map-reading, gunnery or telephony; and, consequently, the potential operators were subjected for the standard period of time to preliminary initiation into the mysteries of "home" jacks, calling indicators, plugs, multiples, pegs and all the awe-inspiring paraphernalia that is gathered together in a telephone switchboard. The initiation ceremonies were endured by the novices with a surprising amount of patience and interest. Even the opal code did not unduly daunt their spirits. The correct methods of pronouncing and repeating numbers aroused something like enthusiasm; and standard expressions—well, there was some difficulty in judging whether or not these beautifully turned phrases—usually spoken "with a rising inflection"—would be acceptable to men who had doubtless been accustomed to that fuller and freer flow of language which uses up such an astonishing supply of dashes when modern artists, novelists, and poets essay a character study of Tommy Atkins. A lecture room, a blackboard and chalk are things that an officer commanding can arrange to supply at almost any hour of the day, but note-books are apparently not easily produced. These adjuncts of memory were requisitioned for the commencement of studies, but had not come to hand when the course finished. Now, the men had a way of finding little things to make life more bearable in a manner that surprised the lay mind. Thus, on a cold day when the supply of coals for the lecture room had run short, there was soon found an old door which did not look particularly aged, and a splendid fire was kept going all the afternoon. Yet this faculty of discovery did not seem to extend to note-books. Notes were certainly made, however, and answers to questions were handed in, on many varieties of paper. Incidentally, the note-paper bearing a red triangle and the initials of the name of a well-known institution seems to be equally suitable for discursive remarks on telephony or love.

The really practical training commenced when the men were drafted into the selected exchanges. "Listening in" was, as usual, the first step towards operating, and this exercise must be rather wearisome even to the most enthusiastic aspirant. One man certainly found it so. The supervisor watched him indulgently for a time while the receiver of his hand-set wandered aimlessly from one shoulder to another and from the crown of his head to a position suitable for stifling a yawn. But the supervisor is a campaigner of experience and an absolute mistress of tactics. She provided him with a head-gear set and the soldier was soon making valiant endeavours to find a required number in the multiple. Another man quickly staked out a sort of claim on the trunk junction board, and could scarcely be persuaded to transfer his attentions to the needs of subscribers. A sturdy Yorkshireman confessed that he was "always slow at taking a thing in" but that "Once I do it's there for life"; and the Scotsman answered inquiries as to how he was getting on with the laconic "Oh, brawly."

The men on certain duties bring their rations with them, and when sympathetic supervisors were cautiously introduced to the army sandwich, they refused to recognise it even as a casual acquaintance. Cries for "something to be done" were raised, and quite persuasive arguments had to be used before the ladies were convinced that the district manager could not appropriately make suggestions to the Army commissariat. When this fact was realised, however, the inevitable happened, and the men from the trenches are now treated by appreciative staffs to little kindnesses of a very practicable and palatable nature.

Naturally, when the men in khaki—to say nothing of the

men in kilts—marched into the exchanges for the first time, some little flutter of excitement arose, but so inured are we to the sweeping away of cherished conventions—all because of war's necessities—that the presence of soldiers at the switchboards soon passed from the region of startling innovation to the common ground of daily routine. And the veterans of the battlefields have settled down to master the details of their new occupation with a quiet and willing composure.

IDLER.

TELEGRAPHIC MEMORABILIA.

“To make a mud patch in Belgium beautiful” Captain A. A. Jayne has appealed to the members of the C.T.O. Amateur Gardening Association for “bits of any kind of plants, cuttings, &c., &c.,” and it is understood that this appeal has not been made in vain. Doubtless the hon. secretary of the above association would be willing to answer inquiries as to any further needs if the year be not already too far advanced by the time these lines appear in print.

Yet another of the C.T.O. benevolent efforts organised by the ladies has been their collection in the office of quite a heap of old gold and silver jewelry, brooches, bangles, watches, &c., on behalf of the Silver Thimble Fund Sale at the Albert Hall. The grand total of this sale it will be recalled was a sum of £10,000, all to be devoted to Red Cross work.

Attention has been directed on several occasions to the different types of telegraphic apparatus and appurtenances which so far have sustained or even enhanced their reputation since the autumn of 1914. Sounders, Creeds, Gells, Wheatstones, Baudots, typewriters (*sic*), and Hughes have, all in turn and in their particular spheres, stood the tests which, generally speaking, their sponsors claimed for them. The Creed has proved of the utmost utility on certain important international long-distance submarine cable work for a period now running into years, and more recently has shown its high utility in connexion with the fairly heavy flow of Press due to the fertility of the correspondents on the Western front, and the equal fertility of interesting happenings there. Gells have of course continued to assert their worth as a modern necessary supplement to both Creed and Wheatstone, and particularly so when dealing with the millions of letter and figure cypher groups which have been so prominent a feature of inter-Allies' telegraphy these 30 odd months, and of which the capital of the Empire has naturally been the hub and centre.

The Baudot has continued its economical and adaptable use of international cables, and when the word “adaptable” is written, a recent instance of this adaptability and French ingenuity may be quoted with very special interest.

With the many military calls and the all-round pressure upon existing circuits for military, naval and diplomatic purposes, on a certain occasion it became specially necessary to maintain direct communication between London and a certain Italian city, while at the same time the pressure of traffic did not permit the French capital to cede a special wire or even to reduce its six-channel Baudot to a quadruple with the cession of two arms extended to the trans-Alpine centre. Two arms of an existing *quadruple simplex* Baudot then working between Paris and X were however extended from Paris to London by means of two arms of the Paris-London *triple duplex* Baudot. This combination thus gave:—

- (1) Two direct channels between London and Italy,
- (2) Four direct channels between London and Paris,
- (3) Two direct channels between Paris and Italy

by means of a single conductor throughout, but duplexed over about 300 miles of its length.

The duplexing and the maintenance of the duplex and repeater section of the apparatus and adjustment has for some time been the work of the Engineer-in-Chief's Department which, somewhere in France, maintains a somewhat lonely engineer standing-to for the better part of the 24 hours, a most peaceful and helpful invader of French territory. Students of modern multiplex telegraphy will best be able to appreciate the problems involved in working two arms, one receiving, one transmitting from a 24-segment plate on to a 17-segment distributor and *vice versa*, and yet maintaining accurate phase all round.

The arrangement of course is not an ideal one, but it held things together for a period measured by days, when traffic conditions were ultra abnormal, so that one was grateful to the bridge which carried one over the stream despite the execrable weather conditions which obtained during this stressful period. One could not help meditating in this connexion upon the inadequacy of mere traffic figures to represent the actual value of work performed under such conditions. With our own British well-maintained lines, now consisting of many miles of well-protected underground construction to rattle off ten thousand words of Press or to roll out some hundreds of telegrams per hour is certainly a feat of which we, as a much-maligned department, may well feel contentedly proud. It would, on the other hand, be ungracious indeed were we to detrimentally compare the output of long Anglo-Continental lines with those of the many shorter and nearer to the ideal British maintained circuits, without making some very large allowance for these widely differing conditions which are quite beyond the control of British supervision and telegraphists' skill.

Yet it is a lamentable fact that this difference in conditions is seldom allowed for in comparative criticisms, while statistical genius has yet to discover numerical signs which could represent its value at any given moment.

The superficial observer is inclined to say, “What, 5,000 words of Press and 10,000 groups, pshaw! a mere bagatelle,” but as a weary lightning gripper once sagely, if sarcastically, remarked “Yes, rather *some* bagatelle when you've only got a wet clothes line to send it on.” The labour and time and care necessary to ensure even moderately accurate reception, in some of the present war-time circumstances more especially, are not expressible on paper, as even are not the deep thoughts of those operators and supervisors more immediately concerned! So much for the by-path of my meditations. Typewriters have naturally proved very helpful in many ways apart from slip-writing, and like Tube and motor-bus and many another modern convenience, one wonders how things would now go without them.

The Hughes has been mentioned because quite recently yet another Government office has seen well to adopt it for its excellent work in connexion with cypher traffic and the fact that it is a particularly useful example of slow-speed type-printing telegraph apparatus. I rather fancy that the L.P.S. has stolen a march here, but am open to correction.

While still on matters that affect more particularly the London C.T.O., though not without interest it is hoped to the widest edges of the JOURNAL's circulation, I would beg to place on record the deepest regret at the premature retirement of Mr. V. M. Dunford, Deputy Controller, so unfortunately occasioned by his failing health. It is sincerely hoped that freedom from official responsibilities will do much to restore him to normal health or at worst a healthy approximation thereto, and thus enable him to enjoy a well-earned rest. It is most certain that had he cared more for himself and less concerning his official duties the present “point” on the Controller's staff would not now have become vacant. While correcting this proof the news arrives that Mr. J. Bailey, who acted as chairman to one of the sub-committees of the High Speed Telegraphy Committee, has been appointed Deputy for the period of the war.

With some temerity I would submit a few words culled from an address by Mr. Rowntree some few months back, and which came under my eyes only just recently. The word temerity is used because, quite unjustly the writer believes, anything to do with the Welfare Movement meets with but scant courtesy and less chivalry in certain quarters at the present moment. Nevertheless the brief excerpt refers very cogently to the present all-round pressure and its effect upon post-war energy.

“The nation,” said Mr. Rowntree, “had never before experienced such a period of industrial pressure, and no one could foresee how serious might be the future consequences to the physique of the country of long-continued industrial fatigue. We should utilise the present opportunity to learn how to use human effort in the most scientific and humane manner, and the experience thus gained would be of great national benefit in time to come.”

Much of the above referred to female labour during the present

crisis, and it is hoped that a motive other than mere egotism will be credited to the writer for quoting this authority in support of similar fears expressed in reference to this question in this same column quite recently.

This charity having been duly accorded, human nature must needs presume upon kindness and cite yet another supporting view, but one even more directly so. Thus Professor Pinard:—

“Pitiful is the myopia which congratulates itself on seeing that young women can do practically anything that a man can do, but fails to see that if woman spends her powers upon the present in the same way as man, she cannot have them for the future of which she is more particularly and specially Nature’s trustee.”

For the many, many kind expressions of sympathy which have reached me during these last few weeks will readers please accept my poorly expressed but sincerest thanks.

J. J. T.

LONDON TELEPHONE SERVICE NOTES.

THE final meeting of the London Telephonists’ Society was held on March 20 and, in addition to two excellent prize papers, the members present enjoyed an address by Colonel Ogilvie. Some particulars of Colonel Ogilvie’s remarks appeared in last month’s issue and the promised announcement of the conditions for employment in France have now been circulated, and we understand that the task of selecting the most suitable applicants is well in hand. Possibly before these Notes are printed the first contingent may have left for the Continent. We trust there will be an official review of the latest recruits to the R.E. (Signal Section) before they leave this country. We should in any case expect the L.T.S. members of the County of London Volunteer Engineers to be present in full uniform. Whether or not the telegraphists and telephonists bound for France are given an official leave-taking, we are certain they will render an excellent account of themselves and win golden opinions in their new sphere of action. We wish them Godspeed and a safe return to their normal duties.

The former remarks are by way of digression and we must now return to the Telephonists’ Society. The first paper read was “An Account of Singapore, its People and its Telephone Exchanges.” This was read by Miss D. O. Keyworth, a lady who is at present attached temporarily to the L.T.S. She and her sister who were engaged in the Singapore Exchange left that colony in order to accompany their family who came to Eng’land at the same time that their father journeyed to Europe to fight for King and Empire. The united family hope to return together to Singapore at the end of the war. We earnestly trust their hopes will be fulfilled. The paper was very brightly written and most pleasingly read, and its reader expressed her willingness to answer any question on the telephone aspect of her essay. The matter of greatest interest to her London *confrères* seemed to be that point of ever-present interest—wages, and Miss Keyworth detailed in a masterful (or should it be mistressful) manner the full scale. It is wonderful how complete information on such a point always appears to be, but as the scale was quoted in a cash denomination other than £ s. d. we fear we did not carry away with us any very clear conception of the comparative generosity of the scale when contrasted with that now in force in London.

The other paper read was by Miss C. K. Hooper. It was an essay on “The Telephone in Modern Drama,” and had earned the special prize of one guinea given by Mr. John Lee. We shall hope to see both of these papers printed in this JOURNAL at an early date so that no further description seems necessary. Colonel Ogilvie presented the awards for the session’s competitions, and a vote of thanks to him was carried with acclamation. It is certain that the telephonists do very much appreciate the unfailing interest taken in their society by one whom they know to be so fully occupied in these days.

Ballot papers were distributed for the election of officers for next year’s session, and in order to allow everyone to enjoy the prize papers the work of counting the votes was deferred to a later date, but it was possible to make two announcements. The president for 1917-18 will be Miss Hooper and Mr. Townsend will

continue to act as secretary-treasurer. It is very gratifying to have a lady as president. Miss Heap’s year of office still stands out as one of the most successful the society has had, and unless the war continues through the coming winter we may fairly anticipate a brilliant session next year. Miss Hooper’s interest in the society dates from its earliest days. We think the retiring president, Mr. J. Stuart Jones, ought to be congratulated on the session just closed. War conditions have, as was only to be expected, reduced the average attendance, but the meetings without exception have been of an extremely bright and interesting character and the prize papers have reached a very high standard.

The Telephone and Telegraph Society have also had their final meeting for this session. The “business” of the passing of the accounts and of the election of officers was first proceeded with.

The society carries forward a balance of over £30 which is a guarantee at once of economical management and of the certain re-election of the hon. secretary, Mr. J. W. Wissenden, and of the registrar treasurer, Mr. G. K. Cherry. Mr. Albert Illingworth the Postmaster-General, having consented to act, was unanimously elected to the office of president. The vice-presidents were re-elected with the addition of Mr. A. B. Walkley and Mr. A. G. Ferard. Mr. Preston was elected to the office of chairman, an honour which will be appreciated by the London Telephone Service as a whole. We shall expect a crowded house at the opening meeting of the new session. The committee were re-elected with Mr. A. W. Edwards to replace Mr. Dunford of the C.T.O. The latter, we regret very much to learn, retires from the committee on account of sickness. We hope he may soon be restored to full health.

The “business” was followed by a paper by Mr. M. C. Pink of the L.T.S., on “Subsidiary Telephone Services.” The paper proved of great interest, and that the discussion following it did not flag will be appreciated by everyone when it is stated that Mr. Pink dealt in detail with certain aspects of the “phonogram” question. This question seems as potent to loosen tongues as was the most carefully concocted potion of a medieval wizard—even those of less ready speech trip fluently from period to period as they express indignation at the thought that at some time or another, in some phase or another, the discussion has sunk to a level or risen to a heat which it never could have done if only everyone had approached it in the same spirit of judicial detachment as themselves. Well, well, probably they are right, but we fancy that after all an occasional spark brightens things up a bit and seldom burns the house down or interrupts friendship—and after all, speaking phonogrammatically, the ivory gates of Hope are moving on their hinges.

EXPERIENCES AND IMPRESSIONS OF A DAY SUPERVISOR TAKING AIR RAID DUTY.

BY EDITH E. VENUS.

A LOUD banging at the door just as I was preparing for bed and a voice saying “Will Miss — take up duty at once please?”—this was the first indication that Zeppelins were on their way and that the emergency staff was being called out. As an emergency supervisor in charge of an exchange during an air raid, I would like to give a few of my experiences.

It is with a sigh of regret that one starts out on an occasion of this kind. The day’s work has already been done, and no one knows what the night is going to bring. Arriving at the exchange, one quickly settles down for the important work which will follow. Suddenly the message is received “Take air raid action,” and at once everyone is alert, and it is a case of all hands on deck. The forms are given out with a tactful remark urging the staff to be as quick as possible, and the telephonists are rapidly transmitting the messages. Two instances which occurred in giving the instructions “Take air raid action” are worth recording. A telephonist had apparently been unable to make a subscriber understand the message, and one of the higher officials of the department, with the idea of helping to make things clear had taken over the



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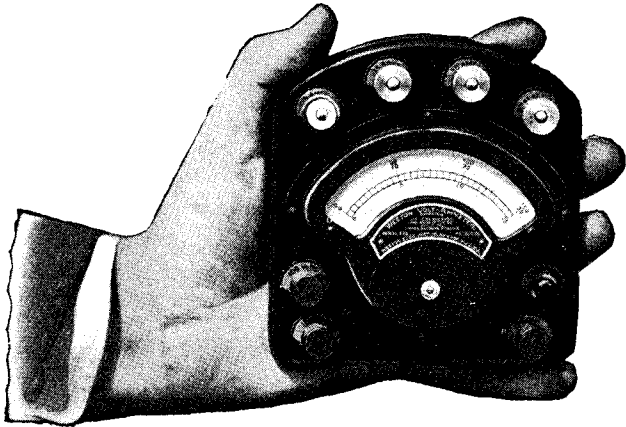
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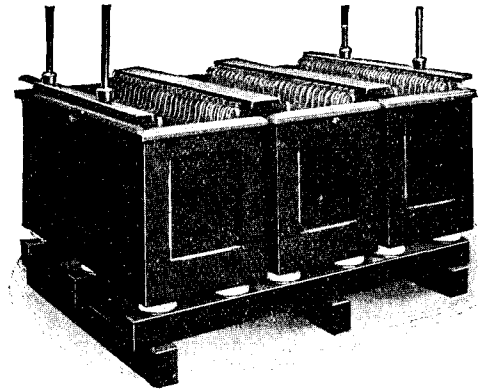
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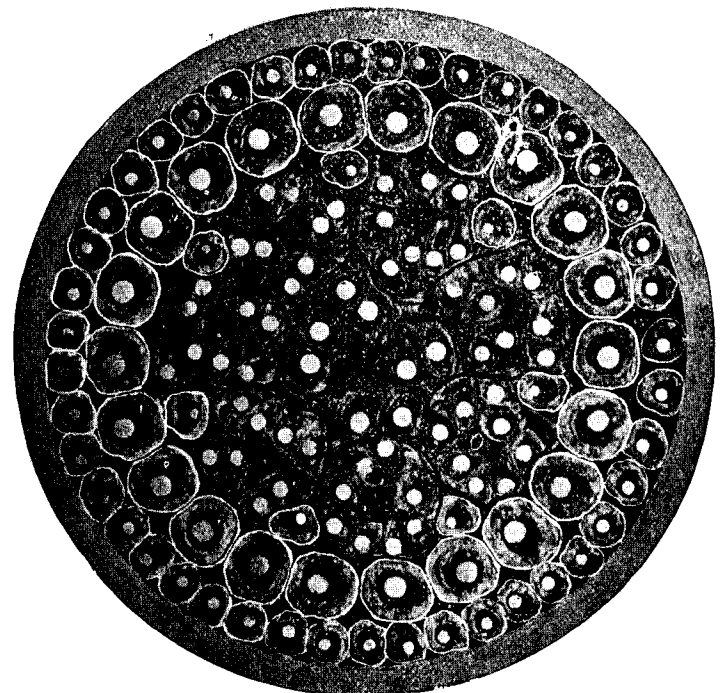
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call. The supervisor was not aware of this, and her astonishment can be imagined when instead of the usual quiet voice of the telephonist giving the message, she heard a loud voice saying "Are you deaf? Will you take this message?" The supervisor could not believe that she had heard correctly, and it shows that no one is infallible on an air raid night.

The second case was that of an office boy who, when the message was given to him, answered in a weak voice "Well, miss, I'm busy now, but if you ring up in half an hour I'll attend to you." Half an hour when the exchange was working by seconds! Words fail to express how one feels towards a subscriber like that.

The exchange is now quiet for a while and the whisper goes round "Where are they?" It takes a great deal of courage to know that the Zepps are close at hand and yet to turn to one's staff with a smiling face and say "Oh! we are quite safe, they won't get here." Safe! With a loud bang the first gun sounds, and then another, until at last it is hard to tell whether they are guns or bombs.

It is perhaps at this time that the supervisor in charge needs most courage, for the staff is relying on her attitude and her self-control. It is no easy matter at a time like this to walk up and down behind the girls telling them there is no danger, and to show their pluck.

The guns cease and everything is quiet, evidently the Zeppelins have gone. It is then that the reaction comes. Everyone feels cold and worn out, and it is with a feeling of relief that the "rest" message is received. Those who can get home for a few hours before taking up duty again are glad to do so. Tired out, yes, but feeling that although they are women and cannot fight they are helping to safeguard the people at home against the most fiendish things ever invented. Were they frightened? Not a bit! For courage and self control give me the telephonists on the emergency list who take up duty at any hour, whether it is 9 p.m. or 2 a.m. We admire our boys in the trenches for their courage and endurance, and in a smaller way our telephonists on air raid duty show the same qualities.

Difficulty in travelling to take duty is one of the chief drawbacks, and I must strike a personal note and relate a couple of my experiences.

Having heard of a big raid one evening I telephoned to inquire whether I was wanted. The reply was "Yes, come at once if you can get here." I got a conveyance about half way, and then found that all traffic was stopped. Walking on I found the streets thronged with people of all sorts and conditions, and the pavements strewn with plate glass. To the right the sky was a mass of flames soaring high from a building set on fire by bombs. It seemed impossible to go on, but after being pushed by the crowd, I heard two men asking the way to a point near the exchange. I followed them. They walked faster and faster and I had to resort to a small run to keep up with them, all through the slums. Never have I chased two men as I did that night. The route was blocked by policemen, and it was not until I asked for the Post Office that I was allowed through with instructions to keep straight on. My delight at reaching the office safe and sound can well be imagined. Never have I been so pleased to take up duty as I was that night.

Another time I was sleeping peacefully when at 2 a.m. I was knocked up by the police and told to attend for duty at once. With a groan I turned out, wishing I had never seen an exchange. No conveyances were running, so I started to walk, but it was not long before I was sorry I had attempted the journey. It was through one of the poorest neighbourhoods, and men were clearing out the sewers. From the remarks made it was evidently unusual to see a woman at that hour. The few people about were of a most unpleasant type, and that walk is an experience I do not wish to repeat. When the exchange was reached at last I was told that everything was all right and my services were not required. My feelings can be imagined, but there was nothing else to do but to go home again.

So much for air raid experiences, but in spite of the difficulties and annoyances at being called out unnecessarily at 2 a.m., we are ready to do our bit again if required, although I hope the Zepps have had their lesson and will not trouble us again.

CORRESPONDENCE.

STAFFING OF THE PHONOGRAM ROOM.

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

CAPTAIN JAYNE's eulogy of the soldier lineman and passing praise of the telegraphists from the Post Office makes pleasant reading, and it is hoped we may often have the pleasure of following that able officer and his men in similar vivid pen pictures.

Another item appearing in your last issue is the question discussed recently by Messrs. Dive and Jones, as to whether the phonogram room should be staffed by telephonists or telegraphists. Unfortunately this question has been left, in the writer's view, very much where it originally stood. This is a pity, because owing to the expansion of phonogram traffic the staffing question is becoming one of serious interest, both from the point of view of efficiency and expediency.

Experience shows that a phonogram operator to be efficient should possess an intimate knowledge of the rules applicable for the treatment and acceptance from the public of Foreign and Colonial telegrams, also Inland telegrams, embracing telegrams under the headings of Reply Paid, Portage, Week End, Deferred, Mixed Postal and Telegraph, Radio, Express, as well as the charges and particular kind of forms to be used for these various services. In fact the phonographist while not needing any knowledge of the working of a telegraph instrument, must nevertheless have all the knowledge of an expert telegraph counter clerk. The writer's opinion therefore is that the phonogram room operating force, if the public service is to be efficient, should be selected from the staff of telephonists and be specially trained in the handling of phonograms, and also be regarded as a distinct body, separate from telephonists. While a difficulty might arise from this arrangement when questions of promotion come up (telephonists and phonogram room operators at present being listed as one body), it would disappear and a great gain in efficiency be attained if the phonogram force were considered as a distinct body from the telephonists. Again, it can be argued that at large centres, it would not be possible to train the entire staff of telephonists on the maze of rules necessary for the handling of telegrams, and withdraw them from this work for long periods to perform the rota of ordinary switch-board duties.

Regarding the employment of telegraphists on phonogram work—clearly, to so staff a phonogram room would be just as unbusinesslike as to employ a skilled violinist to play the triangle in an orchestra. Obviously a waste of skill.

The summary of the recommendations contained in the report of the High Speed Committee is very interesting reading, but perhaps if the committee had experienced the difficulties encountered in the instrument room of the office where the writer of these lines is situated, the recommendations might not have been quite so hard upon poor "Wheatstone."

Geographically the office in question is on the fringe of the telegraph system of this country, and as a result of the severe snow-storm which raged over the British Isles during the beginning of March, the main system of traffic outlets both telegraph and telephone, was wiped out for a week, communication with London fortunately remained open, on one channel, and as London had communication with all large centres the situation was, thanks to Wheatstone and Creed, saved, and that with the minimum of labour at London.

The substitution of manual for automatic high speed systems might be an advantage for the Department at some offices, but certainly not in the case of outlying busy commercial communities, at least so long as telegraph lines are so sensitive to climatic variations as at present. In fact each large centre should be considered separately according to the number of channels available, the length of the lines, and the daily amount of traffic. A common multiple system would be just as applicable to the general need as the system adopted by a certain Poor Law doctor, who kept a large barrel of medicine from which his assistant filled bottles for each and all of the patients, no matter what their individual trouble. This was good for the doctor, but what about the patients? London in the case cited had perforce to take over and above the load ordinarily conveyed to that office, all the traffic usually carried by lines to Glasgow, Edinburgh, Newcastle, Birmingham, Leeds, Manchester and Dublin, and but for "Wheatstone" and "Creed" this could not have been accomplished. On the other hand, the situation would have been a hopeless one if multiple circuit working had been substituted for Wheatstone. May the shades of Wheatstone, Preece and Eden defend us from such a pulling asunder of all the magnificent structure built up by them, which has proudly been called the most perfect of the telegraph systems of the world.

J. D.

WOMEN'S DAY.

IN connexion with the Y.W.C.A. Women's Day Fund to provide Huts and Hostels for women wartime workers, a collection was made amongst the women of the London Telephone Service (Exchange Staff) and a sum of £13 7s. forwarded to the Secretary.

We regret that owing to pressure on space we are compelled to hold over the next instalment of Mr. Sirett's paper on "Telegraph Apparatus" until next month.

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

VOL. III.

MAY, 1917.

No. 32.

THE UNITED STATES.

THERE is no craft kinship between our country and the United States more close than the kinship of telegraphs and telephones. We have visited each other; we have copied each other; we have paid each other the tribute of envy of circumstances which rendered telegraphy or telephony more adaptable to social and economic needs; we study each other's journals, and we co-operate so closely that many contributions appear on both sides of the Atlantic. The step from benevolent neutrality to actual armed alliance is a smaller step in closeness of association in respect of our craft than it is in any other respect. Now we are closer than cousins: we are allies. The spirit of a new friendship throbs in our hearts. It became almost tangible to us in General Post Office North, when the great crowds surged about St. Paul's Cathedral, and Julia Ward Howe's "Battle Hymn of the Republic" sounded round the great dome. If only telephony were not in its infancy we should like to have invoked Mr. Carty's aid and to have spread that solemn chorus throughout the vast enterprise of the American Telegraph and Telephone Company. What an opportunity for the arts of the electrophone! How we should like to have carried to a thousand telephone receivers from New York to San Francisco the great jubilant dedication of "the trumpet that shall never call retreat."

They, our cousins, are to learn by our experience. In the matter of our own craft we have much to tell them. The past three years have been packed with telegraphic and telephonic events. Some we have recorded in these pages; some, to our regret, must still be kept secret. One experience our cousins are bound to have in which their English friends will be interested in an especial degree. We shall watch the Government control of telegraphs

and telephones with the kindest of eyes. It may be that it will affect the general attitude to this question much as the Government control of railways in England has affected the general attitude to the nationalisation of railways. There are still opposing opinions on that subject, but they are stated in a different form; there is a greater readiness on each side to see the strength of the opposing case. Our friends who become civil servants at a dramatic moment in their country's history, even if it be a temporary experience, will be able to throw new light on the problem.

And we shall look with particular interest at their professional experiences. Their enterprise and ingenuity will find new paths; they will find problems which call for solutions even more swift than they are accustomed to apply. Probably some of our problems, now familiar to us, will not be presented: the Zeppelin will not call for an adaptation of the telephone service such as that which we had to discover. But when the time comes for a correlation of telegraph and telephone experiences there will be interesting ventures to disclose. If it should happen that under the Stars and Stripes something of the nature of a signal company should come to our shores, we promise it a welcome which will be a real and present evidence of the sense of fellowship which always has existed and which the present grim tragedy has strengthened and deepened.

HIC ET UBIQUE.

WE congratulate Mr. James Bailey on his appointment as Deputy-Controller of the Central Telegraph Office. Mr. A. W. Edwards becomes Senior Assistant Controller and Mr. T. Mackenzie is promoted to be Assistant Controller.

NOT long since we published an editorial dealing with the nomenclature of telephone exchanges. Liscard must now be added to those exchanges which have changed their name but not their local habitation. It is now appropriately known as Wallasey, the name of the borough within which it is situate.

OCCASIONALLY, perhaps once a fortnight, the editorial telephone bell rings, and a voice—almost always a lady's—asks: "Are you the Telegraph?" We reply modestly enough that we are THE TELEGRAPH AND TELEPHONE JOURNAL, but unperturbed by this confession the lady usually asks if we will insert an advertisement relative to servants, flats, births, deaths, marriages or what not. Hardened by experience we suggest that the *Daily Telegraph* may be the organ required and that the required telephone number will be found in the directory under the letter D. We wonder if such correspondents would confuse the *Christian Herald* with *The Herald*, or the *Sporting Times* with the *Thunderer*!

THE *Logansport Pharos Reporter* referring to an advertisement for "Bright young lady handy at talking by telephone" says:

"Ought not be any trouble these days in finding just the right person for a job like that. When sister isn't doing her fancy work and the heavy work on the piano in the parlour, she is practising on the proper way to talk over the telephone. The result of her telephone practice especially is that she has become extremely 'handy' at the hello machine. She has become so 'handy' with the talk box that she can order ma to go to the furnace room and stoke the fire with one hand, and say, 'Now, George, you're just too mean,' with the other, and never miss a stroke. Saturday we saw her kick the cat clear across the room while she was standing at the 'phone engaged in a telephone marathon with the guy she calls her 'steady' and never for an instant did the seraphic accent depart from her superbly modulated voice. Sis is all right when it comes to being 'handy' with the 'phone and she ought to have the job."

Strange are the little differences between ourselves and our American cousins to be observed in this short paragraph. We don't refer to sweethearts as "steadies" in this country, to young men generically as "guys," nor to young women as "sis." We don't stoke furnaces in private houses because we don't possess them, and, we must add with regret, the telephone is not as common as the piano in middle-class homes.

PROBLEMS IN THE DESIGN AND EQUIPMENT OF A MODERN CENTRAL TELEGRAPH-CABLE STATION.

BY A. E. POWELL.

THE acquisition of the cables of the Anglo-American and Direct United States Companies by the Western Union Telegraph Company in 1911 brought under one control three complete telegraph and cable organisations, each with its executive and operating staffs, cable stations, branch offices and terminal operating rooms.

The necessity of concentrating these facilities being evident, a study was made of the cable system as a whole in order that the best use might be made of the plant and staff at the disposal of the company.

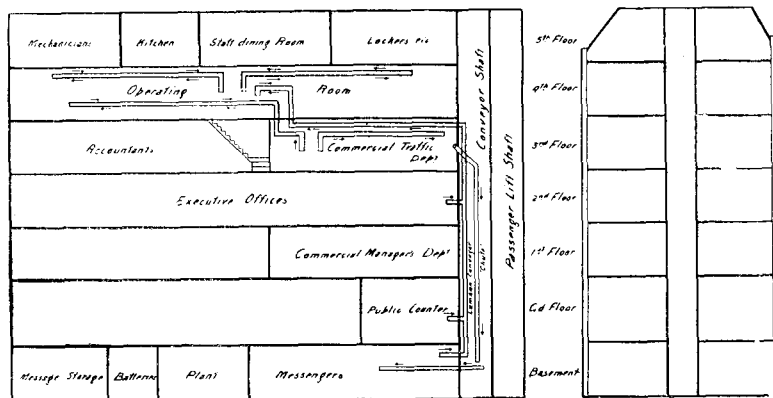
Concentration of the London Offices was held up for several years, but the introduction in 1912 of the deferred and cable letter cheap services, greatly increased the traffic load carried by the company's cables, and it became more and more evident that to distribute these loads efficiently over the three cable divisions, some method for quick interchange of traffic was necessary, especially on occasions when the filings were abnormally heavy on one or other of the divisions or weather troubles hampered the landline outlets.

As it had been decided that all departments were to be housed in the same building, steps were taken to ascertain the amount of space each department would require, and a study of these requirements gave a total of 20,000 square feet, of which the operating traffic space had to be on one unbroken floor with ample room and unobstructed natural lighting. It was further desirable that this space should allow the lay-out of the "Ideal" operating room which, it was assumed, should approximate to the form of a wheel in which the hub would represent the supervision, checking and service portion, and the spokes the operating tables: thus cutting down the handling of messages or services through their various stages to a minimum average distance.

The total space and other requirements having been agreed on, the first problem encountered was where such premises should be situated. Figures provided by the Commercial department showed that the source of the large majority of our traffic lay within the City area inside which it was necessary to maintain a big staff of messengers to afford rapid pick-up and delivery of messages (a vital point in a competitive business) and it was assumed that the Royal Exchange represented roughly the centre of this telegraph business area. The assumption of this centre was based solely on experience and it was thought advisable to try and confirm this by actual figures, since it was desirable that the building should be placed at the shortest mean distance from the various areas within which our largest customers lay. The plan adopted to locate this position was to lay out on the 25-inch, large scale Ordnance map of the City, a circle with a radius of half a mile, having the Royal Exchange as its centre and to divide out the area so enclosed into squares with sides of 140 yards. This ruled map was then handed to the canvassing department to make out a list of all known customers lying within each square, together with the value of their accounts. These values having been obtained the totals were marked into their respective squares and the portion of the map lying within the circle was then treated as a plane surface loaded with various masses and its centre of gravity calculated in the usual manner. This centre of gravity (or really centre of mean business distance), was found to lie in Threadneedle Street, within three hundred yards of the Royal Exchange and showed fairly conclusively the accuracy of the estimate based on experience.

The problem then became one of finding suitable premises with approximately 20,000 square feet of floor area, and well-lit floors on or near the theoretical centre already calculated. After several months a seven-story building in course of construction was found in Great Winchester Street, actually 240 yards from the ideal centre, but as near to it as circumstances permitted. The narrow form of this building was not ideal but the lighting was good both back and front, and it had at least five floors of 4,000 square feet each. The architect's plans showed a central stairway and lift shaft which would have cut up these areas badly but the building was not too far advanced to have this altered and moved to the Western end; thus giving the clear floor spaces required.

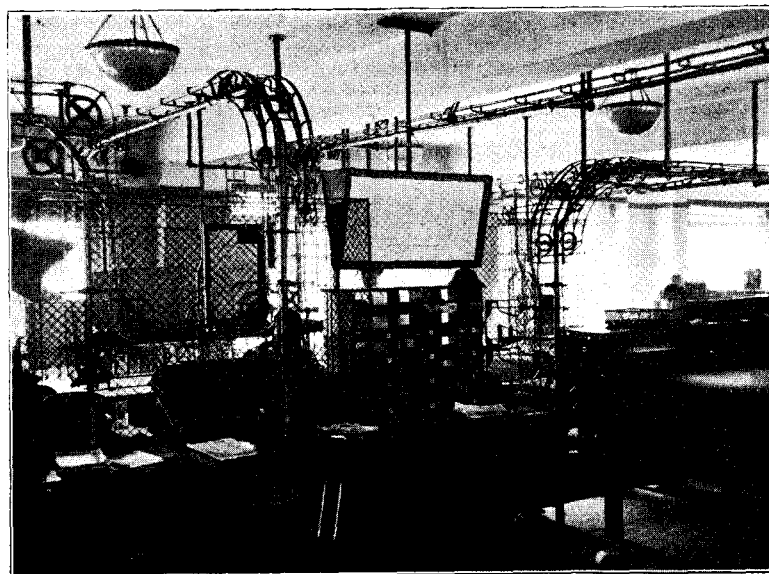
Under the company's scheme of organisation the handling of the actual telegraphic business is divided into two controls or departments—first, the traffic manager's department which is responsible for the operating of all cable stations and such landline stations as work directly into these cable stations. Secondly, the commercial manager's department which is responsible for the operating of provincial wires, City branch offices, and all functions that entail dealings with the public. This line of demarcation means that the traffic management receives all cable messages at its operating rooms in London and Liverpool, transferring printed, typed or written copies of these messages to the commercial management, who "unpack" code addresses, envelope and deliver these messages to the public or other telegraph administrations by tube, wire or our own messenger service. In the other direction the commercial management takes in all counter messages from its customers and receives messages from other telegraph administrations sent to it by tube and messenger.



Plan 'A' Vertical section of Building.

These two departments between them required a large space for their accommodation and had it been possible it would have been best to have placed them adjacent to each other on the same level to facilitate quick message interchange and reference. The traffic department's requirement for their operating room, however, being approximately 4,000 square feet, it was impossible to place the "traffic" operating room on the fourth floor and to divide the commercial department floor space into several portions, the portion which required close contact with the traffic being placed immediately below it on the third floor and the public counter and message delivery portions on the ground floor and basement, which were their most suitable locations: the spreading out of the commercial and traffic departments in this manner necessitated some system of message conveying to link them up and the three most usual methods—namely, belts, pneumatic tubes and track conveyors were considered.

Belts appeared to be the ideal method having the advantage of continuous "pick-up" and "delivery," but the number and length of the vertical runs together with the problem of selected drop-off positions rather put the system out of court. Tubes had the merit of simplicity and



LAMSON DISTRIBUTING CENTRE IN "RING."

reliability but as the runs from a tube standpoint were short, the load continuous and messages often filed in large bundles, it was decided that the labour and loss of time entailed in folding, unpacking and unfolding messages from carriers, together with the inevitable untidiness and possible damage to the message during these processes rendered tubes unsuitable for the purpose, leaving only track conveyors to be considered.

Experience with the "Lamson" track conveyors installed in our Central Cable Office in New York in 1911, had proved them to be satisfactory for the conveyance of un-enveloped messages, and the system had the peculiar advantages that on the one continuous line of track several pick-up and drop-off positions could be installed; also that individual cars could be arranged to "pick-up" and "drop-off" messages between any selected pair of stations. This faculty rendered this system particularly suitable for our purpose, and it was decided that it should be adopted.

The Lamson system having been decided on, it was necessary to consider the "run" positions, where they passed between the various floors and it

became evident that it would be advantageous to provide a special shaft vertically through the building for this purpose; even at the expense of extra length of conveyor instead of going through the various floors as positions dictated. It was, therefore, decided to make a shaft of sufficient size to afford working room throughout its length with means of access at every floor and in it to place the conveyor track and all telegraph, telephone, battery and power cables together with any outside pneumatic tubes, providing in addition sufficient room for future developments.

The obvious position for such a shaft was to follow the run of the passenger lift and the building plans permitting it, the lift shaft was built of double width, separated throughout its length into two shafts, one accom-

Basement.—Messenger accommodation with counter for the delivery and reception of messages, plant and battery rooms, back date message storeroom.

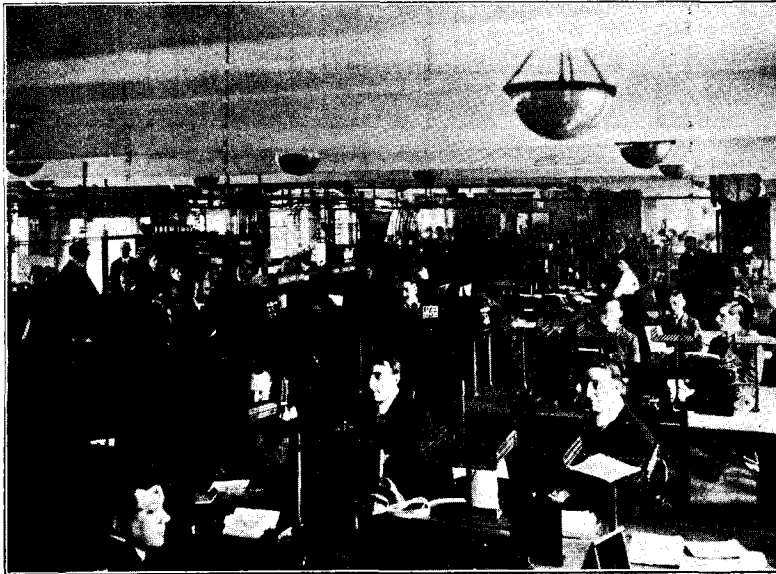
Ground Floor.—Public counter.

First Floor.—Counter for payment of telegraph money orders, European commercial manager with general office, canvassers, &c.

Second Floor.—Executive offices.

Third Floor.—Commercial traffic department, accounts and abstract department.

Fourth Floor.—Traffic operating room, and private branch telephone exchange.



TRAFFIC OPERATING ROOM (FOURTH FLOOR).

modating the passenger lift and the other the conveyor track, cables, tubes, &c. Doors were provided at each floor opening on to light iron gangways, thrown across the shaft—thus giving a clear view and access to all plant within. The conduits connecting with the Power room in basement, the Post Office telegraph and telephone cables, all bell, fire alarm and electric clock wiring, the school wiring system on the second floor, the pneumatic tubes and signalling wires on third floor and the end of the floor duct system running



BRANCH WIRES, CONCENTRATION BOARD AND CIRCUITS.

Fifth Floor.—Men's locker room, staff dining-room, kitchen and mechanic's shop.

After these assignments had been made plans were prepared for the various floors of which only the basement, and third and fourth floors have any interest from an equipment point of view. The lay-out of the fourth floor operating room will be taken first. (Plan B.) This called for operating accommodation for seven main Wheatstone wires to the cable stations at Valentia, Penzance and Ballinskelligs; three Hughes wires to the Continent, two duplex repeater boards, thirty-six Morse wires to the branch offices, Stock Exchange, &c., and check, service and filing accommodation suitable for handling all classes of traffic over three separate cable divisions.

Several problems appeared when considering this lay-out. Firstly, the transition state of multiplex printing telegraphy then coming into use on our lines in America, trials of which had shown it to be undoubtedly the system of the future, and it was necessary therefore when preparing the lay-out to keep this development well in view; without making any radical departure from the normal Wheatstone methods of working that would cause trouble during the process of "change-over" with its amalgamation of staffs and methods. This problem was treated by designing the floor lay-out as for multiplex working basing the installation on the use of standard Western Union multiplex table units and it was found that the space that would be eventually occupied by each set would amply accommodate the provisional duplex Wheatstone tables.

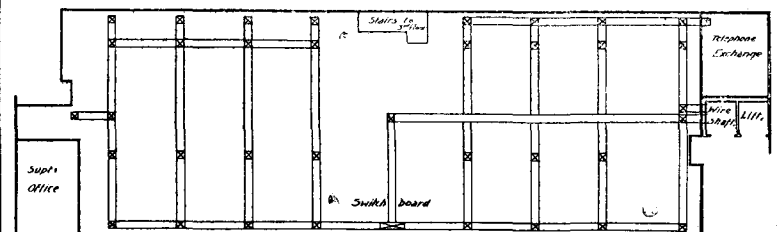
Secondly, the shape and length of the floor and the difficulty of obtaining boy messenger labour demonstrated the necessity of feeding and collecting traffic from the operating tables by means of conveyors; also that these conveyors should be installed in positions that would be permanent, while permitting changes in the position or shape of the operating tables. This problem was solved by arranging the Wheatstone tables in groups of two, back to back, feeding them from a detached conveyor situated at the end of each group. These Wheatstone tables occupy the same positions and space as the future multiplex sets and it will be possible to instal the latter



WHEATSTONE TABLES. TRAFFIC OPERATING ROOM (FOURTH FLOOR).

under the fourth floor operating room, all connect with this shaft. It thus forms a valuable means of establishing any future form of inter-connexion between departments, with a minimum of cost or disturbance.

The relative situation of the traffic and commercial departments having been more or less decided by their inter-communication necessities, the rest of the building was assigned as shown in the vertical section and plan and the natural grouping of the departments concerned, against the conveyor shaft will be readily noticed.



Plan H Wire Duct Layout on 4th Floor.

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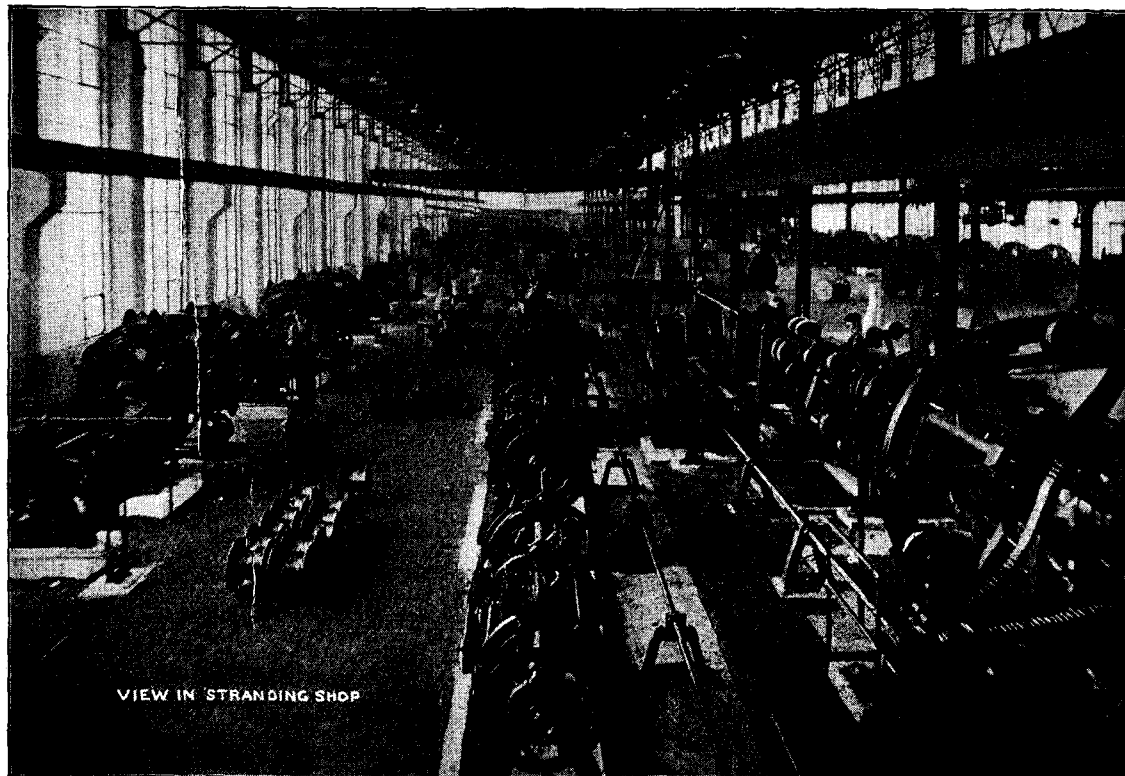
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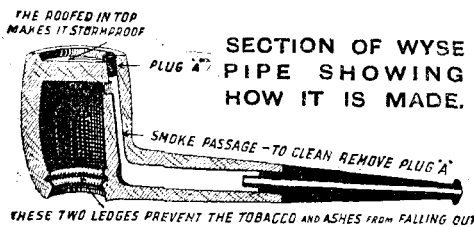
out here, because every man Jack of us is out in all weathers—cigarettes are impossible, but your pipe enables us to still enjoy our smoke."

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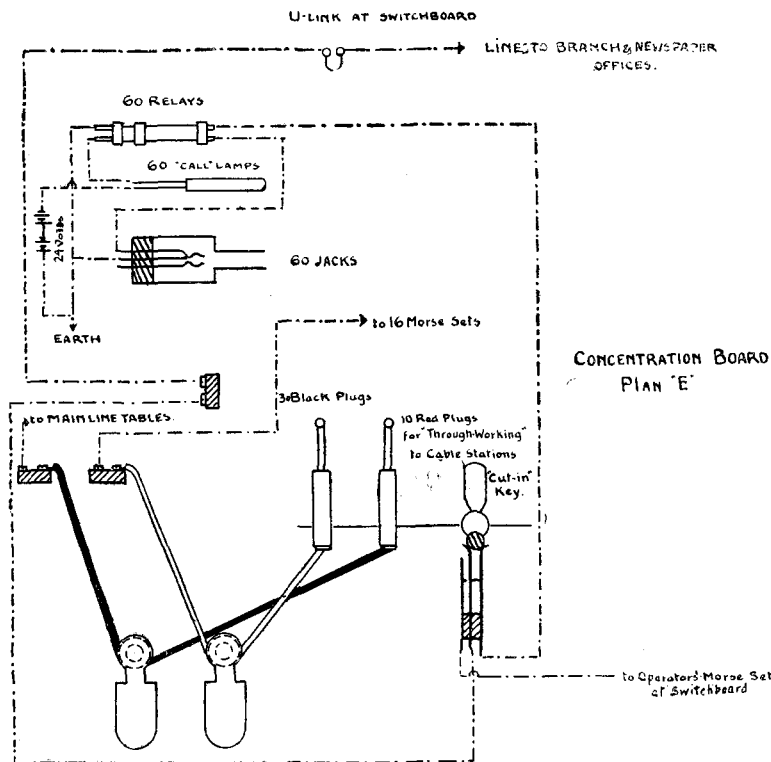
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one by one as traffic permits, without alteration in gangway space or interference with conveyors.

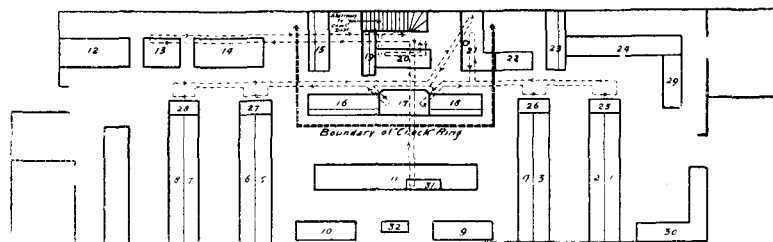
Thirdly, that it should be possible to make any change required in future table lay-outs with a minimum of disturbance to the working of the office and without altering the floor wiring or rearranging the lighting system. This problem was treated as shown in Plan H by arranging the under floor wire ducts in a grid formation with frequent outlet boxes to allow subsequent rearrangement of tables either lengthwise or athwart the room. Each Wheatstone table has been wired as a self-contained unit with its own fuse distribution box and is fed with the few necessary wires—namely, "lines," "earths," main and local batteries, and 110 volt power supply from these under floor wire ducts. These wires can be readily transferred to the table fuse distribution box of multiplex or other future sets without other alteration when changes have to be made. The semi-indirect system of lighting installed giving standard illumination over the floor will cover any re-arrangement of tables: the scale of illumination is one watt per square foot of floor surface.



The number of branch office wires brought in by the amalgamation of the three offices precluded the former system of having a permanent receiving set to each wire and a special concentration board based on telephone practice was designed for this purpose. Plan "E." It has the advantage of a visible "call" in circuit while working, a simple quick connexion system to the receiving instruments: also, a second set of plug cords for putting any branch wire through to any main line operating table for "working through" to the cable stations whenever after-war conditions permit. A row of switch keys is provided by means of which the switchboard operator can cut in or take any call on the local receiving set.

The remainder of the telegraph plant in the operating room generally follows standard methods. All lines, sending and local battery wires and 110 volt power leads are brought on to a central switchboard containing on its upper portion the usual Post Office form of link switch line connexion board, with the customary millimeter and voltmeter, and in the lower half, main switches and fuses for the battery and power supplies with distribution fuses to the subsidiary boards at the various tables. This system was adopted in preference to standard practice to reduce the amount of under floor wiring and simplify the locating and replacing of the blown fuses in circuits remote from the central switchboard. The 110 volt power supply is run to all tables connecting into a series of covered plug sockets so that Kleinschmidt perforators may be worked at any circuit as required. Spare "line" wires are run from this board to the mechanician's shop, laboratory and training school.

Two sets of "Creed" printers have been recently installed and are arranged as "floating" sets, they can be operated from any one of the Wheatstone sets which for this purpose have been fitted with receiving relays. Additional wires from those relay tongues are carried to the main switchboard and can be linked through to either of the "Creed" sets as required. This arrangement has proved a convenient one especially when wires are working badly, as the printers can be readily changed over to any Wheatstone sets the landlines of which at the moment are working best. Plan B shows the actual lay-out.



Plan B Lay-out of Traffic Operating Floor
Detailed (see above Lamson's sets)

- | | | |
|--------------------|-----|---|
| Nos. 1—8... | ... | Wheatstone tables working to the cable stations. |
| .. 9 & 10 | ... | Repeater tables. |
| .. 11 | ... | Hughes sets on the Continental wires and spare Wheatstone set. |
| .. 13 | ... | Branch lines concentration board, branch check and Lamson "pick-up" and "drop-off." |
| .. 12 & 14 | ... | Branch line operating sets. |
| .. 15 | ... | Westward check and filing table. |
| .. 16 | ... | Service table. |
| .. 17 | ... | Circuit numbering table and Lamson message feed position to all main line tables. |
| .. 18 | ... | "Rush" check table. |
| .. 19 | ... | Message sorting table. |
| .. 20 | ... | Assembly table and Lamson "drop-off" for all traffic from basement, ground floor, third floor, branch and Continental tables. |
| .. 21 | ... | Lamson "drop-off" for all messages collected from main line tables and "chute" to distribution table on third floor. |
| .. 22 & 23 | ... | Eastward check and filing tables. |
| .. 24 | ... | Typing-up table from Wheatstone slip copies. |
| .. 25, 26, 27 & 28 | ... | Lamson "pick-up" and "drop-off" positions. |
| .. 29 | ... | Copiers. |
| .. 30 | ... | Creed printer outfits. |
| .. 31 | ... | Lamson "pick-up" and "drop-off" positions for feeding Continental circuits. |
| .. 32 | ... | The central switchboard. |

It will be observed that although the ideal wheel form of operating room could not be attained, effort was made to produce similar advantages by concentrating all the "numbering," "servicing," and "filing" work within a "ring," and radiating the operating tables as far as was practicable from this ring. Actual constant distance for message feeding was impossible but this is in reality obtained by the installation of the Lamson conveyors feeding all the tables from a fixed point in the ring and vice versa returning all messages to the ring. This "check" ring is in close contact with the commercial traffic department on the floor below by a direct stairway in addition to the conveyors and "shoot," so that it may be said to enclose the commercial traffic within its borders.

In practice this lay-out has worked well. Table 24 is an excrescence necessitated by our present transition stage between Wheatstone working and Multiplex printing. The expediency of issuing to the public "typed-up" messages in preference to varying styles of handwritten copies has made this link necessary, but the advent of multiplex printing will sweep this away.

Table 29 should also disappear with the Western Union multiplex type-bar printers which give good carbon copies.

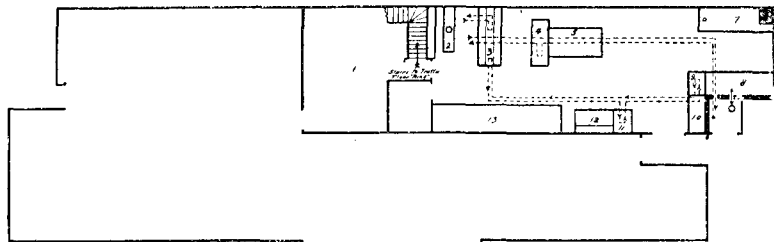
Table 7 is equipped with a separate duplex cable set for direct working between New York and London, and cable signals generated in New York are received here after passing through relaying combinations at Hammels, Bay Roberts and Penzance. The longest cable link of this series is 2.72 KR, and a speed of 187 letters per minute is maintained. This speed has recently been increased experimentally to 220 letters per minute and it is hoped will still go higher. This development is only another instance of the present transition state of telegraphy, making it difficult to design an office lay-out with any idea of finality.

The "Synchronome" system of electric clocks is installed throughout the building and electric "time and dating" stamps worked from this circuit have recently been installed. They are at present used to check "times" between departments but it is expected to extend their use shortly in other directions.

The lay-out of the commercial traffic room on the third floor called for accommodation for:—

- Three pneumatic tubes.
- Filing cabinets containing registered addresses.
- Services.
- Dealing with incoming and outgoing mailed cable letter traffic.
- Enveloping and addressing messages.
- Distribution of work as received from the traffic department.
- Delivery of messages to, or reception of messages from the public by telephone.

Conveyor facilities to transfer messages to the traffic floor.
 Conveyor facilities to transfer messages round own floor.
 Conveyor facilities to transfer messages to the branch office and Continental circuits.
 Also, a means of sending addressed and enveloped messages to the basement counter for delivery to the public or other administrations.



Plan "C" Layout of Commercial Traffic Floor

- 1 Back date message filing room.
- 2 Assembly table for eastward traffic received by "chute" from fourth floor.
- 3 Distribution table with Lamson "pick-up" positions feeding Continental and branch office tables on fourth floor and tubes and addressing tables on own floor.
- 4 Lamson "pick-up" feeding fourth floor.
- 5 Mailed cable letter traffic.
- 6 Delivery and reception of messages by telephone.
- 7 Service table.
- 8 Addressing and enveloping section with gravity chute to basement.
- 9 Lamson "drop-off" from distribution table.
- 10 Portion of addressing table.
- 11 Lamson "drop-off" from distribution table.
- 12 Pneumatic tubes to and from Central Telegraph Office and our Royal Exchange collecting office.
- 13 "Unpack" table for code addresses.

Plan "C" shows the lay-out adopted. No particular problems cropped up during the course of this design.

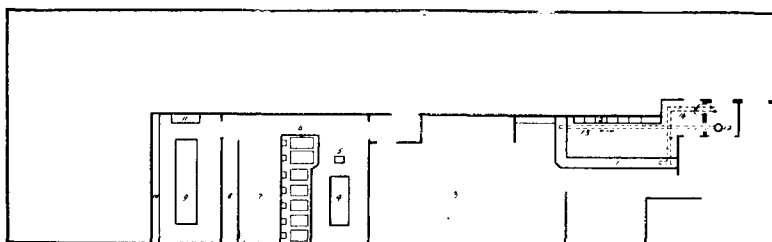
The training school lay-out on the second floor has not been completed as the room is at present otherwise occupied, but a Lamson "pick-up" point from the main Lamson run has been temporarily led into it to convey messages to the third floor.

The Basement lay-out called for:—

- A counter with facilities for transferring messages to the traffic floor and receiving completed enveloped messages from the third floor.
- Telephones for receiving calls from customers for messenger pick-up service.
- Messenger waiting room accommodation.
- Plant and Battery rooms.

Plan "D" shows the lay-out adopted: the main Lamson conveyor running through the building to the fourth floor gives the necessary message "pick-up" facilities and the "shoot" running down the conveyor shaft brings enveloped messages dropped from the third floor on to a belt running from the foot of this "shoot" to the end of the counter where it drops them off into a wire cage. A row of seven telephones is placed against the wall behind the counter and "calls" are dealt with immediately by the messenger department.

The space beyond is fitted up for the boys on duty with suitable tables, forms, lockers, &c.



Plan "D" Messenger Dept. Plant & Battery Rooms.

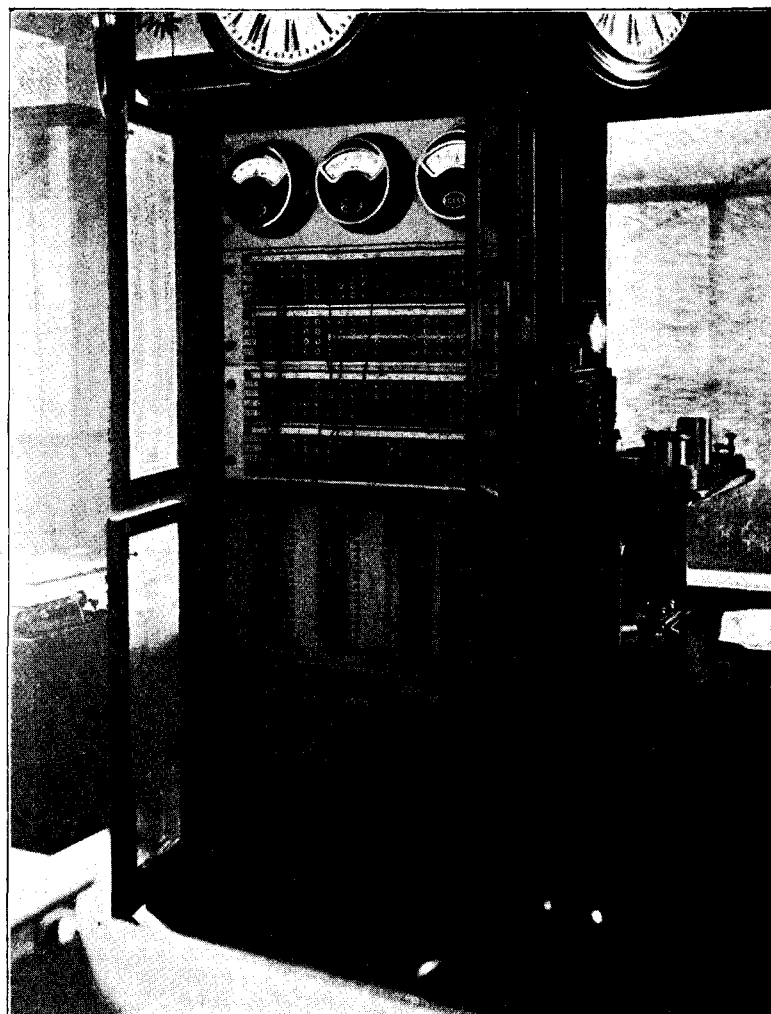
Plan D shows the actual lay-out:—

- 1 Counter containing Lamson "pick-up" for messages for operating floor and belt "drop-off" for enveloped messages from commercial traffic department on the third floor.
- 2 Messenger call telephones.
- 3 Messenger waiting room.
- 4 Motor blower for Royal Exchange tube,

- 5 Automatic starting switch for same.
- 6 Motor generator bank.
- 7 Plant room.
- 8 Switchboard.
- 9 Line and power batteries.
- 10 Local batteries.
- 11 Bell clock and fire alarm batteries.
- 12 End of "shoot" from third floor.
- 13 Belt taking messages from "shoot."
- 14 Lamson conveyor to fourth floor.

Plant and Battery Rooms.—In view of war conditions with possible partial interruptions to public electric power supplies it was decided to divide the lighting of the building between two supply companies. In the portions of the building where work has to be carried on throughout the 24 hours these supplies feed alternate lamps and in the remaining portions alternate bays; the semi-direct system of lighting has been adopted throughout.

All services of electric power, light, telegraph and telephone cables enter the building at the plant room, the meters, main switches and circuit fuses being installed therein. All motors within the building are run from the 415 volt supply across the "outers of the lighting mains," and advantage was taken of the two sources of power to instal a change-over switch and thus provide an alternative source of power in the event of failure of either company's supply.



CENTRAL TELEGRAPH SWITCHBOARD.

The motor plant in the plant room consists of:—

Two 50-ampere motor generators for the supply of 110 volt direct current for the Multiplex, Kleinschmidt perforators and other apparatus, the public companies being unable to provide D.C. current at this voltage.

Three small motor generators (one as spare) for the main telegraph "line" currents.

Two motor generators (one as spare) for charging the 24 volt local batteries, one machine has inter-pole windings to give any required voltage for "boosting" purposes.

One motor blower set for the air supply to the pneumatic tube from the Royal Exchange collecting office.

PARTICULARS OF CONVEYOR SYSTEM.

No. of route.	No. of cars per route.	Length of double track.	Time in seconds to complete circuit.	Speed in feet per minute.	No. of "P.U." stations.	No. of "D.O." stations.	Watts consumed in motor drive.	REMARKS.
1	9	148 feet	112	160	5	3	200	
2	6	63 feet	50	150	4	3	150	
3	6	82 feet	73	135	4	3	150	
4	4	106 feet	103	125	4	4	180	
5	2	55 feet	40	165	2	2	350	Bad run, many bends and angles.

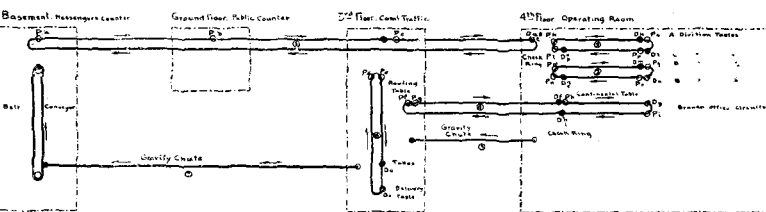
The motor generators are arranged side by side on a long heavy concrete bed raised eighteen inches above the floor level which absorbs all vibration and noise, an important point for the comfort of the inhabitants of the building. Mounted on the concrete bed at the motor end of each machine are iron-clad pillars containing each motor's starting gear. This arrangement confines the 415 volt supply to one side of the motor generator bank and separates the high voltage current entirely from the main switchboard, on which is mounted the panels containing the dynamo switches, regulators, battery charging switches, rheostats, and controlling switches for the various supplies to the operating floor.

The automatic starting and regulating switches of the motor blower set are also arranged on an independent ironclad pillar placed at the end of its set. It is controlled by "push" button from the tube table on the commercial traffic floor.

A special bed constructed as follows was provided to obviate the vibration and noise of the motor blower set:

The foundation was dug out 3 feet below the floor level and filled in with 12 inches of concrete, on this was placed 12 inches of compressed cork slab and above this again was built a concrete raft 12 inches thick tied together with light rails, clearing the sides of the excavation by about 4 inches. This construction localised the vibration very efficiently but the blower still proving noisy, it was covered in with a double-skin wooden casing packed with cork and the suction and pressure pipes joined up with leather sleeves. This cleared all trouble and the set cannot now be heard outside the plant room.

The battery plant consists of four sets of twelve 140 ampere-hour cells for the telegraph "locals" and branch "line" circuits, two sets of twelve 40 ampere-hour cells for the bells, fire alarms and clocks, and two sets of sixty 100 ampere-hour cells which are arranged to be used either as a main line telegraph battery or as a stand-by for the 110 volt supply by cutting off "end" cells. This latter battery is charged from one of the 110 volt motor generators in sets of 30 cells.



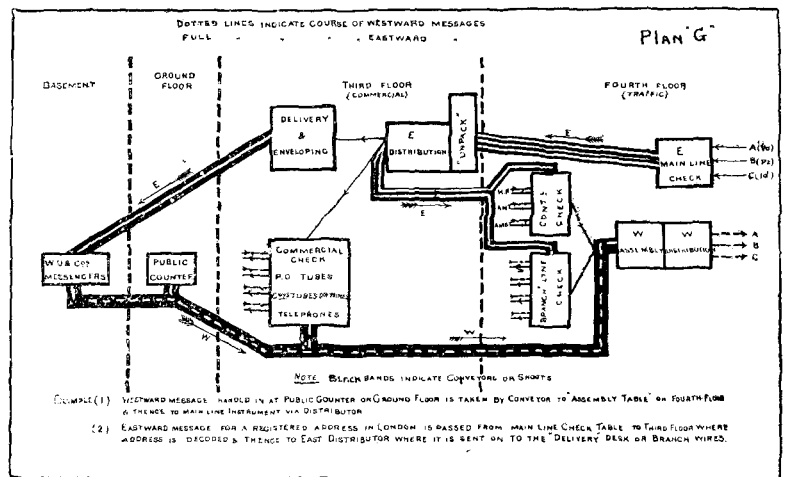
PLAN F CONVEYOR & CHUTE SYSTEM
 THIS P indicates a "pick-up" station, D a "delivery" station. The small letters indicate connecting stations. This is a message picked up at "P" and delivered at "D."

Conveyors and Shoots.—Plan F shows in diagram form the scheme of the various conveyors and shoots throughout the building, and details of each set which may be of interest are given in the schedule above.

Trouble was experienced in early days by catching cars, breaking cords, failures to drop or pick up messages and dropping of messages from cars. The first troubles were cured by reducing the speeds of running from 250 feet per minute to 160 feet per minute, and the dropping of messages disappeared on giving special attention to any cars which had been strained by catching and instructing the staff to fold and place the messages properly in their stages.

It is estimated that these conveyors are doing the work of 30 boys and that the sum saved in wages should pay off the cost of installation in under

two years, but the largest gain lies in the regular and continuous distribution and collection of work without the mistakes and delays that boy labour inevitably produces.



NOTE: BLEND BRANDS INDICATE CONVEYORS OR SHOOTS
 EXAMPLE (1) WESTWARD MESSAGE HANDLED IN AT PUBLIC COUNTER ON GROUND FLOOR IS TAKEN BY CONVEYOR TO ASSEMBLY TABLE ON FOURTH FLOOR & THENCE TO MAIN LINE INSTRUMENT VIA DISTRIBUTOR
 (2) EASTWARD MESSAGE FOR A REGISTERED ADDRESS IN LONDON IS PASSED FROM MAIN LINE CHECK TABLE TO THIRD FLOOR WHERE ADDRESS IS "DISCODED" & THENCE TO EAST DISTRIBUTOR WHERE IT IS SENT ON TO THE "DELIVERY" DESK OR BRANCH WIRES.

Plan "G" shows in diagram form the complete circulation of all classes of traffic throughout the building.

RETIREMENT OF MR. V. M. DUNFORD, DEPUTY-CONTROLLER, C.T.O.

The many friends of Mr. V. M. Dunford will regret to learn that in consequence of ill-health it has become necessary for him to retire. Mr. Dunford spent the whole of his official life at the C.T.O., receiving his first appointment there as Telegraphist on Oct. 15, 1881. He was promoted to be Senior Telegraphist in 1892, but on the formation of the Controller's personal staff in 1894 was nominated to a position thereon. He passed through the various grades of that staff ultimately reverting to the instrument rooms as Superintendent in 1910. Shortly afterwards he became Assistant Controller and about four years ago was promoted to the position of Deputy Controller.

Mr. Dunford is a man of marked ability and powers of organisation, and these characteristics, combined with the large experience gained on both the administrative and practical sides of the office, enabled him to fill his position with distinction. The war added very materially to Mr. Dunford's duties and in connexion therewith it may be mentioned that he has had to travel considerably, sometimes visiting remote corners of the kingdom. It is not too much to say that the extra demands made on him in this direction have told on a physique never too robust.

It is however not only in official circles that Mr. Dunford is well known. He has for many years been an active worker in religious and social circles, and as hon. secretary of the Catholic Association organised successfully numerous large tours to various parts of the Continent. He is himself an experienced Continental traveller and there are very many who owe to him their first experiences of life across the Channel.

Mr. Dunford has the best wishes of those he has left behind who, whilst keenly regretting that he has not been able to complete the full period of service, hope that his health will be restored and that he will be able to enjoy the rest to which he is so well entitled.

PERSONALIA.

LONDON TRAFFIC STAFF.

Miss A. PRITCHARD, a Telephonist of Briston Exchange, has resigned on account of marriage and was presented with an electro-plated sweet dish by her colleagues.

Miss M. A. MELHUSH, of Kensington Exchange, has resigned on account of marriage.

Miss GLADYS A. BENFIELD, of the Trunk Exchange, has resigned to be married and was presented by her colleagues with cutlery and other useful presents.

Miss HOPE M. K. SMITH, of Trunk Exchange, has resigned on account of marriage and was presented by her colleagues with cutlery and other useful presents.

Miss L. L. PERCIVAL, of Paddington Exchange, has resigned to be married.

Miss A. A. GLOVER, of Paddington Exchange, has resigned on account of marriage.

Miss DOROTHY ISABEL GILDERS, of East Exchange, has resigned in view of her approaching marriage and was presented by her colleagues with a silver and glass *epergne* and other gifts.

Transfer—

Miss W. A. BARBER, an Assistant Supervisor, Class II, of Harrow Exchange, having been transferred to Hampstead Exchange, was presented by the staff with a case of silver teaspoons and marmalade jar.

PROVINCIAL STAFF.

On the occasion of the transfer of Mr. W. E. GAUNTLETT, District Manager, Swansea, to the Gloucester District, he was presented by Mr. W. H. Crook (Chief Clerk) on behalf of the staff with a handsome gold watch, suitably inscribed, as a token of the respect and esteem in which he was held during the eleven years he had spent in the district.

Messrs. Stanley A. Young (Contract Manager) and A. G. Bristow (Traffic Superintendent) were also present and expressed, on behalf of their respective departments, regret at his departure.

Miss E. F. MILLER, Telephonist, Cambridge Local Exchange, who had resigned to be married to Mr. Hind, a Sapper in the Royal Exchange, now in Mesopotamia, has returned to her former position and was presented by the exchange staff with a clock and other personal gifts from her colleagues.

THE RETIREMENT OF MR. C. ELLIOTT.

Mr. C. Elliott, District Manager of the Gloucester District, retired from the Service on March 31, and on that date a most interesting and gratifying function was held at the Gloucester Post Office for the purpose of making a number of presentations. These included a silver-plated tea and coffee service from the District Manager's staff and the operating staff; a gold hunter watch from the Surveying Department, District Manager, Engineers and friends in London; an antique Russian copper tobacco jar and a case of pipes from the Postmasters of Cheltenham, Evesham, Gloucester, Ledbury, Leominster, Ludlow, Ross, Stroud, Tenbury Wells, and Worcester.

Mr. T. R. Ling, Surveyor, South Wales District, took the chair, and among those present were Mr. L. Harvey Lowe, Deputy Chief Inspector of Telegraph and Telephone Traffic, Mr. R. F. Bradford, Assistant Surveyor; Mr. Mellroy, Superintending Engineer; Mr. Waite, District Manager, Cardiff; the Postmasters of Cheltenham, Gloucester, Stroud, Leominster and Worcester.

Mr. Ling made special reference to the happy relations which had always subsisted between Mr. Elliott and the Postmasters of the district, emphasising the difficulties in which District Managers were placed and the tact with which Mr. Elliott had faced those difficulties.

Mr. Harvey Lowe expressed his pleasure at being present and, in representing Headquarters, stated the high estimation in which Mr. Elliott was held. He had known him for many years, both in the National Telephone Company and in the Post Office, and he knew the high conscientiousness with which he carried out his duties and the unflinching courtesy which characterised all his relations with his fellows. He made the presentation on behalf of the district staff with every good wish for Mr. Elliott's future.

Mr. Waite, also an old friend of Mr. Elliott's, made the presentation on behalf of the Surveyor, Assistant Surveyors, Engineers and District Managers. Mr. Madden, the Postmaster of Gloucester, made the presentation on behalf of the Postmasters, and laid stress on the vast changes which had followed the transfer of the telephones and on the happy way in which Mr. Elliott had made friends in the Post Office Service. Mr. Freeling, the Postmaster of Cheltenham, associated himself with Mr. Madden, and Mr. Elliott replied feelingly, including in his speech some happy reminiscences.

It was a notable and significant gathering, and one of which Mr. Elliott has every reason to be proud. Not the least impressive feature was its revelation of the spirit of kindly good fellowship which permeates the South Wales District.



	Fairies		Godmother		Fairies	
D. French.	A. Deller.	J. Tuddenham.	A. Davies.	G. Oxley.	E. Dalloway.	M. Clayton.
Courtier	Ugly Sister	Cinderella.	Prince Charming	Ugly Sister	Courtier	
M. Croft.	G. Hussey.	E. Furlwangler.	R. Stokes.	A. Price.	M. Girling.	
	Columbine		Kitten		Pierrot.	Herald.
	E. Atkinson.		K. Deller.		G. Etheredge.	G. Knightley.

ANNUAL TEA AND ENTERTAINMENT TO POOR CHILDREN AT PADDINGTON.

On Feb. 10 the staff of the Paddington Exchange gave their seventh annual tea and entertainment to the poor children of the district. As in former years about 350 children partook of a tea, still substantial though modified to some extent by the prevailing war conditions, and then were entertained by the production of "Cinderella" to their huge delight. The play was interspersed with many songs—in the latest popular favour—and it is difficult to say whether the children, the performers, or the grown-up guests and helpers enjoyed it most. The children certainly gave most exuberant signs of enjoyment, and if the performers were not pleased and stimulated by the increasing applause, they must be hard to please and stimulate. If the "grown-ups" were not pleased, well then they were . . . shall we say able exponents of the art of dissimulation! It was particularly gratifying to have Headquarters so well represented, and these ladies and gentlemen who sacrificed their time to this end may rest assured that their presence meant encouragement, in what we trust may be considered a useful and patriotic work. A photograph of the cast is shown.

ENTERTAINMENT TO WOUNDED SOLDIERS AT LEE GREEN.

For the second time this year, the girls of the day staff at Lee Telephone Exchange played the part of hostesses to 25 wounded soldiers. The entertainment consisted of a whist drive in the afternoon, a high tea at which the fare included sandwiches and sausage rolls, cakes and pastries—made by the girls—and a short concert. The soldiers all came from the Lewisham Military Hospital, and just before their return at 7 p.m., Sergeant Kenny expressed the gratitude of the "boys," and called for three cheers for their hosts. The staff committee making the arrangements consisted of the Misses Johnson (supervisor-in-charge), Stevens, Fuller and Tolley. In all, about 80 were present at the party, including Mr. Alstrom, engineer at the exchange, who filled the role of M.C. Miss Taylor was at the pianoforte. Songs, &c., was contributed by the Misses Somerville, D. Wallis, R. Davies, L. Stokes, Messrs. D. Walker and Ling, Sergeant Longstaff and Lance-Corporal Sherbourne. Whist prizes were provided for all the guests. They embraced an electric torch, pocket books, wallets, cigarettes, and pipes. When the men went back to the hospital, a couple of tins full of good things went with them.

EDINBURGH TELEPHONISTS' ENTERTAINMENT TO WOUNDED SOLDIERS.

On March 31 the Edinburgh telephonists gave a delightful entertainment to 50 wounded soldiers. After tea there was a concert of a high standard of excellence, which the telephonists and their friends provided; and to which one of the soldiers contributed enjoyable items. Mr. C. J. Millar, the District Manager, presided, and among those present were Mrs. Millar, Mr. and Mrs. Lawkes, Miss Kerr, the Matron of the Telegraph Office, Miss Johnson, the Supervisor of the Central Exchange, Miss MacMeikan, the Supervisor of the Trunk Exchange, Mr. and Mrs. Davis, and Mr. and Mrs. Williamson. The telephonists provided the entertainment, and made all the arrangements themselves, and they must be gratified with their success. The soldiers enjoyed themselves thoroughly. How quaint they looked in their various light blue convalescent suits and flaming red ties! From a distance the effect of the red ties among the groups of girls was like poppies among the corn. The soldiers joked, and smoked, and sang to their hearts' content; and their happy faces showed, once more, how irreplaceable is the spirit of the soldier, how impotent is misfortune and suffering in depressing him. The more we see of our fighting man, the more are we impressed by his indomitable character. When he has ill times, he laughs, and when, as on March 31 last, he has joyous hours, he laughs too. He is like the old Frenchwoman, of whom Meredith speaks, who contemplated joy and sorrow, life and death alike with a smile.

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THE Telegraph and Telephone Journal.

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BRITISH TELEGRAPH PRACTICE.

I.—INTRODUCTION.

THE study of telegraph practice, as distinguished from telegraph apparatus, may not seem at first blush to be an enterprise offering much scope for philosophical or economical considerations. The provision of an instrument which will convey telegraph symbols to a distance appears to be the first aim of telegraph science. And so it is, but when there is such an aggregation of telegraph instruments as to form a telegraph organism, all sorts of questions arise as to the conveyance of telegrams to the point where they are telegraphed forward, the transfer of the telegrams from the receiving to the forwarding point at an intermediate office, the passage of the telegram to the administration from the public—the acceptance, and the passage of the telegram from the administration to the public—the delivery. There are questions of tariff, of auxiliary charges for additional services, of combination of the telegraph with other services, of the corporate transmission of intelligence, as for example, press work, as distinguished from the individual transmission, of mutual relationship with foreign and other administrations and of mutual relationship with telephone systems. All these questions have been faced by every administration and in many cases different answers have been given. The study of British telegraph practice must, therefore, come back to the comparative method. It will not regard the solution adopted in the British Post Office as necessarily the best, or at any rate as being applicable to the needs of other administrations, but it will attempt to discover why the particular solution adopted in the British Post Office is the best for the particular circumstances which obtain in the United Kingdom.

It is a misapprehension to regard the British system as having evolved. It is not a mere growth adapting itself to the circumstances of the time with that reluctance to change which is ascribed to Government departments. Long and minute discussions are buried in official files. The consideration of comparative methods has never been neglected. It is true that Parliamentary control introduces a factor which has disturbed the purely economic consideration. The two great changes of tariff—ignoring the last increase as being a war expedient only—were discussed by Parliament, and largely from the point of view of benevolence to the public. The official studies took but a small place in the discussion. There was but little evidence of the scientific consideration of the bearing of the change in tariff on trade and industry and on social life. From this it might be inferred that no such scientific study was made. Yet the fact is that the scientific study was internal while the public discussion centred itself on a

discussion which, of its essence, was politic. An example of this may be found in the extension of the free delivery area on the occasion of the Diamond Jubilee of Queen Victoria. That extension was an enormous boon to that section of the public which lived more than one mile and less than three miles from the delivering point. But it is doubtful if any telegraph administration, conducting its business with a single eye to revenue and efficiency, would have discovered that section of the public or would have come to regard it as having such a paramount claim. Notwithstanding this fact there is much to be said for the Parliamentary articulation of public needs. It may not bring forward the variant demands of the public in a scientific balance; it may not be able to compare the values, in point of accruing revenue, of concessions to the commercial public or to the rural public; it may not be able to calculate the corporate value to the nation as a whole of this or that attempt to cater for special sections. But in the main it must be said that Parliamentary control has the advantage of bringing forward the main demand of the public as a whole, and it is the work of the officials to strive so to apply their principles to practice as to meet the generic demand while in details conserving the rights of specific demands of which their studies have made them cognisant.

To write on British telegraph practice is not, therefore, to invent a new theme. Rather it is to bring a very old discussion into the light of day. It is to attempt to show that behind what seems to be commonplace action there are sound reasons and valid considerations. In many of the details of telegraph practice we shall find the British system somewhat singular and curiously isolated. Here, too, we shall find good reasons for the phenomenon. Occasionally we shall find national characteristics—prejudices, we may say—among those reasons, but a telegraph organism sets out to serve its community and in so doing it must bear with the special characteristics of that community. The Frenchman's cloak is an admirable garment, but it would be an unwise tailor in a Yorkshire village who stocked his shop exclusively with Frenchmen's cloaks. The question is not merely a comparison between the Frenchman's cloaks and the Burberry; it is a question between the Englishman's preference in cloaks plus his cloak, and the Frenchman's preference plus his cloak. It is quite likely that too much attention has been paid to native preferences, but the danger of a defiance of those preferences is to be seen in the matter of the English railway compartment. British railway practice has not found it easy to break down the prejudice. The American parlour car is still to seek on any appreciable scale, and there have been instances of attempts to introduce the open car which have utterly failed.

This does not mean that the comparative system is not to

be followed. Even if there are local prejudices which make up the differentia in the circumstances yet the comparative method must be carried as far as practicable. Moreover it is the one check against positive prejudice. Telegraph officials might drift into imagining that this or that portion of British telegraph practice was beyond criticism, merely by reason of the fact that they had grown accustomed to it. The constant application of the comparative method will prevent any such prejudice from dominating their thought. It can be carried into the consideration of the details of the practice, for there is no small thing in a telegraph organism; the merest detail is of enormous significance when regarded cumulatively. The importance of these apparently small matters in the sum total of the vast enterprise of a telegraph administration is the justification for a study of British telegraph practice. It is in considering them that guidance can be obtained on the greater questions of telegraph economics, tariffs and auxiliary charges and quality and scope of service, and the even more widely reaching questions of the effect on trade and industry of the introduction and development of telegraph services.

Telegraphy as a trade probably is unique in that it lies apart from the ordinary methods of pushing business. Save in respect of rival cable companies it is hardly the case that canvassing and advertising would induce clients to send telegrams. The very nature of a telegram involves the idea that it is sent on an emergency and, as Professor Marshall said, "time is the centre of the chief difficulty of almost every economic problem"; it is the emergency and not the allurements of the telegraph organism which is the deciding factor. It may be the case that more or less subsidiary services—*e.g.*, the Night Telegraph Letter—are more amenable to advertisement, but here again a distinction must be drawn between that conception of advertisement which owes its influence to alluring arts and the mere announcement of the existence of a facility. The public will not send a night telegraph letter because a page advertisement begs them to do so, but a page advertisement may reveal to them the possibility of a means of communication of which an emergency may show the value. A telegraph service must be ubiquitous, yet its ubiquity is never realised, since the general demand is spasmodic and the presence of the facility is only realised when the occasion has arisen for using it. So that British telegraph practice begins with the acceptance of the telegram. There have been cases of inland administrations in America where practice has begun in seeking the traffic, in arranging for telephone call circuits which bring messengers to convey the telegrams to the accepting office. That, however, is incident to rivalry. The object is not so much to get the telegram as to prevent the rival from getting it. The State ownership of telegraphs in England not only views such methods with disfavour by reason of its dignity, but it has no need for such methods as there is no rival. It may and does arrange for telegrams to be passed by telephone and thereby increases its traffic, but that is not primarily a method of touting for trade so much as a method of placing before the public the joint value of the telegraph and the telephone organism. The utmost length to which State-owned telegraph administrations have gone in seeking telegraph traffic is to ensure that all telegraph offices are suitably announced by means of notice boards. From the earliest days British telegraph practice has been characterised by the liberal allotment of accepting points; the sub-contract system of sub-offices is an efficient means of providing them. From the earliest days also the British administration has ensured that public telegraph offices shall be indicated unmistakably.

The efficiency of a telegraph service, after all, is its only advertisement. Of all puddings which are proved by eating a telegraph service is the most striking. The British telegraph service has received high encomiums from all sorts of visiting experts. Those who know it at close quarters are possibly conscious of deficiencies, but it is true to say that they judge them a little disproportionately, and they see the defects more clearly than the virtues. Competition with telephones and with a highly rapid postal service has affected the growth of telegraph traffic, and it may be that the tariff has been too little adaptable to the developing economic needs. But in the main the service is one of which every official

is proud, not the less because they look at it sometimes with the tender eyes which are more likely to see golden visions in the past. Yet this is not a defence of the British system. It attempts to be a plain statement, and a frank statement, of the different problems as they are presented at the various stages in the progress of a telegram from acceptance to delivery. It is as well to begin, however, with a summary statement. That statement will be that though we may question this or that detail of practice in the British telegraph system, in the main we shall find that the details have been carefully considered and that those who have ruled the service have always been ready to learn from experience, and that where conservatism has been evident it has largely arisen from the fact that the danger of tampering with what was well done often led them to shrink from the venture to attempt, at some risk, to do it a little better. If the British Telegraph Service had not been on so uniformly a high level more changes would have to be recorded since 1880. The rapid development in America in the past two years has been due, to some extent at least, to the fact that the administrations had to handle systems which up to that time were not so highly perfected or so widely extended. Those who built up the British system in the earlier days laid sounder foundations than, perhaps, they realised.

(To be continued.)

THE NEW EDINBURGH-GLASGOW "NO DELAY" SERVICE.

A NEW underground cable between Edinburgh and Glasgow has been completed, and on April 1 a service of junction quality was inaugurated between the exchanges in the Edinburgh telephone area, and the exchanges in the Glasgow and Paisley telephone areas, as well as certain other West of Scotland exchanges. The following lists show the exchanges included in the scheme:—

East of Scotland exchanges,

Aberlady, Athelstaneford, Balerno, Colinton, Corstorphine, Currie, Dalkeith, Davidson's Mains, Edinburgh (Central), Gifford, Gorebridge, Granton, Gullane, Haddington, Lasswade, Leith, Loanhead, Musselburgh, Portobello, Prestonpans, Ratho, South Queensferry and Tranent.

West of Scotland exchanges,

Bailliestown, Balfron, Balmore, Barrhead, Bearsden, Bell (Glasgow), Bishopbriggs, Bishopton, Blanefield, Bowling, Bridgeton (Glasgow), Bridge of Weir, Cambuslang, Central (Glasgow), Charing (Glasgow), Clarkston, Clydebank, Douglas (Glasgow), Drymen, Dullatur, Dumtocher, Eaglesham, East Kilbride, Elderslie, Fauldhouse, Gorbals (Glasgow), Govan, Harthill, Ibrox, Inchinnan, Johnstone, Kelvin (Glasgow), Kilbarchan, Killearn, Kilsyth, Kinning Park, Kirkintilloch, Langside, Lennoxton, Maryhill, Milngavie, Paisley, Pollokshaws, Pollokshields, Queen's Park, Renfrew, Rutherglen, Shettleston, Shotts, Southside (Glasgow), Stepps, Uddingston, Western (Glasgow) and Whitburn.

The trunk fee between these East and West of Scotland exchanges, which are about 50 miles apart, is 8d., except in a few cases.

The circuit arrangements between Edinburgh and Leith and Glasgow are as follows:—

Glasgow (Central) to Edinburgh (Central) ...	10 lines and 1 order wire.
" " " " " " ...	4 ringing lines.
" " " Leith " " " " ...	8 (lending) lines and 1 order wire.
" " " " " " " " ...	2 ringing lines (lending).
" (Trunk) " Edinburgh (Central) ...	5 ringing lines.
" " " " (Trunk) ...	10 ringing lines.
" " " Leith " " " " ...	2 ringing lines.
" (Bell) " Edinburgh (Central) ...	2 ringing lines.
" " " Leith " " " " ...	2 ringing lines.
" (Bridgeton) " Edinburgh (Central) ...	2 ringing lines.
" (Douglas) " " " " " " " " ...	4 ringing lines.
" " " Leith " " " " " " " " ...	1 ringing line.
Edinburgh (Central) to Glasgow (Central) ...	8 lines and 1 order wire.
" " " " " " (Bell) ...	5 ringing lines (lending).
" " " " " " (Bridgeton) ...	2 ringing lines.
" " " " " " (Douglas) ...	3 ringing lines.
Leith " " " " " " (Central) ...	6 lines and 1 order wire.
" " " " " " (Douglas) ...	1 ringing line.

The arrangement introduced on April 1 completes the policy of diverting all traffic between the exchanges mentioned from Edinburgh Trunk Exchange. The provision of twelve direct lines

from Glasgow Trunk Exchange to Edinburgh Central Exchange, and five to Leith Exchange on Feb. 21, 1915, was the first step in that policy. All traffic between the Edinburgh area exchanges on the one hand and the West of Scotland exchanges detailed on the other, now circulates direct between Edinburgh Central and Leith and four Glasgow exchanges.

The five lines from Glasgow Trunk Exchange to Edinburgh Central, and the two lines from Glasgow Trunk Exchange to Leith, carry through trunk traffic for subscribers in the Edinburgh area, while the ten lines between Glasgow Trunk Exchange and Edinburgh Trunk Exchange are provided for trunk calls other than those to and from the places between which the working is on a junction basis.

The new service, which ensures that all calls between the exchanges mentioned are effected on demand, is excellent, and there is good reason to believe that the public are well satisfied with it.

The change has involved the control of trunk calls at fourteen local exchanges in the Edinburgh area, including Edinburgh (Central) and Leith. At the Central Exchange, with its well-nigh 8,000 subscribers' lines and 57 "A" positions, the assumption of trunk control necessitated a good deal of special instruction to the large staff, and considerable re-arrangement, but it has not affected the organisation of the exchange, and the local service has not suffered. By careful distribution the danger to the local service of any "A" telephonist having to book and control too many trunk calls was guarded against, and even a close observer could not have told a few days after the introduction of the scheme that anything unusual had occurred at the Central switchboard. In normal times it would not have been practicable to introduce such a change without unloading, and consequently opening additional positions, for the "A" telephonist's normal load is 200 valued calls in the busy hour, but through the decrease in the local work incidental to the war no unloading has been necessary.

The assumption of trunk control by the "A" telephonists involved the abandonment of trunk priority at all the multiple exchanges in the Edinburgh area. Unfortunately, on the day after the inauguration of the new service, a heavy snowstorm caused many hundreds of line interruptions at the Central, but even under the adverse conditions thus created, and the newly inaugurated control of trunk calls by the "A" telephonists, the service was little affected, for on that day the observation records showed that 73 per cent. of all calls were answered in 5 seconds, or less, while the average time occupied in the total operation was but 10.2 seconds. At Leith, where 50 per cent. of all the trunk calls originated were controlled by the "A" telephonists, the observation records for the same day showed that 90 per cent. of all calls originated were answered in 5 seconds, or less, and that the average total operation occupied only 8 seconds. There have been slight fluctuations in the quality of the service, but no falling off that would be noticeable to any save a close observer of the daily observation records, has occurred. Traffic men know that if the control of trunk calls by the "A" telephonists prove successful at such large exchanges as Edinburgh Central and Glasgow Central, there need be no fear of an extension of the policy of combining local and trunk exchanges. Certainly at Edinburgh, the traffic staff regard the multiplying of additional trunk circuits at the "A" positions with enthusiasm, and proposals towards that end are now being formulated.

It should be said that the engineering work in connexion with the new scheme was very efficiently carried out, for not a single hitch in the working of the groups of lines occurred. Those of us who have been closely associated with the inauguration of the new system know how the engineers strove to guard against every possible difficulty, and the excellent work done by them is appreciated accordingly.

The supervising and operating staffs faced the new situation with enthusiasm, and any operating difficulties which occurred were speedily overcome.

ERRATUM.

In Mr. Baxter's letter on "Staffing of Phonogram Rooms" in the April issue, page 96, the word "telephonists" in the third line of the fourth paragraph should read "telegraphists."

REVIEWS.

The Principles of Electric Wave Telegraphy and Telephony. By J. A. Fleming, M.A., D.Sc., F.R.S. Published by Longmans, Green & Co. Third Edition: xvi + 911 pages. Price 30s. net.— Since 1906, when Dr. Fleming's book on *The Principles of Electric Wave Telegraphy* first appeared, it has been without doubt the standard work in this country on wireless telegraphy. The continual growth of the subject has necessitated the appearance of two subsequent editions, and incidentally the augmentation of the title, and the present edition is the most complete and up-to-date account in the English language of the methods used for the production of electro-magnetic waves and their utilisation for the purpose of conveying information between distant points.

The whole of the sources of the invention and improvement of modern wireless telegraphy are usually summed up in the name "Marconi." Without at all detracting from the credit due to the famous Italian inventor for his achievements in this field, it must be admitted that Dr. Fleming has borne no mean part of the labour of bringing wireless telegraphy to the position which it holds at the present day. The numerous discoveries he has made in the realms of pure research on the phenomena of electro-magnetic radiation and the many ingenious inventions in which he has applied the results of research to practical purposes, have eminently fitted him to act as instructor and guide to those who would follow in the footsteps of the great pioneers of the subject.

The book is divided into three parts. Part I deals with the production of electric oscillations, Part II with electro-magnetic waves, and Part III with the application of the phenomena discussed in the two previous sections of the book to practical wireless telegraphy and telephony.

Part I is divided into three chapters. In the first, after a brief mathematical introduction, the various devices used for generating high frequency currents are described, together with the different methods by which of such currents can be actually observed.

The second chapter deals with the various measurements involved in the quantitative investigation of the electrical phenomena in circuits in which high frequency currents are flowing. The present development of wireless telegraphy could never have been reached had it not been possible for accurate measurements to be made for the exact determination of the behaviour of any existing arrangement of apparatus and the prediction of the behaviour of any proposed device.

In the third chapter the mathematical theory of damping in high frequency circuits and the effects produced by the coupling together of two such circuits is given. Some interesting oscillographs are reproduced of current curves observed in circuits having various decrements, and also of the beats set up in an oscillatory circuit coupled to another circuit having the same natural period of oscillation. In the first edition of this book the explanation given of the production of these beats between two coupled circuits was inaccurate, and we are pleased to notice that in the present edition the explanation previously given of this important phenomenon has been eliminated and replaced by a correct explanation.

The second part of the book is likewise divided into three chapters. Chapter IV deals with stationary electric waves on wires. The mathematical treatment of this subject is based on the laws governing the propagation of waves of current and potential along an infinite conductor. These are the same laws upon which the theory of the transmission of the alternating currents used for the propagation of telephonic speech is based. The expressions for the attenuation constant and the wave-length constant for a circuit of given electrical properties are deduced, and it is satisfactory to see that the symbolism adopted by Dr. Fleming is that usually employed by English writers on this subject, and not that employed by German investigators and unfortunately by certain English writers as well. The English conventions are to denote the attenuation constant by α and the wave-length constant by β . The use of the symbols in this manner follows naturally from the manner in which similar symbols are employed in the mathematical theorems upon which the discussion of the electrical phenomena

is based. The German writers use the same symbols with the reverse significations. Of course, it does not really matter what symbols are used by a writer, so long as he defines the meaning of those which he employs, but anyone who has had experience of the trouble caused to students by various symbols being applied to the same quantity will admit the great desirability of adopting such symbols as will involve the minimum of memory work on the part of the student, and of steadily adhering to these symbols.

Chapter V deals with the radiation of energy in the form of electro-magnetic waves from a circuit in which electric oscillations are taking place. The growth of the idea of an electro-magnetic medium is briefly sketched, leading up to Maxwell's electro-magnetic theory. The mathematical discussion of this theory is then given. Then follow descriptions of methods for generating electro-magnetic waves, and for experimentally investigating their properties. The remainder of the chapter is devoted to the mathematical discussion of laws governing the radiation of electro-magnetic waves from different types of oscillator.

In Chapter VI descriptions are given of the various appliances used for the detection and measurement of electro-magnetic waves. Starting from the crude spark detectors used by the first workers in this field, the evolution of the different types of detectors is traced, through coherers, magnetic detectors, electrolytic detectors and hot-wire detectors, up to the modern crystal detectors and cathode ray valves. The series of detectors concludes with a description of a method by which the muscular contractions set up in the leg of a frog when a stimulus is applied to the sciatic nerve by the passage of the currents in the receiving circuit are utilised to record the signals arriving from a distant station! Although successful results have been obtained with such a detector, we trust the day is far distant when a supply of frogs will have to be maintained at wireless stations for use with the detecting apparatus. We are afraid that, in these circumstances, discrepancies in the station stock would be alarmingly frequent.

This chapter concludes with a description of various forms of wave-meters and decimeters.

The third part of the book, on wireless telegraphy proper, comprises four chapters. Chapter VII is devoted to descriptions of the various types of apparatus used for the transmission and reception of signals. A brief sketch is first given of the work done by investigators prior to 1896, when Marconi took out the first patent for telegraphy by means of electro-magnetic waves. The development of the subject is then traced up to the apparatus actually in use at the present day. Considerable space is devoted to the discussion of the theory of various types of directional antennae.

In Chapter VIII descriptions are given of various types of station, from the small portable station suitable for carrying on horse-back up to such large stations as Clifden, Carnarvon, Tuckerton and the Eiffel Tower, and including ship and aircraft installations. The concluding sections of this chapter deal with the various methods used for the prevention of interference, the efficiency of a wireless station, and the method of designing a wireless station of given power, wave-length and spark frequency.

Chapter IX is devoted to a discussion of the laws governing the transmission of electro-magnetic waves over the surface of the earth, and of the effect of daylight on radiotelegraphic transmission. It concludes with a short section describing the methods used for measuring the currents set up by the waves in the receiving antenna.

The final chapter is devoted to the subject of wireless telephony. The elementary theory of the transmission of sound by means of an electric current is first given. Then follows an account of the methods used for generating continuous high frequency oscillations. Such oscillations are designated "undamped," but the use of this term is erroneous, as of course there are always energy losses due to resistance, radiation, &c. So-called "undamped" oscillations are those in which the energy losses from the circuit in which they are set up are continuously made good from the source of energy employed, so that the amplitude of the oscillations remains constant.

The various devices used for moulding these oscillations so

that the radiated waves shall have the form of the complex wave forms which make up speech, and for detecting the waves so radiated at the receiving station, are then described.

It would not be possible in the limits of a review considerably longer than the present to deal adequately with the mass of information which is contained in Dr. Fleming's book. It has only been possible to give a brief sketch of the ground which it covers. The subject-matter of each section is treated in great detail, and students owe a debt of gratitude to Dr. Fleming for the enormous amount of work which he must have devoted to producing such an invaluable work of reference for all members of the profession.

TELEGRAPH APPARATUS.—AN INTRODUCTION TO THE STUDY OF TELEGRAPHY.

By A. SIRETT.

(Continued from page 91.)

FIG. 16 illustrates the first transmitter devised by Morse for the transmission of his new dot and dash signals.

From 1844 Morse's apparatus became widely used and we are told that he became electrician to the New York and Newfoundland Telegraph Company and also of the New York, Newfoundland and London Telegraph Company, and that in 1857 he received a present from the European States of 400,000 francs as an acknowledgement of his international services. It is now nearly 80 years ago that Morse invented his telegraph code of long and short signals, and in spite of all other changes in the engineering world "Morse" is still the basis of the Universal telegraph code.

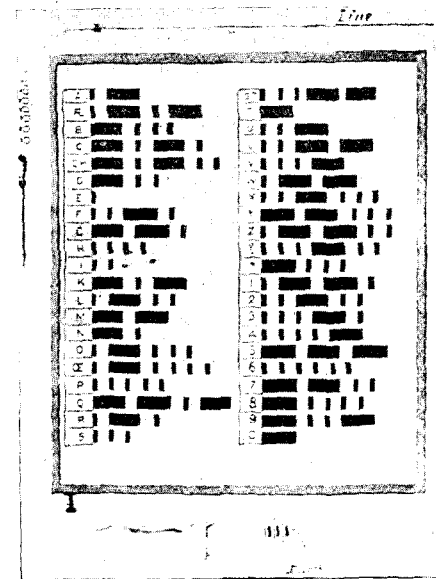


FIG. 16.

I have referred to a chemical telegraph invented by Sömmering where the signals were indicated by the decomposition of water. This idea of decomposition seems to have been followed up and in 1842 "Bain" produced his chemical telegraph. The principle consisted of making the end of a wire at the receiving station move over a paper soaked in a solution that could be decomposed when a current passed through the wire and paper.

Fig. 17 shows the sending and receiving apparatus. The word to be telegraphed is made up of metal letters. These are connected with the positive pole of a battery—the negative pole of which is connected to earth. The receiver consists of a metal plate connected to earth. Upon the plate rests the paper saturated with the solution to be decomposed. The brush at "K," the sending station, with its five fingers, is connected with a similar

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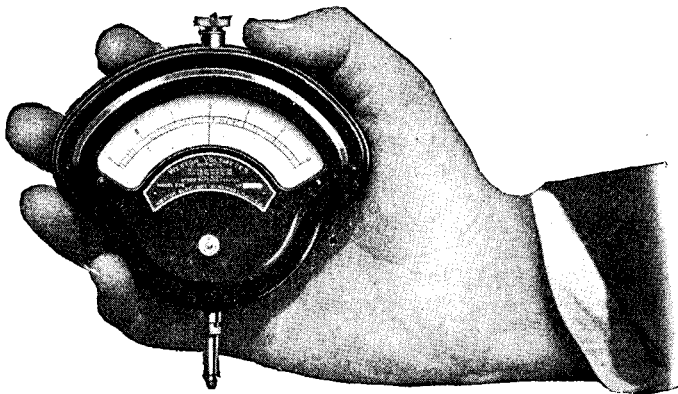
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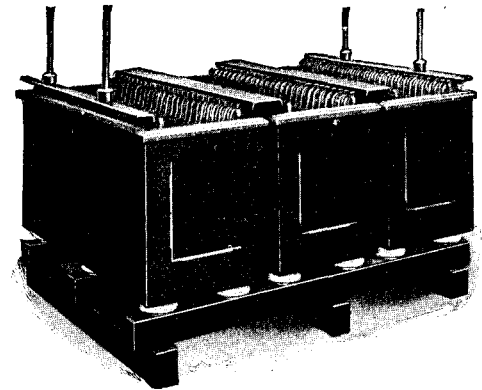
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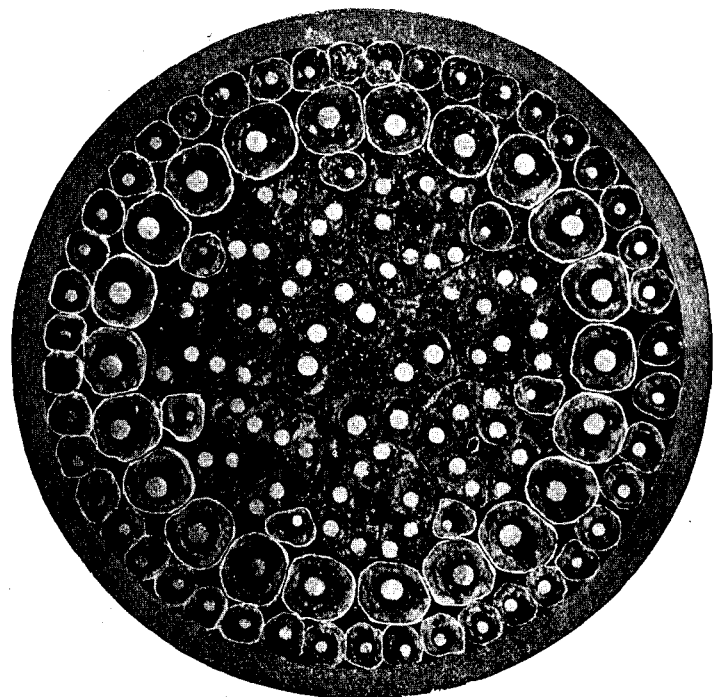
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brush "K¹" at the receiving station. Finger "b" being connected to finger "b'" and so on. If these brushes be moved in the same direction, at the same time, and at the same speed the current from the battery will pass through the metal letters to the fingers of the brush along the cable to the receiving station, to the corresponding fingers there, through the paper to the metal plate below, to earth and back to the battery.

As the current passes through the paper it will set up a chemical action which will discolour the paper and produce a copy of the letters which the brushes passed over at the sending station.

Five line wires were necessary for this instrument.

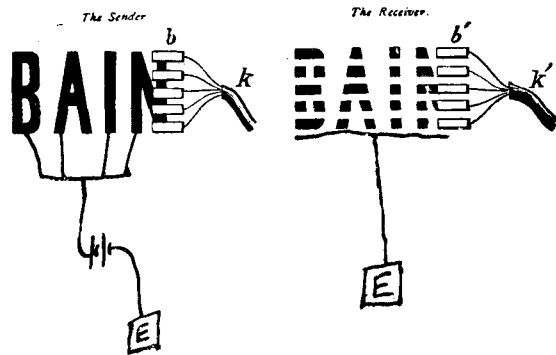


FIG. 17.

Bain later produced the instrument shown in Fig. 18. This records the dots and dashes of the Morse alphabet by a similar process to that just described. "A" is a metal wheel. "B" is a small wooden roller pressing the paper tape against "A." Motion is imparted to the wheel by clockwork. The paper passes over the wheel beneath the wire style "3." The metal point is in connexion with the line wire, and the brass wheel "A" is in connexion with the earth so that when the current flows along the line wire to earth it passes from the point "3" through the paper to the wheel "A," and leaves lines or marks on the paper in accordance with the signals sent. This instrument is worked by an ordinary Morse dot and dash key. It is not now in use except for experimental purposes. It is very sensitive and can register signals with marvellous rapidity, as it is independent of springs, magnets and induction. It was at one time the only form of recording

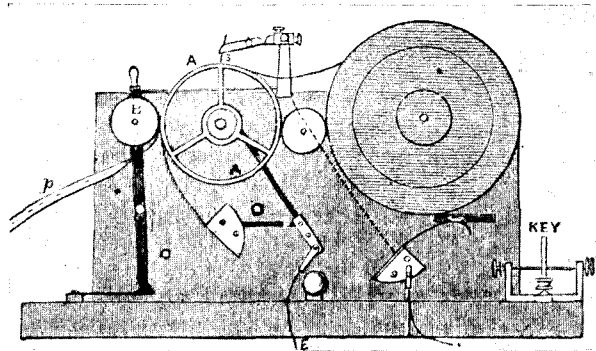


FIG. 18.

instrument in use in England, but it has been displaced by the Morse recorder which does not need chemically prepared paper.

Modern Telegraphy.

The instruments I will now endeavour to describe are what may be termed the more modern and practical instruments. They have shaken themselves out as it were, from a mass of beautiful apparatus of the same species, and each has in its own sphere proved itself to be the best adapted to the purposes which it was intended to serve.

The modern instruments may be grouped under two classes,

viz., non-recording instruments and recording instruments. The non-recording kinds give visible and audible signs and the recording kinds make their signals in various ways on paper tape.

Non-Recording Instruments.

The first is the needle instrument Fig. 19 (A). Twenty years ago this was largely used by the Post Office but it is now to be

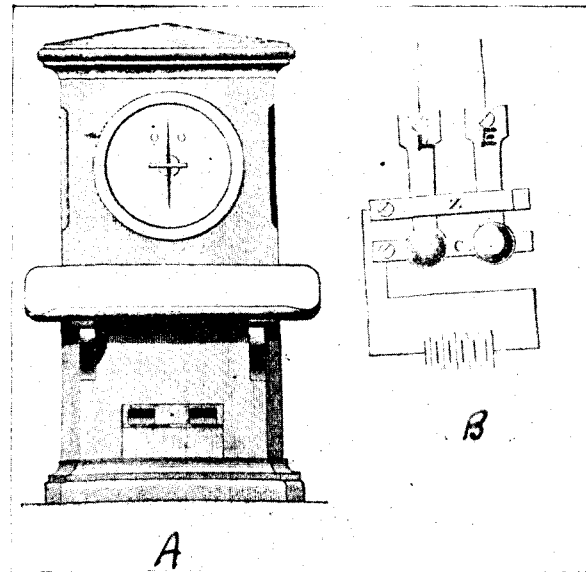


FIG. 19.

found chiefly in the signal cabins and offices of railway companies and a few of the smaller post offices. It has been displaced in the Post Office by the sounder and the telephone. It is simple in design, inexpensive in prime cost and maintenance, and does not require a technically skilled operator to work it. The principle is shown in the diagram Fig. 20. The needle is magnetised and swung at its centre in a coil of wire. If the current is sent through the coil in one direction, the needle will swing to the left "a-b," and if the direction of the current is reversed the needle will swing to the right "c-d."

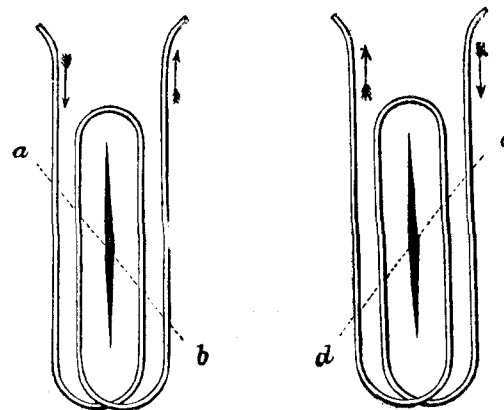


FIG. 20.

The Morse alphabet is made up of dots and dashes. The dot is represented by a deflection of the needle to the left, and a dash by a deflection to the right. In practice the wire was wound on two hollow bobbins and a small magnetic needle was made to swing inside the bobbins having a pointer fixed on the same spindle to indicate the signals. The main defect in this instrument was the liability of the small magnet inside the bobbins to be partially or sometimes wholly demagnetised and even reversed in polarity by lightning. This defect has been entirely removed by the introduction of induced needles—Fig. 21. The needle is of the horse-shoe type and is free to move to and fro. It obtains its induced

magnetism from the two permanent magnets at the top—Fig. 21 (A,B). They are fairly strong and are rarely affected by lightning. Another form of needle has two powerful horseshoe magnets to magnetise the needle—Fig. 21 (C and D). Each type of needle instrument depends for its signals on the direction the current is sent through its coils, and that is governed by the tappers or keys of the sending apparatus Fig. 19 (B). "C and Z" are two strips of metal to which the positive and negative poles of the battery are brought respectively. "E and L" represent two metal springs which are connected to earth and line respectively. If "L" be depressed and brought into contact with "C" the circuit will be completed from "C" of the battery through the

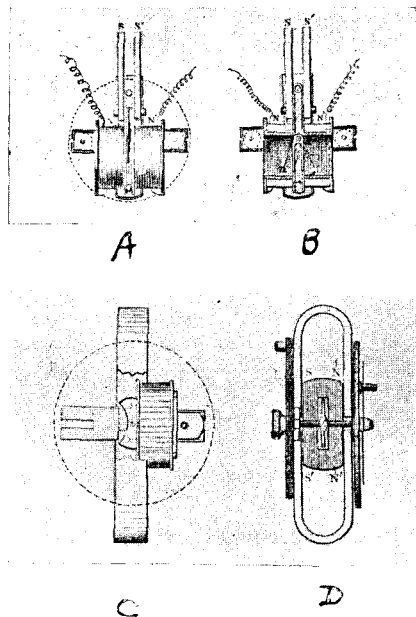


FIG. 21.

line to the distant station, to earth and back to "E.Z." causing the needle to be deflected to the left. If "E" is depressed the direction of the current is reversed and the needle is deflected to the right. The adjustment of the apparatus is of the simplest character. Any number of instruments can be joined in one circuit provided the traffic is not too great to cause delay. Signals from the needle instrument are read by sight, but it is possible to read by sound. The working current required is from 15 to 20 milliamperes and the working rate about 30 telegrams per hour.

(To be continued.)

TELEGRAPHIC MEMORABILIA.

THE war was of course alone responsible for the change of *rendezvous* of the P.O. T. and T. Society at its last meeting, Government needs having rather suddenly ousted the above and several kindred societies from their exceptionally comfortable and commodious meeting place on the Victoria Embankment. No longer did we walk through a marble-pillared vestibule, no longer did one enjoy an almost perfect system of eye-rest lighting, no longer did the soft-hued panelling open so mysteriously and noiselessly and disclose the cunningly hid lantern above our heads, and no longer did the audience sit in curved tiers before an augustly accommodated chairman and committee.

No! As one sat in the substituted room "Somewhere in the City" the membership appeared at first sight to be arraigned before the chairman, secretary and treasurer who alone of those present appeared to have maintained due dignity. Maybe it was the solidity and permanence of the huge green-baized table which gave the gathering something of the appearance of a country

magisterial court until Mr. M. C. Pink rose and delivered his specially interesting paper on "Subsidiary Telephone Services," quite unmoved by the mustiness of the room, the sombre surroundings, and the various pairs of eyes which looked down upon him from the oil and canvas portraits of by-gone patriarchs on the wall.

One could almost have seen these painted greybeards start with surprise as they listened from their places on the wall to the unfamiliar jargon of the most modern of the Services, "glows" and "pegs" and "plugs" and "A operators," &c., &c. How would they understand the respective merits of a "lamp signal" and a "buzzer"? How would they have managed to comprehend that "Position 1 of the black key removes the buzzer calling signal, connects the recorder's telephone to the calling line, and darkens the controlling 'A' operator's calling supervising signal?" How would they—but no, they are perhaps fortunate to have lived at a time when there was no thought of a "no-delay" service by road or rail, or telegraph or what-not, no aeroplanes at 90 miles per hour, no telephone calls to attend a Zepp raid, no telegrams to fetch one back from leave just as one had reached home, no "mighty human progress" such as we have to-day—no war!

Notwithstanding the new environment, Mr. Editor, it must not be understood that the debate which followed Mr. Pink's paper was at all depressed by the sombre surroundings. In fact the small, and certainly select, company seemed all the more keen to rise superior to circumstances, with the result that a very useful hour of exchanges of thoughts and ideas was the net result of Mr. Pink's excellent production, specially well delivered. Thus terminated yet another session of useful work under adverse conditions which might have deterred many a committee from carrying on. It has already been notified elsewhere that the balance of cash carried forward was very considerable despite the much-reduced membership, and war or no war there is every evidence that the next session is not likely to lag behind in interest and in good financial management.

The hopes that were expressed in this column of Mr. Dunford's recovery, once he had been released from the trammels of official life, were unfortunately not realised, and that very soon after the JOURNAL had gone to press. From many quarters come tributes to his kindliness and his earnest desire to deal justly and to hear all sides of a question. Many have undoubtedly lost a personal friend, others can testify that he had, when need be, the courage of admitting an error to a subordinate and of completely reversing a decision when he found that the previous evidence had been lacking in some material point, a quality, one would submit, which betokens character of the highest type.

One has become used to hearing of casualties from across the seas, where the nations are locked in the present death-grips, but there is a certain telegraphic circuit between this country and a foreign fishing-town, we will call it, over which, almost ceaselessly the 24 hours through, pass the casualties of the homeland.

Telegraphists are accustomed to touching the whole gamut of life's experiences, births, marriages, deaths, although the stream of inward traffic which denotes the toll the nation is paying for human freedom has not ceased to move them. The circuit to which reference is made is one however which carries the urgent calls from home to our fighting men, denoting that this side also the shadows are falling across poor stricken humanity.

Naturally with the millions of men engaged in the present conflict there must by all actuarial laws of necessity be the usual proportion of peace-time casualties to our home population.

Never before in telegraphic history, however, has human sorrow been so concentrated upon one single circuit as upon this particular Anglo-Continental line, while not a single telegraphist who has dealt with the traffic but has been impressed by the piteousness of the bulk of the traffic. Now and again there is a splash of joy which in other times would have appeared strange, such as the mingled hope and fear of that mother's telegram, "Glad you are wounded. Is it bad enough for Blighty?" and with these infrequent reliefs to the shadows one has to be content to signal day after day the tolls of disease and death of parent, wife, friend,

child to men over yonder fighting our battles yet with their own heartaches to bear as best they may.

One hears that there is likely to be a change of location for the special circuits which have formed so distinctive a feature of the cable room C.T.O. since August 1914.

There does not appear to be any cause for complaint in the management and supervision one is given to understand, but there would appear to be something of the nature of swapping horses while crossing the stream in the operation, and although the present position is not an ideal one it must be candidly admitted that the shifting of the circuits cannot be considered as a compliment to those who have organised and pulled matters through some months and months of very difficult and hazardous national times and without hope of reward.

However, if a more efficient service is to be obtained no one should grumble, for this is a time—as Tennyson says—

“When the individual is no longer.”

J. J. T.

LONDON TELEPHONE SERVICE NOTES.

“OH, East is East, and West is West, and never the twain shall meet.” So wrote Rudyard Kipling, and either we have failed to grasp his meaning or else he knew little of the London Telephone Service. The alternatives seem equally probable, so you are free to choose which you will—the fact remains, that so far as the L.T.S. is concerned East and West (not to mention a multitude of other Exchanges) did meet on the evening of Saturday, May 12, at the Cabin Restaurant, Caxton House, and they met to honour one whose name is known throughout the whole of the Post Office London Telephone Service—Mrs. Drake, the Chief Supervisor of the Western Exchange, who now retires. In our youth we remember to have joined lustily in a ditty which appears in the Harrow School Song Book. The lines we have particularly in mind run,

When glory gave to Drake the wave
She gave to us the hill,
For we began when he began,
Our times are one.
His glory thus shall circle us
Till time be done.

We quote from memory, but it seems to us that a slight paraphrase of these lines would express very well the relationship of Mrs. Drake and those of Pre-Transfer Telephone Service in London. Some of the later recruits to the Service will wonder what that mysterious expression “Pre-Transfer” may mean. Well, it is the complement of “Ex-National,” and together they provide us with distinctions which we choose to keep up in order to show how completely we have broken down the barriers between them. We are a peculiar people and this peculiarity is emphasised (pleasantly enough) in the fact that Mrs. Drake received a special gift from *Ex-National* supervisors; but we anticipate.

Indisposition prevented our own attendance at the traffic officers' meeting (why does a perverse fate always arrange these indispositions for the wrong meeting), but from the “Notes of Proceedings” circulated to us we learn that the chair was taken at 7 p.m. by Mr. E. A. Pounds, and that he had the support of headquarters officers, exchange managers, supervisors and telephonists to the number of nearly 200. (If anyone was there who cannot rightly consider themselves as covered by this description will they please accept our apologies.) A whist drive which secured the participation of nearly 100 players was followed at 8 p.m. by an *excellent* supper which concluded with ices! (We quote from the Notes and as no mention is made of bread we may conclude that the Food Controller's requirements were strictly observed.) In any case the ices entirely failed to detract from the warmth of the good wishes expressed to Mrs. Drake by those who paid their tribute to her. After an introduction by the chairman, the presentation was made by Miss Heap, whose observations as ever were couched in felicitous terms. Valedictory speeches were also made by Mr. Kennedy and Mr. Webb as well as by Mr. Prossor, whose remarks were in the happiest possible strain, and saved the

gathering from distilling too much sweet sorrow from the parting. Mrs. Drake made an appropriate reply in which she said that her interest in the social activities of the staff had brought her in contact with their parents, brothers, sisters and sweethearts—all very nice boys. (We hope J. J. T. will miss this.) The gifts included a silver table kettle and coffee pot from the “Western” staff; a cake dish and Coalport china butter dish from “Ex-National” supervisors; case of tea knives from three supervisors, and a framed photograph of themselves from “The Fool and her Follies” (the Western Concert Party).

The entertainment concluded with a first class concert given by the Western Exchange Concert Party and friends (who have already given 30 concerts to wounded soldiers. The programme included numbers by the troupe (“The Fool and her Follies”—Misses Short, Green, Burrell, Gilchrist, Steward and Child); songs by Miss W. Kempe, Miss F. Clarke, Miss D. Bott, Miss G. Davis and Messrs. Donaldson and Townsend; Miss L. Armstrong appeared as a soubrette, Miss Kathleen Cope (from the Duke of York's Theatre) recited, and Mr. Wellington provided various humorous items.

The assembly is described by those who were present as one of the most enjoyable at which the members of the L.T.S. have ever foregathered—a worthy tribute to a worthy dame. To Mrs. Drake in her retirement we offer the best of wishes from the Telephone Service, and trust she may long be spared to revisit us in our work and in our play. This account cannot be closed without a tribute to Miss Hill, of the Western Exchange, who was very largely responsible for the arrangements—to the excellence of which all alike testify.

On Saturday, April 23, a party of 22 wounded soldiers from the Princess's Club Hospital, Bermondsey, were entertained at the London Coliseum by invitation of members of the Hop Exchange staff. The soldiers were conveyed by motor char-a-banc from the hospital to the Coliseum where they were met by their hostesses. The guests, who were provided with a generous supply of cigarettes and chocolates during the afternoon, were later conducted to the Coliseum Tea Room and there provided with a hearty meal. So successful was the outing that it is hoped ere long to arrange another of a similar character.

The individual efforts of the exchanges to cheer the lot of the wounded soldier has not in any way decreased their combined efforts on behalf of the sick. The annual collection in the L.T.S. on behalf of the Hospital Saturday Fund totalled £858 13s. 9½d. or more than £80 in excess of the previous year's total. The Trunk Exchange sent in more than £57 and several other exchanges forwarded handsome sums. This is a splendid effort of which the promoters may well be proud.

The writer who told us that the ivory gates of Hope were already moving on their hinges has proved a prophet indeed. An additional war bonus payable as from Jan. 1 has rejoiced telephonists and supervisors not to mention other classes. It is to be hoped that an effort will be made to spare a little of this to swell the already splendid total put by the members of the L.T.S. into War Savings Certificates. Their combined savings have already purchased well over fifteen thousand pound certificates whilst the coupons sold approach half a million, and the number of cartridges thus supplied by the L.T.S. for the protection of our fighting forces is heading quickly for the two million mark. In common with all other War Savings Associations that of the L.T.S. is now busy enforcing by precept and example the necessity for food economy. We are certain that much can be done by our enthusiasts discussing this question on their journeys to and from the exchange by bus, tram or train.

The first contingent of the overseas Telephonists Corps will have taken up duty ere these Notes are published. The uniform (apart from the hat) seems to have satisfied the taste of the wearers as well as the lookers-on. It is businesslike and smart. We wish the latest recruits to the Royal Engineers complete success in their military undertakings and the speediest possible return to civil duties with the other British victors.

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

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OUR GIRLS IN KHAKI.

TOWARDS the end of last month the first batch of telegraphists and telephonists left England for France to play their part in the scheme for relieving for other duty soldiers now employed at the base on work which can be performed by women. They are the first selection from the satisfactory number which responded to the call for telephone and telegraph volunteers, and when Mr. Pike Pease and Col. Ogilvie bade goodbye to them on their departure they represented the feelings of the Post Office staff in the main. We have pleasure in giving our readers on another page a picture of these ladies in their proudly-borne khaki.

A contingent of army post office women and other women in khaki had already preceded them and by now are doubtless a familiar, gracious and unobtrusively-intrusive feature of the ceaseless activities which are going on behind the great battlefield. Probably officers will quickly get accustomed to the military salutes which this feminine legion duly renders them, but at present we imagine the novelty is found somewhat embarrassing by those to whom salutes—at least of the military sort—from the other sex are unfamiliar. We apprehend that when the conditions of service over yonder are more widely known in this country the rush of volunteers will be great, for we are disposed to imagine that the life there is not without its compensations, and if it should include the amenities of some charming French watering places we shall not be surprised.

Having in mind their consistent devotion to duty the willingness of our women to undertake the work occasioned no surprise; it is of a piece with their excellent record all through these stirring years. We are, in fact, afraid of repeating ourselves in drawing the attention of our readers and of the public

to the great and worthy part telephonists have played during bombardments, air-raids, explosions and other terrifying emergencies incident to the war. Women's work generally and their invaluable assumption of the rôles necessarily forsaken by men engaged in a sterner struggle has received its due meed of recognition. In some cases, indeed, we venture to say that the credit given to them has been exaggerated, especially where the work has entailed no risk and been generously paid. But with the telephonists the case is not so, and danger has been faced without special reward and with a devotion and courage which we are glad to dwell upon.

We only allude to this subject once again because it seems there are strange critics to be found who question this often-proved fact. A correspondent of *Municipal Engineering* complains that he has never been able to obtain a reply from the telephone exchange during an air-raid. "So far as I understand," he continues, "subscribers are cut off immediately the raid occurs, and, if this is not so, only one of two things is possible: (a) I have been singularly unfortunate, or (b) the 'heroines' were all prostrate with terror or excitement." The writer possibly has been unfortunate, although not singularly so, for whilst, of course, subscribers are not "cut off" during a raid, police, fire and ambulance calls, as would reasonably be expected, receive a priority on such occasions, and in the enormous rush of calls which ensues, the claims of ordinary subscribers are necessarily of secondary importance. But we consider the inverted commas applied to the word "heroines" uncalled-for in the last degree. The calm assumption that girls who have voluntarily braved the dangers of a raid at the dead of night to answer the call of duty are prostrate with terror because, in the sudden and heavy traffic which arises, his private calls are not answered, is gratuitously insulting. We wonder if the writer would dare to describe the men in the trenches "heroes" (in inverted commas) whenever it seemed good to him to question their conduct in action, and, if he did so, whether any editor would print his letter. The cases seem to us to offer a fair parallel, knowing as we do, on the best authority, that the behaviour of the telephonists in emergencies has been beyond praise.

HIC ET UBIQUE.

WE gather, although we have not yet seen an official announcement, that our correspondent, Captain A. A. JAYNE, M.C., R.E., has been promoted Major. We offer him our heartiest congratulations.

MR. E. ROBBINS has retired at the age of 70 from the manager-ship of the Press Association, after being in the service of the famous news agency for more than 47 years. The relations between the Telegraph Department and Mr. Robbins have always been most cordial and we wish him many years of life to enjoy his retirement.

THE covers of our New York contemporary, *The Telephone Review*, are generally artistic efforts in colour, so that that business-like journal often used to remind us externally of *Jugend*, a well-known German art paper which we enjoyed in the days when they directed their "hate" towards Hohenzollernism, Militarism, Junkerdom and all forms of anti-social stupidity. The last issue of the review exhibits an effective picture entitled "The Call,"

which a well-knit khaki-clad young American is receiving, characteristically enough, over the telephone, while the charming figure of his wife (*in esse* or *in posse*) stands by listening anxiously.

A CORRESPONDENT of *Pearson's Magazine* writes :

"Can you tell me the secret of the telephone's fascination for women? A man, if he has to talk on the wire, says what he has to say, and hangs up the receiver quickly. Not so a woman. However excellent her business capacities in other respects, she is unable to resist the lure of the telephone. She will go on handing out any old drivel so long as she can induce the person at the other end to listen to her. And if no business calls come through to satisfy her craving she will ring up all her friends and relations, and indulge in long and intimate chats about Lizzie's new baby, or Amy's new hat, or the show she went to with Captain Dash last night, regardless of the feelings of frenzied subscribers who are being flouted meanwhile with the parrot cry, 'Number engaged!' As for a public call-box, if you see a woman in one, you may as well go home and have a nice, long sleep. You'll waste your time waiting."

We think the telephone-monopolist is distinguished not so much by sex, as by a native capacity for boredom or trifling which is found in both sexes. What does the writer mean by the parrot-cry of "number engaged!" when he is at pains to show that the number actually is engaged by a member of the offending sex? Nothing, probably—nothingness being the substance of most of the well-worn humour of telephony.

TELEPHONES IN THE UNITED STATES.

	1915.	1916.	Increase in 1916.
No. of telephone stations—			
American Telephone and Telegraph Company ("Bell" system)	5,968,110	6,545,490	577,380
Independent, connecting with American Telephone and Telegraph Company	3,183,111	3,301,702	118,591
	9,151,221	9,847,192	695,971
Mileage of toll wire (Bell Company's)	2,453,483	2,682,910	—
Mileage of exchange wire (Bell Company's)	16,052,062	17,167,405	—
	18,505,545	19,850,315	—

The American Telephone and Telegraph Company estimate that there are 11,300,000 telephones in the United States. This gives about 1,452,800 independent stations having no connexion with the Bell system, which with the 3,301,702 which have such connexion makes a total of 4,753,500 Independent stations in all.

ENTERTAINMENT TO WOUNDED SOLDIERS.

A most enjoyable entertainment to wounded soldiers was given by the Edinburgh telephone staff (trunks and local) on Saturday, March 31, in Hill Street Hall. The hall brought back many memories of other and happier days before the war when the girls were wont to trip the light fantastic toe with partners who are now far scattered abroad, and others who have served their country unto the last sacrifice. Once again the hall was filled with happy faces but the gathering was of a different nature to those of previous times. Now the girls were paying tribute to brave lads who, on the call of duty, had turned their backs on home and comfort, and gone forth to face the horrors of war and got stricken by the way. The guests arrived about 3 p.m. and quickly made friends. They had time to choose their partners by tea-time, and the meal was a merry one. After tea a charming musical programme was carried out by the soldiers, the staff and their friends—the former meanwhile enjoying the soothing cigarette and the girls the sweets which had thoughtfully been provided. Mr. Crawford J. Millar, district manager, fulfilled the duties of chairman in a delightfully happy manner—adding another link to the chain of esteem in which he is held by the staff. Among the invited guests were the trunk and local supervisors, the traffic and assistant traffic managers, the controller and matron, telegraphs. Corporal Milne from the Castle Hospital expressed the thanks of the guests to their fair hostesses in a neat and very apt speech. All agreed with him "that the time was up and the Tommies had to ring off" all too soon. The latter part of the evening was spent in dancing and games. The catering, musical and financial arrangements, which were entirely in the hands of the girls, reflected great credit on their organising ability and unflagging energy.

SUBSIDIARY TELEPHONE SERVICES.*

BY M. C. PINK.

THE subject upon which your committee has asked me to prepare some notes for your consideration this evening is a wide one, and I must crave your indulgence if I gloss over many aspects of it which are deserving of full treatment in order to concentrate more particularly on the more important subsidiary services.

Under the chairman who presides over this society's meetings this session one has some hesitation in presenting a paper which cannot claim one iota of literary grace. We all hunger for literary feasts, so allusive and also sometimes so illusive, such as those with which Mr. Walkley and other members of the secretariat can delight us. But nowadays we have to accustom ourselves to humble fare, and in presenting my remarks this evening without sugar I trust you will regard such action as a patriotic duty.

DEFINITION.

In order that the range of our subject may be clearly established, it is proposed to define "telephone service" as the function of connecting one telephone speaking point to another for the ordinary purposes of conversation. All other services may be regarded as *subsidiary* to that main function.

SERVICE CLASSIFICATION.

On the basis of this definition subsidiary services may be divided into two main classes:—

- (1) Services established for the conveyance of telephonic messages which are not actually conversations, within the ordinary meaning of the word, over a public telephone system.
- (2) Internal services provided with a main or branch exchange for the purpose of facilitating the handling of difficult calls or for the proper administration and control of exchange working.

The first of these classes comprises:—

- Phonogram service.
- Telephone telegram service.
- Telephone ordinary and express letter service.
- Alarm calls.
- Time calls.
- Calls for police, fire brigade, ambulance, &c.
- Electrophone service.

It is also legitimate I think to include under the same heading inter-communication service obtained by subscribers using private branch exchanges.

ALARUM AND TIME CALLS.

Alarm and time calls are quite minor items and do not offer much prospect of increased revenue, although they are a decided convenience to subscribers in certain cases. The number of inquiries from subscribers for the time cannot be stated. In London we handle an average of about 160 alarm calls per month, although at the present time the number is tending to diminish possibly on account of other alarms.

ELECTROPHONE SERVICES AND CERTAIN ASPECTS OF PRIVATE BRANCH EXCHANGE WORKING.

Mr. Kennedy's paper.—General descriptions of the police, fire, ambulance &c. services, of the electrophone system together with descriptions of certain business services, which were most useful in calling attention to the way in which the telephone service is bound up with the commercial activities of the country, were given in the paper on "Special Services in the Metropolis" read before this society by Mr. D. H. Kennedy in January 1915. The existence of the information then published fortunately permits me to omit from the present paper some descriptive matter which might otherwise have been desirable, and to direct your attention more particularly to certain aspects of the phonogram, telegram and express services to which it is important to devote more attention than has hitherto been given, in view of the potential development of such services in the future. These services were not dealt with in Mr. Kennedy's paper.

In the second class, *i.e.*, internal services provided within a main or branch exchange, it would I think be in order for me to deal with the details of the information desk, observation desk &c. equipment provided in a public exchange, and also with the corresponding features in connexion with private branch exchange working. It is feared that time will not permit of any more than the bare reference to such services so far as the main exchanges are concerned; but I hope to deal later with some of the special features of private branch exchange working which have had to be developed as a result of the remarkable strides made with branch exchanges during the war.

COMMERCIAL AND TECHNICAL ASPECTS.

In investigating the conditions relating to any service, two main aspects of that service must be taken into account. We have first to consider the nature and grade of service to be given, together with the amount of traffic to be handled—*i.e.*, the *commercial aspect*. Secondly, the method of operating the service and the nature of the plant which must be provided to permit efficient operating have to be determined—*i.e.*, the *technical aspect*. I am more particularly concerned with the technical aspect of the services we

* Paper read before the London Telephone and Telegraph Society.

are considering this evening; but before going into the question of the equipment which should provide the best possible conditions it is desirable briefly to review the commercial aspect.

Tariff questions are naturally bound up with the plant and operating aspects of the case and cannot, therefore, be dealt with until the quantity of the service handled and the manner in which it is to be handled have been finally decided. It is not proposed to develop any tariff arguments in the present paper. I trust, however, than an article on "An Express Idea," by Mr. J. Webster, which appeared in the November 1916 number of THE TELEGRAPH AND TELEPHONE JOURNAL, has been fully studied by our accounting experts.

A cheap tariff must carry with it low administration expenses. There is a tendency for the office charges for Postal services passed by telephone to remain high. At one time in London the office costs amounted to 22 per cent., of the derived revenue. They have now been reduced to about 12 per cent. but no doubt further accounting simplification would bring about a further reduction in this percentage.

COMMERCIAL ASPECTS IN GENERAL.

Express Letters dictated by Telephone.—The highest recorded total of telephone express letters dealt with in one year, viz. 226,400, was reached in the financial year 1913-14. The annual total had increased by about 500 per cent. during the previous decade, but in the years just prior to the outbreak of war the annual percentage increase had fallen to about 5. Owing to the transfer of the National Telephone Company, complete figures of the growth of ordinary telephone traffic during the same period are not available, and no comparison with the growth of express traffic is possible. Trunk traffic, which was handled under fairly constant conditions during the decade in question, increased by about 310 per cent. This is a lower total increase than in the case of express messages; but if annual increases, which were probably due to the special advertisement of the express services, are eliminated the remaining annual increases in trunk traffic are higher than those experienced with expressed services. It seems clear that the public have not appreciated to the fullest extent the advantages of the telephone express letter. When the time comes an enthusiastic advertising campaign should increase very considerably the demand for such services.

Ordinary Letters dictated by Telephone.—To those of us who know from personal experience the convenience of this particular service it seems an extraordinary thing that throughout the whole country less than 7,000 ordinary letters are handled in this way annually. The actual total for 1914-15 was 6,700. When the prejudices which still linger in certain official minds against those methods of advertisement which the London Telephone Service and certain of the Secretary's traffic officials favour, can be overcome and written message services can really be offered to the public in an inviting way, it can safely be anticipated that the 7,000 telephoned ordinary letters per annum of the present day will be very considerably exceeded. This bye-product of the telephone system should materially affect the dimensions of the phonogram rooms of the future.

Phonograms and Telephone Telegrams.—These two classes of transactions are dealt with as one in view of the difficulty of obtaining statistics of phonogram work apart from telephone-telegram work.

The total number of telegrams dictated over the telephone during the financial year 1914-15 was 7,748,000. It is estimated that during the same year 4,285,000 telegrams were delivered by telephone representing 4.87 per cent. of the total number of telegrams delivered. Five years previously the percentage was only 2.7. A good deal of attention is being paid to the question of delivering telegrams by telephone owing to the difficulty of delivering telegrams by hand being enhanced by the scarcity of messengers.

The extent to which the telephone has replaced the telegraph for the transmission of written messages during the war is strikingly demonstrated by the following figures:—During the financial year 1915-16 the total number of telephones handled was 84,157,000, as compared with a total of 91,179,000 in 1914-15, a traffic decrease of 8 per cent., in spite of the set-off of a marked increase in Government work. The number of telegrams sent by telephone during 1915-16 was only 27,000 less than in 1914-15—a decrease of only .3 per cent. The alteration in tariff was responsible for the drop in the traffic as a whole, but it will be seen that the effect of the increased tariff on traffic in the case of telephoned telegrams has been almost counterbalanced by the increased use of the telephone system.

The Postmaster-General's return for 1915-16 does not give the total number of Post Offices now transmitting their telegraph work solely by telephone. In 1913-14 the number was 6,257 and this had increased to 7,350 in 1914-1915. There is little doubt that the number is now very much larger for the country as a whole. In London alone the number of telegraph circuits closed down in favour of telephone working during the war is now running into hundreds. In many cases the use of the telephone for telegram service will be retained after the war.

If a really efficient phonogram service can be guaranteed, the public use of phonogram and express facilities after the war should increase very considerably.

POSSIBLE DEVELOPMENT OF THE WRITTEN MESSAGE.

Apart from the development which would arise from the more extensive advertisement of the existing facilities there is the expansion which might be expected to follow from a differentiation, suggested in Mr. John Lee's recent paper before this society, in the rates charged for long distance and short distance telegram work. It seems clear that, whatever the relief given to the public on charges for short distance telegrams, the result of that relief would be a definite increase in the service demand. The shorter the distance over which a telegram has to be transmitted the greater will be the probability

of an ultimate decision to transmit the message by means of telephone circuits.

With a short distance telegram charge approximating to the charge for an express message in force, there will probably be no reason for retaining different names for the various written message services. There is no real reason why a message which is passed by a subscriber direct to a Post Office for delivery should be regarded as differing from a message which a member of the public hands over a Post Office counter for transmission by an official. The addition of a small charge to cover the services of the official in the latter case is incidental. I think it is desirable, therefore, in collecting one's thoughts as to the future of these services, to set on one side the existing distinctions of service nomenclature and to accept as our main subsidiary telephone service problem the consideration of how we can best handle in London, on the large scale which will probably develop in the future, written messages of the following general types:—

- (a) From subscriber to delivery office.
- (b) From Post Office official to delivery office.
- (c) From subscriber to central recording and transmitting office.
- (d) From Post Office official to central recording and transmitting office.

LIMITING PHYSICAL CONDITIONS OF A TELEGRAPH SYSTEM OF TRANSMISSION.

Official association with one particular branch of our vast system of communications rather inclines one to base his views regarding the system as a whole on the views derived from the experience of his own section of the work. Many members of this society have what I may perhaps call the telegraph view of communications and fail somewhat to realise the different problems which have to be faced in a telephone system, just as many of us whose lives are spent in wrestling with telephone problems are ignorant of the more or less related telegraph problems. Mr. Tyrrel refers to this point in the current number of THE TELEGRAPH AND TELEPHONE JOURNAL.

If I may say so, I think there is perhaps some danger of the problem of the future method of handling telephoned written messages being regarded from the telegraph rather than the telephone point of view, in spite of the fact that in all the classes of messages I have just mentioned only telephone apparatus is involved from the time the message is dictated at its originating end to the time it is taken down as a written message for delivery or for onward transmission by telegraph. Before embarking, therefore, on the consideration of the telephone system which is best suited for the handling of this traffic I would like to refer briefly to the fundamental conditions of the telegraph system and to compare them with those which have to be met when dealing with telephone traffic.

A telegram instrument (the equivalent in a telephone system of a subscriber) is permanently associated with a particular line. Generally speaking the line has apparatus permanently connected at both ends. In the case of a line associated with a concentrator switch it is true that one end is capable of being connected with the similar end of another line, and in this way bears a resemblance to a subscriber's circuit on a telephone system. The analogy only holds good, however, in the case of a circuit in an isolated telephone exchange which is not linked up with other exchanges by means of junction groups, and which is, therefore, restricted to the handling of local calls as between one subscriber and another on the same exchange. With such a simple system of circuits, whether equipped with telegraph instruments or telephone sets, it is quite a simple matter to arrange to hold over any demand which cannot be acted upon at once; and it will be clear that the decision to defer a demand is arrived at without the employment of any plant which could be utilised for other services.

CONDITIONS APPLYING TO THE TELEPHONE SYSTEM.

A local telephone system comprising more than one exchange is designed on the assumption that the chances of any one call failing to go through on the first demand owing to inadequacy of line plant is negligible. Inter-communication between the huge number of available speaking points in an area like that of London can only be effected by the provision of groups of junctions which are not earmarked for the service of any particular terminal circuit but are available indiscriminately for any of the calls passing over the route. Commercial loads and efficient service on the junctions can only be obtained by the provision of switching and signalling conditions which will ensure the rapid release of lines at the termination of one call and their immediate re-employment for other services. If the Telephone Administration did not aim at eliminating delay, the pressure and harassing staff conditions due to an accumulation of delayed calls, together with the public irritation at the delays experienced, would quickly lead to an impossible state of things.

THE DELAY PROBLEM IN CONNEXION WITH HANDLING OF TELEPHONE MESSAGES.

I wish particularly to emphasise this fundamental difference between the telegraph system and telephone exchange system because, as the consideration of the future of telephoned messages is developed, we must inevitably come up against the question whether a system of allowable delay such as can be accepted with impunity by a telegraph administration, whether on lines working with fixed terminal sets or in conjunction with a concentrator switch, can be reasonably applied in the case of a telephone system.

I think I am right in saying that the Controller of the Central Telegraph Office, who takes a keen personal interest in all aspects of telephoned telegram work, is prepared to accept the view that in all cases where a telephone subscriber desires to dictate a written message over the telephone system, his demand should be handled right up to the recording point on what is

known as a "no delay" basis. He is, however, of the opinion that an ordinary telegram transmitted from a Post Office by telephone should be liable to suffer some delay in order to permit of a certain degree of staff economy during the busy portions of the day—just as the message would be liable to suffer delay if it were transmitted telegraphically.

"NO DELAY" SERVICE ON ALL CALLS GOING DIRECT TO DELIVERY OFFICE.

I take it that it is agreed by all concerned that terminal delivery offices which are available for the purposes of writing down and delivering telephoned messages should be provided with telephone circuits on the same basis as subscribers, and that the chances of delay owing to engaged terminal lines should not therefore be greater than those experienced in connexion with subscribers' calls proper. In fact it will no doubt be agreed that the Department would provide service on the lines of the ideal subscriber and would not adopt the course taken by so many shortsighted subscribers of refusing to provide adequate channels for their telephone traffic. In such circumstances the telephone service at delivery offices would on the whole be better than that applying on the average to subscribers' circuits. If this is agreed, we have only to consider the question of allowable delay in connexion with such written messages as have to be passed to a central office, such as the phonogram room in the Central Telegraph Office, for onward transmission.

PRESENT CONDITIONS IN CENTRAL TELEGRAPH OFFICE PHONOGRAM ROOM.

At the present time the Central Telegraph Office phonogram plant is carrying under the same service conditions both subscribers' phonograms and telegrams telephoned to and from Post Offices. At times the traffic suffers delay. This is admitted by the Central Telegraph Office who claim, however, that if the arrangements were such as to avoid delay it would be necessary to employ during busy periods double or even treble the phonogram staff at present authorised. It is on this account that Mr. Newlands, while, as I have already said, agreeing to accept "no delay" conditions for phonograms from subscribers, has proposed that the treatment of telephoned telegrams should be segregated from that of phonograms proper and should be subject to a recognised condition of probable delay.

If it were a fact that the ratio of staff requirements between "no delay" service and a service involving a recognised delay of moderate dimensions, say 5 minutes were of the order of 3, or even 2 to 1, it is agreed that the case for differentiating between phonograms and telephoned telegrams might be a strong one.

CLOSER CONSIDERATION OF THE RELATIONSHIP BETWEEN STAFF AND DELAY.

In this connexion, however, it is interesting to consider the difference which exists between telephone service provided on a delay and on a "no delay" basis. The trunk routes are an example of the former type. In this country while there is recognised relationship between delay on a trunk route and the revenue earning power of the route, such circuits are in practice not provided on the same traffic basis as shorter lines designed to carry traffic without appreciable delay. So far as I know no investigations have been carried out by the British Administration on routes capable of providing "no delay" conditions which would be sufficient to enable us to say what circuits we could actually save by recognising delays of various periods instead of adhering to "no delay" conditions. Other telephone administrations, however, provide long distance lines on the same basic principles as short distance lines, and it is possible to obtain from their standards a direct comparison between the number of channels required for the disposal of traffic on a "no delay" basis and the number required for the disposal of the same amount of traffic on a recognised average delay of 5, 10 or 15 minutes. Under the American Telephone and Telegraph Company's practice the conversion of a service suffering from a recognised average delay of 10 minutes to a "no delay" service would involve an increase in the number of channels available for the traffic of 41 per cent. To convert an average delay of 5 minutes to a "no delay" service the increase would be 12.5 per cent. only. It is a well-known feature in all telephone work that once the traffic gets out of hand the difficulties arising from that condition are altogether out of proportion to the additional staff required to eliminate the trouble. I cannot help feeling that this feature has not been fully taken into account by our telegraph friends in estimating the proportionate staff increase that would be involved in eliminating delay in the phonogram room; but I should be glad to hear the views of any Central Telegraph Office officers present on this point.

DETAILS OF PRESENT TRAFFIC.

An analysis has been made of the traffic outgoing to the Central Telegraph Office from all the London exchanges. This now amounts to about 550 calls in the busy hour. The proportion of telephone telegram work fluctuates somewhat, but it is generally approximately half the total traffic. The junction holding time appears to have gone up considerably during the past year or so. The average is about 4.6 minutes as compared with the 3.6 obtained from an earlier record. The increase in the number of telegraph offices disposing of their work by telephone and the tendency of some of those offices to retain connexion for the passage of a series of telegrams will naturally tend to keep the average holding time at a much higher level than that which obtained under pre-war conditions. It is perhaps worth pointing out that even if there is no increase in the number of transactions handled, an increase in the holding time per transaction from 3.6 to 4.6 minutes would necessitate an increase in the number of channels handling the traffic of 28 per cent. This is a point which must be taken fully into account when dealing with the phonogram staff question.

EFFECT OF ACCEPTED DELAY ON TELEPHONE SWITCHING CONDITIONS.

If a recognised delay system were introduced it would be quite impossible to throw the burden of the "delay" upon the calling Post Offices, leaving them to repeat their demands and take their chance of getting a connexion to a vacant recording operator at the Central Telegraph Office. It would be necessary to institute some intermediate switching point, as an alternative to the present distribution board in the Central Telegraph Office, at which when it was not possible to connect a call on demand, it would be possible to speak to the calling Post Office, get that Post Office to wait for a short period if it were expected that a connexion could be given shortly or to note the call, if a longer delay seemed probable, and reverse the connexions when the phonogram room was in a position to deal with it. A system of this sort could be developed, and I will deal further with the question later, but obviously the switching arrangements would have to be adequately and efficiently staffed. While it is difficult to gauge exactly what staff would be necessary for this work it is clear that there would be a distinct set-off against any saving in recording staff.

The position of the Post Office official despatching a message from a Post Office should also be taken into account. It is surely better that that officer, who may be required to attend to a miscellaneous variety of public duties, should be able to dispose of any message quickly and to avoid the constant necessity of having to hold on to the telephone for extended periods while waiting for a recorder to take down a message.

After considering all the points in favour of a system of accepted delay from the Central Telegraph Office point of view, I cannot help arriving at the conclusion that the desirability of regarding phonogram plant as an integral portion of the telephone system and of staffing it on such a basis as to ensure the elimination of any appreciable delay, is in the best interests of the Administration as a whole.

METHOD OF HANDLING INCOMING WORK ON "NO DELAY" BASIS.

When once a recording operator in the phonogram room has become associated with a particular calling line she can undertake no other duties until the caller has been disposed of. The overlapping work which is possible on ordinary telephone operating positions and on information desk services in many cases, cannot be applied. It is clear from this that the amount of plant required at each recording position is very small. This plant can only be kept at a minimum if some switching point exists at which it is the function of a particular operator to connect the calling line to a vacant phonogram recorder.

Suggestions have been made for the elimination of this switching point and the setting up of conditions which would permit a recording operator to accept a call direct from any calling line in the system, or at any rate from any one of a group of such calling lines. If it were to be possible for every recording telephonist to answer any incoming call, the answering equipment would have to be of considerable magnitude. There are at present 157 junctions incoming to the London Phonogram Room, and if these were rendered directly accessible to each phonogram recorder, even on the basis of one calling equipment per three recorders, each calling equipment would have to be ancilliaried about 25 times, with consequent waste of plant, wiring, current consumption, &c. This wastage is emphasised by the fact that in the nature of things the ratio of lines in simultaneous occupation to the total incoming lines is not high, and this ratio decreases as the number of junction routes arising out of an extensive system increases.

It must be admitted that in the case of a small phonogram service, involving up to say ten recording operators, an ancillary system providing direct access to all recording operators is attractive. It might be argued that there would be a case for providing for the larger phonogram conditions by supplying an installation with a number of small ancillary groups, each having its particular calling circuits allotted to it. It must, however, be remembered that traffic varies in intensity over the different portions of a system of this description, and that staff economy could only be ensured if the whole of the incoming staff could deal with the traffic fluctuations as a whole. If the scheme of supplying a number of small ancillary groups were adopted, there is no doubt that, with the fluctuations that take place, times would arise when units of the ancillary system which were fully staffed would be unable to cope with traffic rushes, while, owing to the inelasticity of the system, other units which were not so busy would be unable to assist. It is considered that with any system of ancillary working for phonogram traffic it would most probably be necessary to provide specially for overflow work from any group by means of simple circuits terminating in head sets or pedestal sets, and that in any case with such a system the plant provision would be very costly.

It is felt that the case for the use of an ancillary system is not convincing, and that we should rely either on manual distribution of work to the recorders somewhat on the lines of the existing system, or on the substitution of distribution by means of automatic switches for manual distribution.

MANUAL DISTRIBUTION.

The essential features which must be provided for if the phonogram system is to be thoroughly efficient are:—

1. Good transmission over all circuits.
2. Efficient junction working to the phonogram room.
3. The protection of any junction to phonograms from use by an outgoing operator unless that junction is disengaged at the phonogram room and in a position to receive an incoming call.
4. The prompt connexion of an incoming call to a disengaged recording operator.
5. The prompt clearance of junctions at the termination of transactions,

6. The elimination of any chance of a recording operator being connected for a fresh transaction before she has completed the earlier transaction.
7. An efficient means of attracting the attention of the recording operator.
8. The provision of circuit conditions which will prevent the recording operator from leaving circuit after she has been connected for a call until she gives a definite clearing signal to the distributing point.
9. Adequate supervision.
10. Regular observation of work and tabulation of results both quantitative and qualitative.

I am aware that the case for insisting that at the termination of a phonogram transaction the recording operator shall promptly clear her stall, has already been fairly fully dealt with in discussions on the phonogram service, and I know that telegraph officials are strongly of the opinion that the phonogram recorder should be allowed a certain amount of time at the termination of a transaction for the clerical work which she is called upon to perform. The final decision as to the necessity or otherwise for this is such a vital feature in the consideration of the ideal equipment, that I fear the point must again be referred to here. The sequence of events at the termination of a phonogram transaction has to be very clearly kept in mind. When a calling subscriber finishes dictating his phonogram he hangs up his receiver and clears to his local "A" operator. If the phonogram operator clears practically simultaneously, the controlling "A" operator receives a double "clear," takes down the connexions and there is no trouble. If the phonogram operator fails to clear, the controlling "A" operator gets a single lamp supervisory. Under her instructions she waits for 10 seconds, then enters circuits and inquires if the caller has finished. She may or may not receive a reply from the phonogram operator. In many cases it appears that this operator cuts herself out of circuit as she is able to with her existing installation, especially when using a pedestal set, and does not hear the challenge, although her stall is still connected to the incoming junction used for the transaction. The "A" operator, if told by the stall operator that the connexion is not finished with, is in a quandary, because so far as her originating subscriber is concerned the transaction is ended, and there should be no necessity to ring him back. If she gets no reply to her challenge she takes down connexions in accordance with her telephone instructions, and under the present circuit conditions the junction which she so releases is rendered immediately available for another call. Any operator in the originating exchange may make immediate connexion to that junction for a further transaction, and the fresh caller will, in such circumstances, be connected straight through to the recording point at which the operator will either be still engaged on the previous transaction or have just given a clearing signal to the distribution board, which would cause the distribution operator to take down the connexion and would leave the caller stranded on the calling line without giving any signal to the phonogram distribution board to indicate that he was without service.

If, after the fullest consideration, it is still deemed necessary to allow the phonogram recorder power to retain her stall after the caller with whom she has been in communication has cleared his line, then it is essential, if efficient working is to be ensured, to provide the recorder with some means of notifying the distribution point that the calling junction can be freed, but that the stall must be held. This would imply that she would have to be in a position to give a further signal when her stall became available for the next transaction. This complication of the signalling system would naturally involve a considerable amount of engineering work and would render the operations at the distribution point more difficult.

AUTOMATIC DISTRIBUTION.

An alternative to manual distribution would be the use of automatic selector switches. A scheme for the use of such switches in connexion with the distribution of demands to recording telephonists in the London Trunk Exchange was considered some time ago and adopted. The scheme in question proposes the use of Siemens' pre-selector switches, which, by means of second pre-selectors, will have access to all the recording telephonists in the exchange. The first pre-selector will be started by the insertion of the "A" operator's plug at the calling exchange, and a signal will be practically simultaneously given to the first available record telephonist. At the termination of the transaction the record telephonist will depress a clearing key, which will immediately release the selector switches and render the incoming record line available for a fresh service. If the caller desires to speak to the information desk, the recording telephonist will depress a transfer key, which will cause the second pre-selector switch used for the connexion to her instrument to travel on, ignore connexion to other record telephonists and effect a connexion to a disengaged information circuit, at the same time freeing the recording telephonist's line for its normal functions.

The scheme includes a system of storing waiting calls. The adoption of this storage system is justified by the fact that the average holding time in the case of a trunk recording telephonist is only 34 seconds, and the average wait for second choice calls during a traffic peak will, therefore, be only 17 seconds.

It would be possible to instal a somewhat similar system for the distribution of phonograms and telephone-telegram demands from incoming junctions to vacant phonogram recorders. In designing a suitable system the difference between the 34 seconds holding time experienced in connexion with trunk recording transactions, and the average holding time in the phonogram room of about 4.6 minutes would have to be borne in mind. In my opinion it would not be a practical proposition to utilise in connexion with phonogram work the same system of providing for the storage of one waiting call in view

of the fact that the average waiting time would be nearly 2½ minutes. Apart from the telephone operating difficulties that such a condition would introduce, no one would agree that a telephone caller should be kept waiting for such a time without any definite advice as to what was happening.

The provision of a means of guarding a stall from a further call after it had released the calling junction could probably be made more readily on an automatic system than on a manual system, but it would be much more open to abuse on the part of the recording staff and a very complete system of checking lamps would have to be installed and kept under frequent observation.

(To be concluded.)

ENTERTAINMENT OF WOUNDED SOLDIERS, BRISTOL.

On Saturday afternoon, March 31, the fourth entertainment to wounded soldiers was given by the District Manager's staff, this time by the operative staff of the local exchange. The young ladies and the "boys" were fairly matched in numbers, and some 130 in all sat down to an excellent tea. A capital entertainment had been arranged by Miss Nicholls who is in charge of the exchange. Amongst the artists who contributed to the enjoyment of the afternoon were Miss Dora Bubbear, Miss Talbot, Miss Ash, Mr. Wilshire, Mr. Lionel Venn, Mr. Townsend and two of the "boys."



The District Manager, Mr. T. A. Bates, acted as chairman, and welcomed the guests on arrival. Amongst the visitors were the postmaster, Mr. Beaton, Mrs. Beaton, Mrs. Bates, Mr. Townsend, secretary of the Inquiry Bureau, with Mr. Baines, Mr. Crombie, Telephone Traffic Superintendent, Mrs. Crombie and others. The room was tastefully decorated with spring flowers, and from all accounts both hostesses and guests much enjoyed themselves.

DALSTON EXCHANGE STAFF CONCERT.

An evening concert was given by members of the Dalston Exchange staff and friends on Saturday, April 21, at Aspland Hall, Chatham Place, Hackney, to assist the Entertainment Fund for Wounded Soldiers. A good programme was arranged which well displayed the talent of the staff. The concert commenced at 7 p.m. with a selection of solos, duets, recitations, &c. Next came Mrs. Jarley's waxworks, with a display of notabilities including the "famous" Charlie Chaplin. Evidence of the huge success of this show was forthcoming in the laughter and applause which greeted each new figure as it was uncovered. During the interval sweets were sold for the cause, after which the musical programme continued. Lastly came a playlet entitled "The Betrothal," an old English love story. The quaint costumes and dresses added much to the fine acting and the male character was played by one of the telephonists with small loss of effect. All who took part in the concert were well rewarded by the reception given by an enthusiastic and delighted audience. It is not yet certain how much the fund will benefit but it is thought that about £10 has been realised. This sum will help towards entertaining more wounded soldiers at an early date.

THE POST OFFICE SANATORIUM SOCIETY: SECRETARY'S REPORT.

The secretary, in submitting his report to the fifth biennial conference of the society, gave a brief *resumé* of the past two years' working, supplemented by a statement showing, that during 1915, 2,140 new members had been added, making a total estimated membership of 58,500. The society had dealt with 213 claims during 1915, and 120 cases had been completed. A percentage of 88 of satisfactory results had been obtained, which was highly satisfactory. The average stay was 19½ weeks; the longest stay being 56½ weeks on the men side and 52 weeks on the women side. The Army medical examination had resulted in eight members being rejected for phthisis, who were now under the society's care; whilst the number of cases at present under treatment was 53. Despite military requirements, the society is still able to maintain its record of granting relief without a waiting period.

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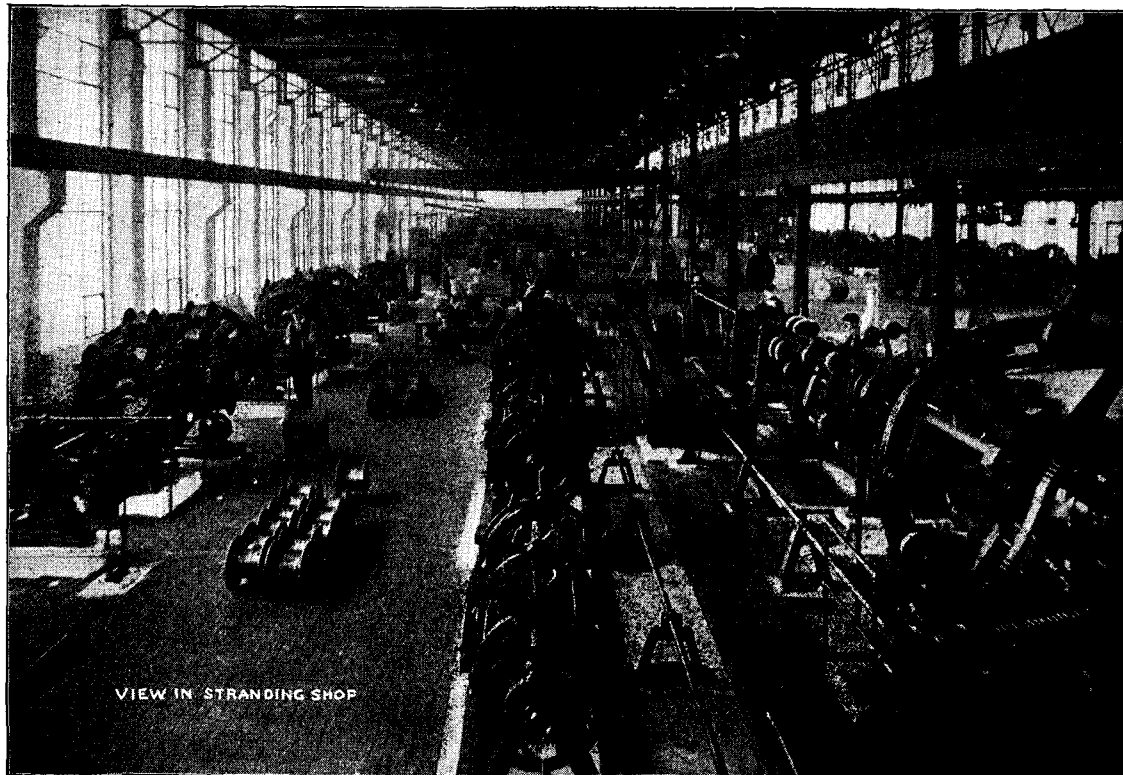
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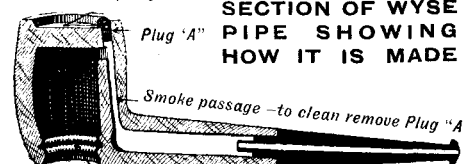
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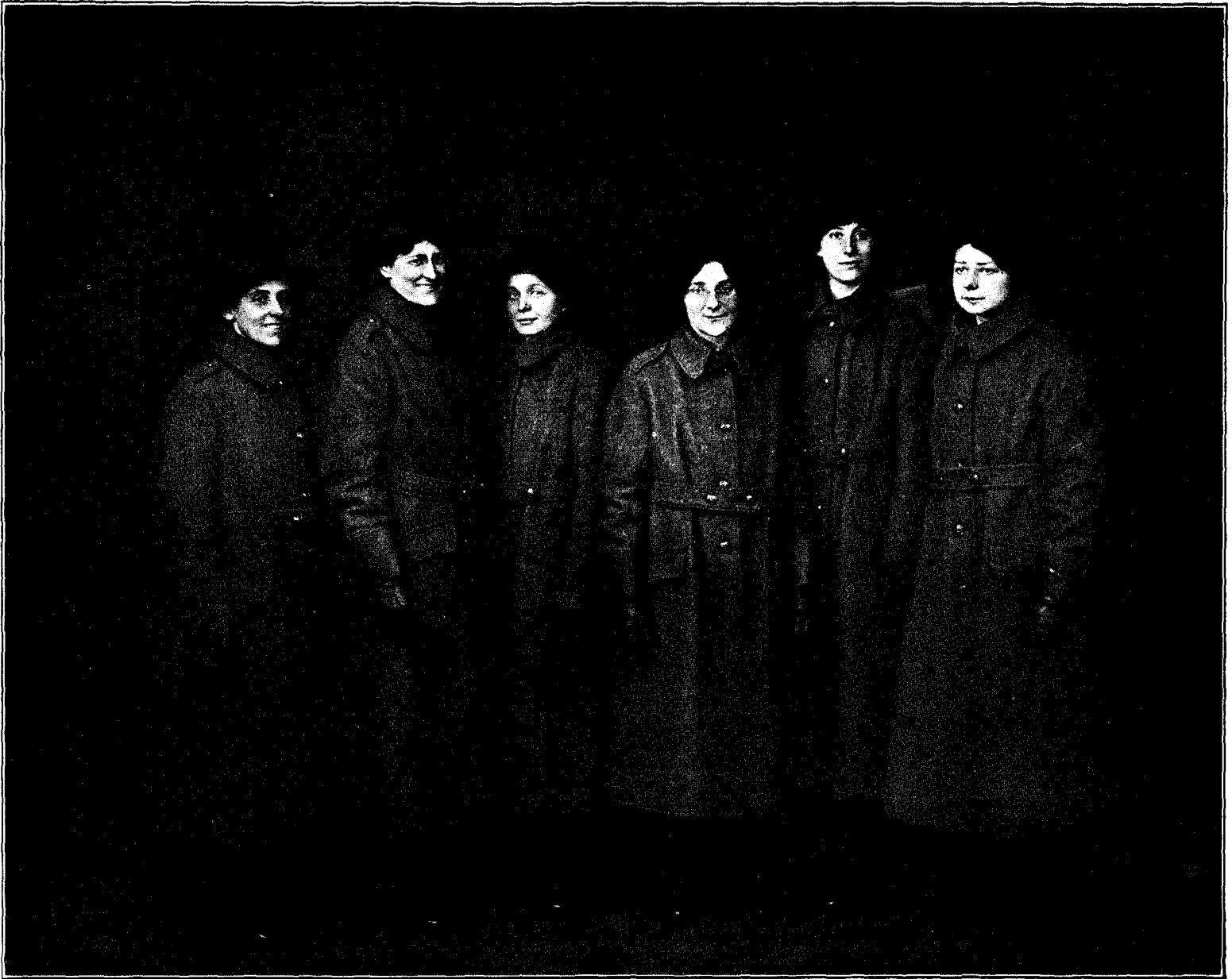
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THE FIRST BATCH OF WOMEN TELEGRAPHISTS FOR FRANCE.

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PERSONALIA.

LONDON TRAFFIC STAFF.

Miss C. S. HARBARD, of the Holborn Exchange, has resigned in view of her approaching marriage and was presented with a tea service by the staff.

Miss A. E. SIMS, of the Holborn Exchange, has resigned to be married and was presented with a case of fish knives and forks, and several other gifts.

Miss M. L. BANSON, a Telephonist of London Wall Exchange, resigned on account of her approaching marriage and was presented with a case of fish knives, forks and servers and a case of tea spoons.

Miss R. ALLEN, of the Trunk Exchange, has resigned to be married and was presented with a silver tea service and other presents by her colleagues.

Miss B. M. GOFFE, of Trunk Exchange, has resigned to be married and was presented with a salad bowl and servers, and other presents.

Miss E. M. FOSTER, of the Trunk Exchange, has resigned on account of marriage and was presented with a salad bowl and servers, and other presents.

Miss E. C. M. CREED, a Woolwich Arsenal Telephonist, resigned in view of her approaching marriage and was presented by the staff with a tea service, biscuit barrel and a butter dish.

Miss E. F. LUDLOW, of Paddington Exchange, has resigned to be married. She was presented with a dinner service and several other useful presents by the staff.

Miss W. N. MARSHALL, of Holborn Exchange, has resigned on account of her approaching marriage and was presented with an oak tray and a bread basket.

PROVINCIAL STAFF.

Miss M. A. BARROW, Senior Typist and Shorthand Writer, District Manager's Office, Gloucester, has resigned after eleven years' service to take up other employment. She was the recipient of a gold wristlet watch from the staff.

Miss A. M. SHADGETT, Senior Telephonist of the Gloucester Local Exchange, has resigned on account of marriage. She was presented by her colleagues with a handsome timepiece of Sheraton design, suitably inscribed.

Miss H. P. MULLINGER, Clerical Assistant, District Manager's Office, Gloucester, and formerly Telephonist at the Cheltenham Exchange, has resigned to take up other employment. She was presented by her colleagues with an ebony manicure set.

Miss D. M. G. JAMES, Clerical Assistant of the District Manager's Office, Gloucester, recently resigned to be married, when she was presented by her colleagues with a silver-plated cake basket.

Miss C. S. BRINKWORTH, after two and a half years' service as Temporary Clerical Assistant in the District Manager's Office, Gloucester, has resigned to take up other employment. She was presented by her colleagues with a pair of silver-plated flower vases.

Miss A. STONE, Supervisor, Class I, Portsmouth, was presented with a gold wristlet watch, subscribed for by the members of the telephone and engineering staffs, on the occasion of her transfer to the Bournemouth Exchange on March 31.

Miss I. YATES, Telephonist, Bristol, on the occasion of her resigning to be married after nine years' service, was presented by the staff with a silver cake basket.

Miss O. VENN, also a Telephonist at Bristol, was presented with a tea service on the occasion of her resigning to be married.

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BRITISH TELEGRAPH PRACTICE.

(Continued from page 114.)

II.—THE ACCEPTANCE OF TELEGRAMS FROM THE PUBLIC.

In British telegraph practice there are two ways in which telegrams normally are accepted from the public. They may be handed in over the counter or they may be passed over a subscriber's telephone circuit. Until quite recently the handing in of telegrams over the counter was the general method, corresponding to American practice, which describes the process as "filing" a telegram, but in recent years there has been a steady development of using telephone circuits for the purpose and this development has been accentuated during the war largely as a result of the difficulty in obtaining the services of office boys for the conveyance of the telegrams. This method has the advantage of being available so long as the office where the telegram is accepted by telephone, usually a central office, is open, so that the subscriber is not bound by the hours of attendance of his local telegraph office. Exceptionally, telegrams may be deposited in post letter boxes, subject to being properly prepaid, or they may be handed to a rural postman, or to a telegraph messenger. Forms are provided for writing the telegrams, but the public is not bound to use them, and arrangements are made so that telegrams may be accepted if written on ordinary paper. Permission is given, under certain conditions, to persons to have their own forms specially printed, in order that they may provide for special devices, such as duplicate or even triplicate copies. The Post Office issues specially embossed forms with medallions to represent the charges and with a provision for duplication. Different forms are used for originated telegrams according to their destination, whether British, European, Extra-European, North American, or according to their nature, whether press, or ordinary, or deferred, or "week-end." The British system, like the American, is more separated in character from the international system than the French or German systems, and this is indicated by the forms on which the public write their messages.

The characteristic British system of accounting for charges is by means of adhesive postal labels or stamps affixed to the forms. This was introduced at the time of the transfer in 1870. For a few years a separate telegraph label was used in order that the telegraph revenue might be more easily estimated as separate from other aspects of the Post Office revenue. This system of using a separate telegraph label had a somewhat chequered history, but in the end it became clear that the separate revenue could be estimated from an examination of the originating forms even if the charges were accounted by generic labels available for postal, telegraph and inland revenue purposes. The history of the separate telegraph label was not very different from the history of the special label for receipt stamp purposes. The only check on dishonesty in the case of telegrams accepted over the telegraph counter lies in the regulation that the public themselves must affix the stamps, the presumption being that the official cannot remove those stamps without leaving signs on the originating form that they have been removed. In practical working this seems to be quite a satisfactory check; certainly it is less costly and cumbersome than any system of receipts given to the public. It has the advantage of being a permanent evidence of the payment of the money so long as the forms are in being. Receipts for the amount paid may be obtained by the public on payment of a penny fee. There are signs, at the moment, of the production of small machines which will stamp the telegram form and a check sheet with the chargeable amount. These instruments are being developed in America and they may afford an improvement upon the English gummed label system.

The most striking change in the method of payment for telegrams was in 1885 at the introduction of the sixpenny tariff. Before that time the name and address of the sender and the name and address of the addressee were telegraphed free of charge. After that time all words were charged for except the office of origin, and the time at which the telegram was handed in. This followed the Continental but not the American precedent and had a natural consequence. The name of the sender came to be placed at the end of the message in the form of a signature instead of at the beginning. Other changes in respect of the acceptance of inland telegrams lay principally in the allowance of five figures or cipher letters for a word, and in the arrangement whereby indicative words such as "reply paid" were telegraphed free of charge, as showing that the reply telegram has been prepaid. This last arrangement was the result of a process of evolution. If the prepayment of a reply is indicated only in the instructions to the service and is not included in the actual message and therefore in the number of words, there is a danger of omission in transit. To telegraph it as part of the address is a safeguard against omission and also relieves the sender from the necessity of paying for the intimation that the reply may be despatched free of charge to the recipient of the telegram.

This method of charging for the addresses naturally gave a stimulus to the system of abbreviated registered addresses. Of these there are 80,000 in London at the present time. The charge is one guinea per annum and this includes the charge for the registration of special instructions for the delivery of telegrams to alternative addresses including the variation of these special instructions from time to time. The question of the desirability of registered abbreviated addresses is open to discussion; they are still looked upon with disfavour in the United States for inland telegrams, where a system is in force of allowing a certain number of words for the address, any excess being charged. Probably their use has been a little strengthened in England by the introduction, a few years ago, of telephone addresses, whereby a telegram may be addressed to a subscriber by his exchange and telephone number, an address but little longer than the registered abbreviated address, and carrying with it a tacit instruction that the message must be telephoned to the addressee. In London, owing to the enormous work entailed in consulting huge lists of abbreviated addresses before telegrams can be circulated to the appropriate delivering office, a system has been introduced whereby the delivering office can be indicated by an "indicator" word. This involves the telegraphing of three instead of two words for each arbitrary address, but the indicator word is telegraphed free of charge. It has the advantage in point of rapidity of transit that the distributing official can see at a glance to which delivery office the message should be circulated. The question of portage, that is, of a charge for delivery from a telegraph office to a distance more or less remote will be discussed in the chapter dealing with the delivery of telegrams, but it is necessary to say at this point that the accepting officer must have some indication, before levying the charge for the telegram, whether or not an additional impost should be made for conveying the message beyond the limits of free delivery. This is provided by a list in the Post Office Guide which shows the distance of places not provided with a telegraph office from the nearest telegraph office where delivery facilities are available. Consequently, it is the primary duty of the accepting official to ensure that the name of the destination in each telegram which he accepts is a telegraph office, that it is open for business at the time at which the telegram will probably reach it, and that if an additional impost is necessary to provide for delivery either by physical or other means it should either be paid or the subsequent payment should be guaranteed.

The fundamental presumption is that all telegrams are paid for in cash. To prevent inconvenience in paying for large numbers of telegrams day by day by means of separate charges, arrangements are sometimes made for what is called a Merchant's Deposit Account. In these cases the Post Office

holds a sufficient sum to pay for the telegrams. Its officials attach the appropriate postage stamps or labels to each telegram and debit the amount against the deposit account. A small fee is levied by way of interest on the deposit account for the facility which is thus given.

The next duty of the accepting official is to time the message, with great precision, at the moment it is formally accepted from the public. This time—which bears the technical name of "code time" from the fact that it is telegraphed forward in a code of letters—appears on all the forms of the telegram at every stage in its progress. "Code" was in its origin an ingenious method of abbreviating the telegraphic symbols, as the Morse symbols for figures are somewhat cumbersome; the development of printing telegraphs renders the signalling of time in "code" of somewhat restricted value.

Every telephone subscriber who has made suitable arrangements with the Post Office can pass his telegrams by telephone. Telegrams accepted from or delivered to the public over telephone subscribers' circuits are called "phonograms." An appropriate telegraph office is chosen in each case, and on asking for the telegram service the subscriber is put through to that office. It may be, or may not be, the head office of his district, for in some cases it is more convenient for the Post Office to switch the subscriber through to a comparatively distant point in order to save the necessary labour of an additional transit of the telegram, but it is always a centralising point. In these cases care is taken that in the telegram, as telegraphed and delivered, the name of the office at which the telegram should normally have been accepted is given as the office of origin, and the name of the office at which it is actually written is indicated by arbitrary letters which are of no significance to the public.

In the case of telephone subscribers the fundamental theory of cash payments is met by a deposit account for which no interest charge is made. The telegrams are written down, the charges assessed, and the appropriate amount is debited against the deposit account, and at the end of the month an account is rendered to the subscriber on payment of which he restores his deposit to the original sum. Phonetic difficulties are met in British practice by spelling out difficult words and figures and by the use of "analogy," which means that the letters are indicated in some such way as this—O for orange, M for Mary and so forth. This system is not beyond criticism and by some officials is considered to be inferior to the American system of using the two precedent letters, thus: O MNO, M KLM, A XYZ and so forth. Where skilled persons are available at each end of the telephone circuit a consonantal method has been adopted whereby those letters of the alphabet which are in danger of misinterpretation are conveyed by arbitrary symbols, so arranged as to meet the deficiencies of telephone speech. This system, in its origin, was a military device, and it seems to be advantageous where skilled persons transmit the telegram, but it is not suitable for general adoption to and from the public.

Press messages, which are subject to a special tariff, are usually accepted under deposit conditions and are counted at a later stage. Telegrams transmitting money, or withdrawing money from the Savings Bank are subject to special regulations, and the telegraphic transmission of money to other countries is a facility which has grown with great rapidity and shows signs of being one of the features of international economics in the future. The night telegraph letter, which has become the outstanding feature of American telegraphy, has faced in England the competition of a highly efficient postal service with a geographical area more within the compass of late collections of letters for early morning delivery than the vast territory of the United States. Still there seems to be a future for the night telegraph letter, at a tariff approximately one-sixth of the telegraph tariff.

It is not practicable with British telegraph practice, which is involved at the accepting stage with a wide and increasing variety of other Post Office functions, to estimate with precision the number of telegrams per hour which should be accepted by one official. In this respect the British system is obviously at a disadvantage when compared with the system in the United States, which provides a telegraph service and only a telegraph service, or with the system on the Continent of Europe which lays emphasis on an entirely distinct accepting point for telegrams and for no other postal work at each counter where there is anything approaching a flow of telegrams. Broadly speaking 80 telegrams of ordinary difficulty per hour are not short of a full hour's work. At places where there are abnormal conditions, such as race meetings, stock exchanges, and at such offices as West Strand and Liverpool Exchange a higher figure might be quoted. It is essential that at the accepting point the telegram should be speedily handled, that there should be such secrecy that no member of the public can read another member's telegrams, that there should be scrupulous accuracy in counting and in indicating the time of acceptance, and that illegible writing, especially in the case of unusual words, should not be passed. In a word the whole aim of telegraph counter work should be to prevent reference back from the telegraph instrument room, and once a telegram is accepted it should be finally ready for onward transmission. The officer at the counter requires a wide range of knowledge. He must be prepared to accept telegrams for any part of the world, under conditions which differ widely and in many cases with alternative routes and rates applicable. He must know the regulations governing money telegrams, application for repetitions, telegrams which entail other services such as those for foreign countries which are sent forward by post, deferred telegrams, week-end telegrams, radio telegrams, and it is not too much to say by way of conjecture that one of the results of the war will be to add to the complications. For the interchange of telegraph business is of vital importance to international trade, and the characteristic British system is to provide the fullest telegraph privileges at every point. Wherever an inland telegram is accepted, there also a telegram can be accepted for any telegraph office in the world, under all manner of varying conditions. So that the acceptance of telegrams is not the simple routine matter which it may seem to be; it

is the missionary work which brings the rapid intercommunication available by the vast network of the world's telegraphs to everybody's door, and in no country has this been carried to such an extensive development as in the United Kingdom.

III.—THE CENTRALISING OF TELEGRAPH TRAFFIC.

The intensive development of the British telegraph system is evidenced by the fact that it provides a larger number of accepting points both in urban and in rural districts than any other telegraph service. This is achieved largely by the method of agency by means of which accepting points are provided at sub-post offices and railway stations in addition to what may be called telegraph offices. The first problem which has to be faced therefore after the acceptance of a telegram from the public is by what means it shall be passed forward to the general organism.

It would at first seem that the invariable system would be to have wires from all the accepting points to the central office in each town or area, but in practice, seeing that a very small proportion of the total traffic is for local delivery, and with the recent increase of tariff a still smaller proportion, it has been found desirable in a large number of cases to connect town sub-offices, as well as the head offices in one town direct to head offices in another town. For example, two offices in Llandudno are connected with Liverpool; two offices in Blackpool are connected with Manchester; two offices in Scarborough are connected with Leeds; two offices in Brighton and two in Hastings are connected with London. This might seem to be wasteful in wires, but it is found, in view of the nature of the traffic, that the saving of a telegraph transaction at the head office of the town where the telegram is handed in justifies this departure from a more local centralising procedure. This policy has been emphasised with the development of the telephone as a telegraph instrument, since the through switching of telephone circuits to more important centres is readily provided by the telephone organism.

The smaller offices are generally equipped with the telephone, which is used both for the transmission of telegrams and for use by the public for telephone communications. The load which such a circuit can carry depends upon the ratio of the busy hour to the day's total traffic but generally speaking the official standard of 70 units (each telegram or each telephone call being a unit) with 14 units in the busy hour is not wide of the mark. There are a number of cases where this total has been exceeded, and there have been a number of cases where a smaller total day's traffic includes a heavier busy hour total in the busy hour, and a single telephone circuit has been found to be insufficient to carry the traffic, telegraph and telephone, without undue delay. The comparison between the telephone and Morse sounder working is subject to a number of limiting conditions, but it seems clear that in respect of errors the safeguards of repetition—analogue indication of letters which are similar phonetically, or the Army system already described—have checked what seemed at one time to be a disadvantage on the side of the telephone. The telephone has this great advantage that it can be switched through not only to a larger main centre for the avoidance of telephone re-transmissions, but also direct to smaller centres from which the telegram can be delivered. This is subject to the various radiating lines of the telephone organism being sufficient to permit of prompt connexions without prejudice to the quality of the purely telephone service.

Above this standard, Morse working is usually introduced at the smaller offices. Morse apparatus, unlike the telephone, is capable of being worked either simplex (one channel), duplex (two channels, one in each direction), or quadruplex (four channels, double bothway working). Translated into standard loads it would seem to be broadly the case that 40 telegrams per hour is the carrying capacity of each channel of a Morse circuit, but this is not the arbitrary standard, and to provide the proper quality of service, especially when the traffic is not quite equal in each direction, it has often been necessary to provide more channels than the bare figures of traffic would justify. More modern types of apparatus with automatic printing on continuous tape or on separate forms are not used on those lines which centralise the traffic. They are used on the main routes only, but it is probable that the fundamental principles which underlie the high speed systems will be adapted to what may be called "local" lines.

Mechanical transmission takes the place of a telegraph transmission in the case of accepting offices with a larger bulk of traffic. The general method of mechanical transmission is a pneumatic tube sometimes equipped with a hand pump when the transit is only from a counter to a telegraph room in the same building, sometimes equipped with the provision of vacuum or pressure by an engine in the case of longer tubes, or in the case where a group of tubes is required. Standards based on traffic alone are not sufficient as criteria for the provision of these devices as the cost of the arrangement differs so widely in different circumstances, and questions arise as to the conditions under which streets can be cut up for laying the tubes. In all cases the question resolves itself into the balance of cost between the expense of labour and human transmission at both ends of a wire and the cost of the physical means of conveying batches of messages, there being a slight advantage on the side of physical transmission in the fact that errors are avoided except the very rare cases of mutilation or loss of a telegram form due to accident. These tubes vary considerably in length. The longest are in London, from the West End offices to the Central Telegraph Office. The tube transit time has been much accelerated of recent years; it varies from about two and a half to five minutes per mile.

In some cases for physical transit from the counter to telegraph instrument rooms, where the telegraph instrument room is directly over the counter, lifts have been introduced; in a few other cases varied kinds of carriers have been introduced whereby cages or holders are mechanically propelled.

Though the characteristic of London telegraphy is that in the main the telegrams are centralised at the Central Telegraph Office, there is an important

variant in the provision of the intercommunication switch. This switch has some of the functions of a telephone exchange, and by its means offices within the London area, or the closely surrounding area, are switched directly through to each other for the direct transmission of telegrams by Morse sounder. Similarly, as the Central Telegraph Office is very large and consists of several floors, offices within London and surrounding London are switched through direct to the particular floor on which is placed the instrument for the outgoing transmission of the telegram and a very appreciable saving in time results.

Another variant in the method of centralising is to be found in the Provinces where telephone subscribers are switched through for the acceptance of telegrams to an office other than the proper head office. The most interesting case of this kind is Loughborough where the subscribers are put through either to Nottingham, Derby or Leicester head office, and their outgoing telegrams are written down at one of those points. Another interesting example is Wolverhampton where subscribers are switched through to the Birmingham head office, where the telegrams are written as if they were accepted at Wolverhampton. The aggregate saving of transmission is considerable and similarly there is a saving in time of transit of each telegram.

These are the devices of centralisation as they have been developed up to the present and modified by war conditions, particularly by the withdrawal of skilled Morse telegraphists for the war, but it is probable that the British Telegraph Service, like the American Service, is on the eve of a development which will include a considerable application of automatic transmission by means of telegraph instruments of a new type. The bearings of this development on telegraph practice will fall to be considered later.

The question of the physical transit of written messages has hitherto been regarded as a subsidiary aspect of telegraphy. In truth it is a different question. The express delivery services in England and America have arisen from a demand for the transmission physically not only of written messages but of more or less ponderable articles. The *Petit Bleu* system in Paris, whereby cards are specially printed and sold for the transmission of written messages by tube, is now seen to have its shortcomings when compared with an express messenger service. It may be that in larger towns we shall see a development of pneumatic tubes which will convey not only the written message, and not only the telegram for onward transmission, but also the item of material goods within a certain reasonable compass. The postal tube system in Chicago and the new Post Office tube in London are on a grander scale, but they would seem to indicate that we are far short of the full development, in crowded districts, of the capacities of the pneumatic tube. The *ad hoc* arrangement for telegrams only would seem to take much too short a vision of the possibilities of the demand. The centralisation of telegraph offices in large towns, with certain bold exceptions for particular industries, would seem to be a policy which is as inevitable as the development of large scale industries. It has been viewed, a little narrowly perhaps, as a telegraph problem only. If we could so equip the larger towns with tubes for the local transit of communications and what are called "small parcels," it is probable that the conveyance of telegrams could become part of such an arrangement, and the centralising of the traffic at the one main telegraph office would then be based on the use of telegraphy proper for distant communications, with the utmost economy in the methods of transmitting those distant communications. Tendencies seem to be in this direction. So that the telegraph service in a large town would be afforded by (a) a main telegraph office; (b) a pneumatic system from the principal accepting points over which telegrams might pass; (c) telephones at the smaller accepting points. The possibility of a cheaper and of a more adaptable tariff to variant needs depends primarily upon the reduction of the number of telegraph operations for each message. Certainly the British Post Office, throughout its history, has developed the use of pneumatic tubes for this purpose farther than any other administration, and maybe to the British Post Office will fall the leadership in some such wider scheme as that which here is indicated.

(To be continued.)

COMFORTS FOR THE FORCES PROVIDED BY THE NEWCASTLE CENTRAL EXCHANGE STAFF.

A war committee of the Newcastle Central Exchange staff was formed shortly after the outbreak of hostilities, the object being to collect and distribute funds, and in spite of great changes in the personnel of the exchange staff, subscriptions have been maintained, and they have been enabled to despatch 170 parcels to friends serving in H.M. Forces at home, abroad and on the seas. The night telephonists and members of the engineering staff attached to the exchange received the first thought, then followed the men of the labouring class, and, up to the present, the following articles have been sent out:—250 pairs of socks, 8,000 cigarettes, 160 writing pads, 40 lbs. chocolate and toffee, 100 tins oxo, 2 dozen handkerchiefs, 3 dozen tins biscuits, 3 dozen scarfs, 3 dozen pairs mitts, 2 dozen belts, 3 dozen packets boracic powder, 150 respirators, 30 lbs. Christmas cake, 4 dozen mince pies; 167 parcels have been acknowledged, two were returned as insufficiently addressed, leaving one only unaccounted for, which speaks volumes for the postal organisation. Appreciative letters from recipients have been received from time to time and credit is due to staff and committee for their thought and work on behalf of our men on active service.

THE GERMAN POSTAL BUDGET FOR 1917.

BY W. H. GUNSTON.

OUR enemy contemporary, *Blätter für Post und Telegraphie*, publishes the figures of one more war budget, of which we give our readers a summary. It is not very instructive, for, as the *Blätter* confesses, "the figures must be taken *cum grano salis* because no reliable picture of the actual receipts is obtainable and in general they have been supplied from the budget figures of 1914 which, it goes without saying, have suffered many alterations and disturbances." Nevertheless it presents one or two points of interest. As in 1915 there is no provision for "telephone purposes" in the Extraordinary Budget, and the capital expenditure on "large underground telephone works" which in 1916 was reduced from five to two million marks is now nil.

The working costs on the telegraph side have been reduced by 10 million marks (3½ maintenance and 6½ new construction). On the other hand, increased costs on the postal side could not be circumvented. Notwithstanding this a saving in the total working costs of nearly 9 millions is effected.

As the long duration of the war rendered the economic condition of wage-earners increasingly difficult and indeed intolerable, the principle of creating no new posts during the war has been abandoned as regards the middle and lower officials. 4,045 new posts were appointed for middle officials, 3,000 for women officials, and 7,120 for lower officials at a cost of 25,850,000 marks. 19.28 millions was saved on the auxiliary staff, so that an increased charge of less than 7 millions (or 1.15 per cent.) remains, "a trifling matter" says the editorial comment "in comparison to the priceless benefit which the great host of postal officials draws from this indispensable measure."

RECEIPTS.		1916.	1917.
		Marks.	Marks.
Ordinary Budget	... ..	881,288,500	881,247,500
		(£44,064,425)	(£44,062,375)
EXPENDITURE.			
A.—Ordinary Budget.			
Salaries, &c., headquarters	... ..	4,176,790	4,178,730
Salaries of oberpostdirektors, overseers, inspectors, and officials generally in Germany and Colonies	330,634,523		353,702,842
Dwelling allowances	... ..	64,982,883	70,983,730
Other personal expenses for assistance, pensions, &c.	... ..	173,831,997	160,406,321
Working costs (maintenance of travelling post offices and apparatus, payment to railway administration, despatch of posts, maintenance of telegraphs, &c.)	... ..	87,273,970	78,353,970
Sundry expenses, travelling, rents, office expenses	... ..	40,991,900	41,391,900
Building costs	... ..	3,760,000	3,770,000
Other expenses (payments to foreign railway, telegraph and shipping authorities)	... ..	37,546,608	37,546,608
		743,198,671	750,334,101
		(£37,159,933)	(£37,516,705)
Receipts	... ..	881,288,500	881,247,500
Balance	... ..	138,089,829	130,913,399
Less capital expenditure (see (b) below)		25,413,547	19,285,220
Surplus	... ..	112,676,282	111,628,179
		(£5,633,814)	(£5,581,408)

B.—*Extraordinary Budget.*

Telephone purposes	—	—
(b) Capital expenditure :		
Extensions (new land and buildings, &c.)	25,413,547	19,285,220
	(£1,270,677)	(£964,261)
Included in this amount are the following telegraph and telephone charges :—		
Repayment of and interest on capital	15,208,080	15,208,080
Large underground telephone works	2,000,000	—

(The mark has been taken at the old approximate equivalent of twenty to the pound sterling.)

It will be seen that the receipts are practically identical with those for 1916, but it should be borne in mind that the product of the special charges on postal and telegraph receipts contemplated by the law of June 21, 1916, do not appear in the budget.

A long editorial on the budget begins as follows :—

"If, following our old custom, in considering the new Postal Budget for 1917 we cast our eyes backwards over the past year, duty compels us before all other things to think silently of those who have offered their lives for us all in heroic conflict on the bloody battlefield, and we renew upon their Manes the holy vow to show ourselves worthy of them and to endure danger and hardship with tough, unbending will until the high aims for which they fell are attained. Thankfully also our feelings turn to those who have reaped sickness and suffering on the field, or, torn away from home and kindred, suffer the torments of imprisonment, and we wish them early recovery and freedom. Further our sincere greetings are due to the brave ones who are holding a wall of iron and fire around our beloved fatherland, ready to give body and life for their brothers and for Germany's welfare and victory. All of them, in the East and West, North and South, on the ocean and in the air should know, and it should strengthen them anew to know, that we hold stoutly by them and keep true comradeship. Nor must we forget those who have kept the postal flag flying in the homeland, doing their best that the good name of the German post, the best in the world, shall remain unstained. The longer the furies of war wield their scourges over the country the more responsible and the more difficult becomes the task for the officials at home. The old, accustomed lines of the peace-service are long since forsaken; the mail van rumbles over inaccessible roads. The notable lack of trained staff, the eternal variations of traffic, the altered tariff conditions, and the quantity of new rules following on each other's heels, the heavy loading of means of transport, the insufficiency of room, the huge arrangements for military news service—especially on telegraph and telephone lines—the unconscionably swollen field post traffic, the increase of working costs, the scarcity of raw material; all this has placed before our fellow-officials, both administrative and operative, a gigantic number of new problems, to overcome which required the highest application of all mental and bodily powers. Hard work has been performed at home day and night, without peace or rest. Everyone is striving to serve the great Whole, without consideration for his own ego, his comfort, his health or his recreation. New problems arose and were solved to the best of our power. That has repeatedly been recognised in Parliament and Press. And if we draw attention to it to-day it is not from love of self-praise but from feelings of pride in the spirit which imbues our postal officials, sound at heart, active, willing in spirit in spite of all. In spite of economic pressure, which has oppressed them for half a generation, in spite of the sad conditions which spoil the bloom of their manly years, in spite of the bitterness which the ever-postponed and hesitating policy with regard to remuneration has necessarily aroused and must arouse. The various and justifiable expectations to be made equal to other higher officials in the Empire and in Prussia, still not fulfilled, from a hard touchstone for their thoughts and feelings. But the German virtue of the Categorical Imperative has not failed them a single moment; truly and willingly each one

in his place gives his All—in the field and at home, with the sword and with the pen. And that is our pride!"

The editorial, as usual, is chiefly concerned with the burning questions of staff promotions and gradings. It goes on to say that the wishes of officials are advanced a step towards their goal by the increase of posts for vice-directors by 325, increasing them from 240 to 565 by withdrawing 175 inspectors' posts. This is hailed as "a small plaster on a deep wound." A radical cure, it is said, would be obtained only by a grading throughout for all higher officials of 3,000 to 7,200 marks (£150 to £360) in steps of 600 marks (£30). The creation of new posts for the middle and lower staff before referred to, does not of course affect the grievance of the higher staff, in whose interests *Blätter für Post und Telegraphie* is published.

It is interesting to note that as a patriotic protest against the use of the foreign word *Etat* for budget, the *Blätter* adopts the heading "Posthaushalt" which may be Englished as "Post-housekeeping."

TELEGRAPHIC MEMORABILIA.

CITY of London telegraphists and telephonists alike had one of the severest tests put upon them during the recent daylight raid by enemy aircraft. Needless to say both sets of officials came out of the ordeal with enhanced reputations for coolness and courage, and one could only have wished that the querulous correspondent of *Municipal Engineering*, mentioned in last month's leader, could have been present. He—it could not have been she—would then have had an opportunity of proving *his* right to the title of "hero"! In no case, however, could he have been classed amongst the "nice boys" of the London Telephone Service!

I have just finished reading a report of the last meeting of the Circle of Scientific, Technical and Trade Journalists, which included a discussion on "Women in Industry," and a very interesting report it proved to be.

Mr. G. H. Baillie, Chief Technical Adjudicator to one of the M.O.M. sections, eulogised the excellent work done by women and the variety of operations women could now perform. He dilated on the readiness with which the "weaker" sex had reached high skill in many a department hitherto closed to them, acquiring in a few months that dexterity which would normally have taken years for a man to obtain. This eulogy he somewhat modified by directing attention to the greater care now expended on the training of women as against that upon the ordinary male apprentice, who was less specialised, expected to know all the sub-divisions of his trade and was often left to discover correct methods for himself.

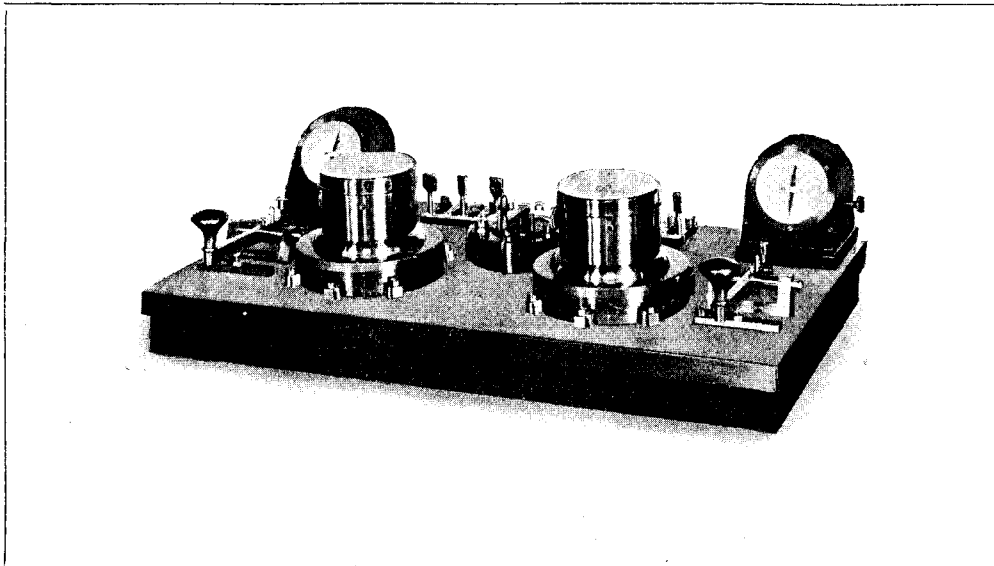
Miss Anderson, H.M. Chief Lady Inspector of Factories, warned her hearers that although there were few kinds of work that women could not undertake, it was necessary to consider very carefully what conditions in the future would be. It must not, urged this lady, be forgotten that a woman's most important work of all was in the home, and her duties in this respect made it impracticable to count upon regular work from women quite in the same way as from men. Neither was it to be too readily assumed that the efforts made in the present emergency could be maintained afterwards; meantime the health and comfort of women workers needed careful supervision.

One gentleman, well acquainted with the dangers of chemical works, paid ready tribute to the presence of mind of women in the most dangerous emergencies, and said that, contrary to the theories of those who had prophesied that women would "lose their heads" during hazardous operations and happenings, as a matter of fact it was the women in one case who far from stampeding, themselves promptly set about putting out a certain dangerous fire.

Miss Monkhouse, speaking on the advantages of female supervision for female workers, added that there seemed to be an excellent opportunity for women of the *educated* class to act in this capacity.

This latter suggestion would appear to need both amplification and explanation; especially would one like to know this lady's definition of "educated" for overseeing and supervisory purposes.

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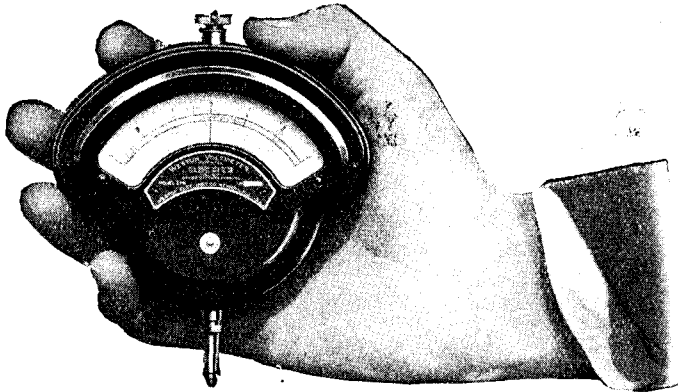
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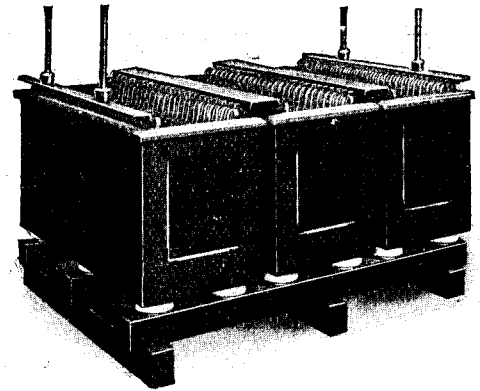
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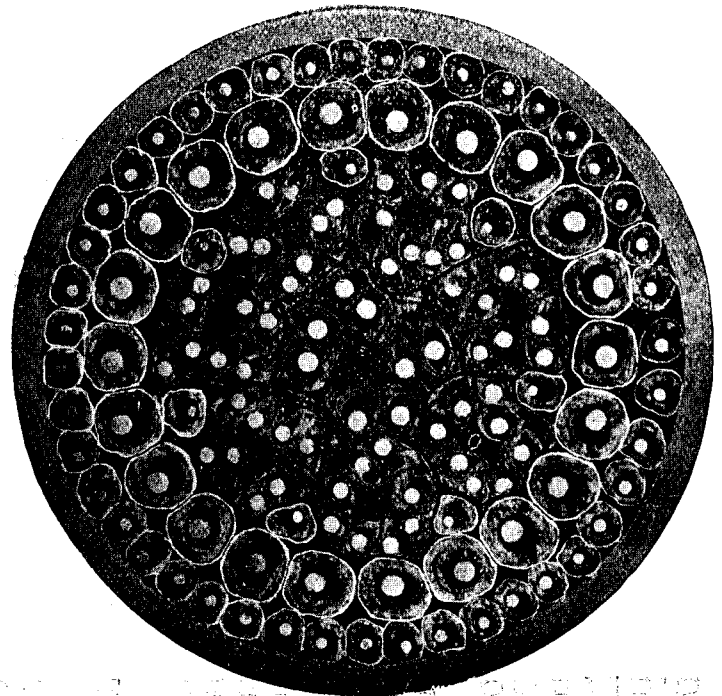
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Does she intend mere academic qualifications? If so, then, not only would the mere possession of lettered knowledge fail, of itself, to render either man or woman capable of supervising, but the laying down of this as a principle would involve the total shutting out from all higher posts of some of the most worthy members of the female rank and file. It would create an aristocracy totally alien to the spirit of the age and it would certainly fail to suit the Government Services, but perhaps one has misunderstood.

I have listened, for the most part dumbly, to the expression of a very fair amount of semi-official "disgust" regarding those bodies of Government telegraphists who were inclined to criticise the terms upon which their female colleagues are employed abroad on military work.

To thoroughly understand that tendency one must study the psychology of the present stressful period, firstly as it affects the general body of workers throughout the land, and secondly as it more particularly affects the special class of operators above mentioned.

That there is general unrest throughout the country, sweeping and in some cases doubtlessly unjust criticism of men and organisations is an undeniable fact, and so acute is the phenomenon as to demand very special Governmental inquiry by a number of Committees.

That this unrest has anything within it of the nature of disloyalty to the cause for which the nation is fighting, any wavering as to the necessity for pressing forward to the goal of a Living Peace for the world, can be emphatically and truly denied. It was, however, not to be supposed but that the sensitive, highly-strung telegraphists, with their inside knowledge of something at least of the seamy side of commercial war time speculation, proof of which at times passes through their hands, would readily respond to the murmurs against profiteering in the outside world and prove additionally prone to the lure of criticism which, rightly understood, is simply impatience with *seeming* injustice, if at times this translates itself into adverse comments on some of their best friends.

The telegraphist has a psychology all his own. His very occupation has never yet acted as a sedative, but his loyalty to the Service and his or her jealousy for its efficiency is known to be beyond all cavil by those who have been brought up with and understand this really lovable genus whose faults are often born of an over-generous sympathy, and are the faults of his very virtues.

Perhaps the closing words of the chairman of the Buxton Conference best voice the real spirit at the heart of those who represent the idealists of the Service, "that there may be no waste of life, that men may stand up before men, that women may love and care for men as their pride and for their children as God intended, and that children may enjoy young life without the shadow of a tragic future upon them."

With sentiments such as these no one can quarrel. The tragedy centres on the fact that, from causes into which I have no authority to enter here, grim MISTRUST stands between the higher and lower branches of our Service, and with that spectre as interpreter, misunderstanding grows into greater misunderstanding, and men and women who should be bound up in one great guild of State Service are kept wide apart to continue their unjust thoughts and to attribute unworthy motives to one another.

The hint given in these columns, many months ago now, regarding the possibilities of the aerial post forming a very formidable rival to international telegraphy of the future has recently received interesting confirmation by the trip of British aircraft to Rome. If an aerial post between London and the Italian capital, then an extension to the chief city of our own Indian Empire is likely to prove no mere dream of post-war development but a very real rival to the future of long distance telegraphy.

Writing of international telegraphy reminds one that whatever may be the truth regarding the proportion of "unnecessary" telegrams exchanged between places in the United Kingdom, the proportion that merely social traffic of an avoidable character bears to the bulk of telegrams passing over the international lines may at the present moment safely be considered as negligible.

Very little indeed of the present traffic that passes to and

from the Continent but bears some vital relation to the present world struggle, and in this I would include the Press telegrams.

It does not appear to strike many folks that Press telegrams of a certain type, and even those passing to neutral countries, are part and parcel of the Information organisation of this country and their Allies, an arm of war service which Germany has not failed to foster and which Great Britain cannot afford to neglect.

It can most definitely be stated that this latter view is that of certain senior offices of the Civil Service which have not a little to say regarding the conduct of the war and which certainly should be in a position to decide on vital matters of this type.

Let it be hoped that we in the Telegraph Service, together with so many of our countrymen, are leaving that insular view point, coarsely but significantly expressed by the man in the street, that "It doesn't matter what the -- foreigner thinks."

The writer is unfortunately placed in so far that any high value placed upon telegraphy the range of which stretches out beyond these islands is, somewhat naturally perhaps, looked upon as biased judgment, and possibly even as an attempt to boost one's job. Anonymity would have served the cause better probably: nevertheless I hope for that charity which has rarely been denied me by the Telegraph Service and venture once more to press the importance of inter-continental communications and the special knowledge born only of years of experience needed to conduct this arm of the Service efficiently. I would claim no special praise for those of us who have been so closely associated with this particular branch for many years. It is one's simple duty to know one's job thoroughly and intimately. If one does not, then "drumming-out" would not be to sharp a sentence. The feeding and the coaxing of long and difficult lines with piles of urgent diplomatic traffic of varying importance governed by cumulative secretarial instructions, and the varied methods of treatment allowable by half a dozen allied legations and headquarter staffs, is not a matter that can be treated as a glorified coffee-mill, but demands supervision not so much of staff as of traffic. Outside the Cable companies there are very very few even of the most competent administrators of the British Post Office who yet realise the fact that even the matter of annual revenue does not represent the complete value to the Empire of these thin lines that stretch out under our seas. One fears that even the war has not yet driven home the lesson to some minds, and the writer somewhat wearily feels a minor Dante as he wails out his sad complaint:

"But if Cassandra-like amidst the din of conflict
None will hear, or hearing heed this voice from out the wilderness,
The sin be theirs, and mine own feelings be *my* meed
The only querdon I have ever known."

I would not, however, ask my most credulous and sympathetic friends to believe in the too personal application of the final line!

J. J. T.

TELEGRAPH APPARATUS.—AN INTRODUCTION TO THE STUDY OF TELEGRAPHY.

BY A. SIRETT.

(Continued from page 118.)

THE next instrument to consider is the sounder. The principle is based on the electro-magnetic effects of a current. As you are aware, an electro-magnet is formed by passing a current through a wire which has been wound round an iron core formed of solid iron or of a bundle of iron wires. If this iron is sufficiently soft it will only remain magnetised so long as the current is passing round it. Now consider the sketch Fig. 22. If a current is sent through the coil the armature "a" will be attracted and held down so long as the current flows. When the current ceases the armature will be released and the lever "c" will respond to the pull of the spring "S" and return to the stop "e". If we introduce a single tapper into the circuit we have the means of sending and ceasing the current at will, and can so send the dots and dashes of the Morse code. The dot is formed by pressing the key down and immediately releasing it, and the dash is made by holding the

key down for the space of time taken to make about three dots. The lever on striking "d" begins the signal and on striking "e" ends the signal. There is only one tapper or key necessary.

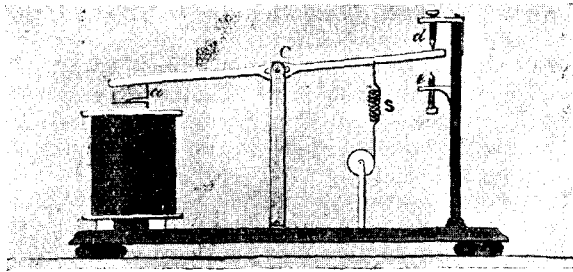


FIG. 22.

The working current required is 80 to 100 milliamperes. It is possible to transmit from 50 to 60 messages per hour over a single Morse sounder circuit, according to the degree of skill of the telegraphists at both offices.

Recording Instruments.

Fig. 23 is an illustration of the first standardised Morse instrument. The radical principle is exactly the same as that of the sounder.

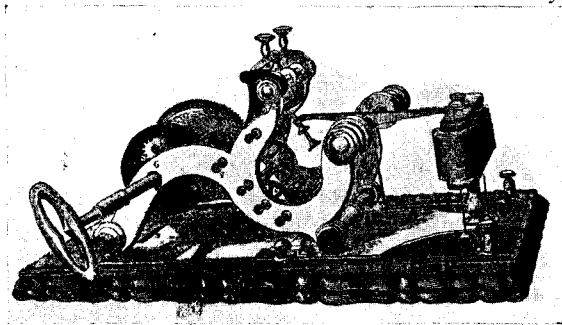


FIG. 23.

which has already been described. The recording arrangement is purely mechanical. Clockwork draws a paper tape between friction rollers "A.B." Fig. 24. There is a groove cut in the upper roller and beneath this groove is a steel style "s" fixed in the end of the lever "h" carrying the armature. When the coils attract

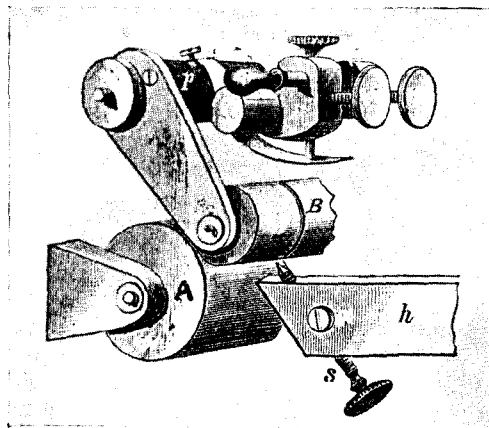


FIG. 24.

the armature, the style is brought into sharp contact with the paper and the dots and dashes are embossed on the tape. The reading of the signals was found to be so trying to the eyes that the instrument was soon supplanted by the more modern form of recorder, viz., the inkwriter.

The first form of instrument of this description is represented in Fig. 25. It was invented by Thomas John, an Austrian engineer, in 1854. The main object which he had in view was to reduce as far as possible the force which was required to drive the style against the paper before the marks could be distinctly recorded in the embosser. He succeeded in doing this by substituting, in place of the style, a small metallic disc "M" which was kept constantly revolving in an inking fluid. The disc was pressed

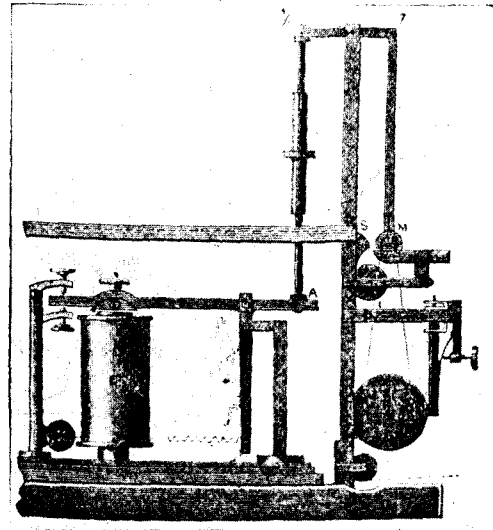


FIG. 25.

against the paper at "S" as it passed before the projection making a distinct ink-mark instead of a mere depression every time a signal was received. The passage of a current through the coil "E" caused the armature "D" to be attracted and the rod "A h" to rise and move the angular lever "h l M" in the direction of "S" at "M."

All the inkwriters which have been brought out since 1854

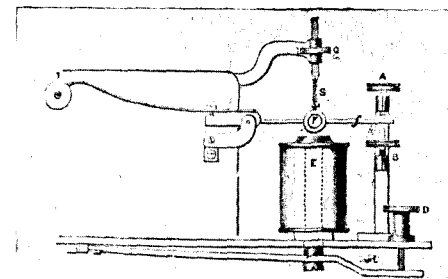
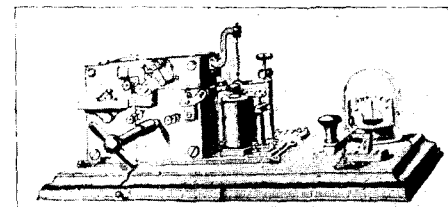


FIG. 26.

have been simple modifications of this idea, and the most perfect instrument which is now in use is only a mechanical improvement upon John's original principle. Fig. 26 shows the latest form of inkwriter. The tape is neatly coiled in a drawer in the base of the instrument. The current from the sending station passes through the coils "E" causing the electro-magnet to attract the armature "f." As that is attracted the wheel "I" is pressed up against the tape as it passes above it. The wheel "I" is made

to revolve by the clockwork which also propels the tape between the rollers, and its lower half dips in a reservoir containing a thick specially prepared quick drying ink. The paper is slightly absorbent and the marks do not smudge.

The movement of the lever "f" is regulated by the two thumb-screws "A and B," and the height of the electro-magnet "E" can be adjusted by the screw "D." The screw "C" governs the tension on the spring "S."

The working current required is .15 to 20 milliamperes and the working rate is about 45 telegrams per hour.

Automatic Telegraphy.

The majority of the different kinds of apparatus I have dealt with are manipulated by hand. In the A.B.C. and needle systems

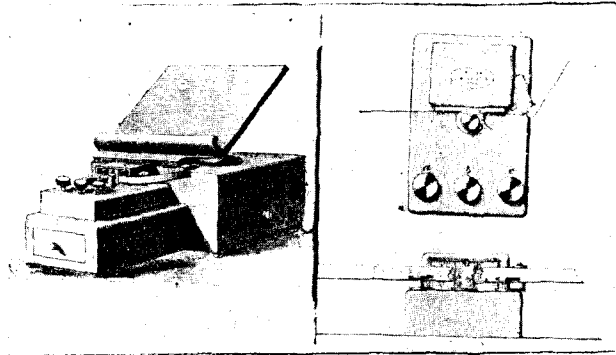


FIG. 27.

little skill is needed to work the sending portion of the instruments, but in the other systems skill, practice and endurance are required to keep up the constant sub-division of time into dots and dashes. The operators naturally tire after hours of continuous working, and it will be understood that there is a limit to the speed at which the hand can work the key of the Morse instrument. The maximum use of the Morse system cannot be reached by hand but signals can be made to follow each other on the simple Morse apparatus far quicker than clerks can signal or even write. The muscular motion of the wrist and the directive action of the mind have their limits both as regards speed and endurance. If the sending clerk be replaced by a suitable machine, working with precision and regularity, not only can it attain, but far exceed the highest speed the ordinary Morse printer or sounder is capable of. Hence,

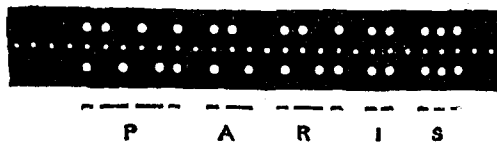


FIG. 28.

efforts were made to replace the hand-worked key by some mechanical contrivance which would not only remove the defect inherent to manual labour, but would secure precision in the formation of the characters, accuracy in the despatch of the messages and speed in transmission. "Bain," already referred to, in the year 1846 was the first to propose this. He punched broad dots and dashes in paper ribbon which was drawn with uniform velocity over a metal roller and beneath styles or brushes of wire which thus replaced the key, for, whenever a hole occurred in the tape a current was sent by the brushes coming in contact with the roller beneath. The recording instrument was his chemical marker. The speed at which messages were transmitted at experimental trials was enormous; 400 messages per hour were easily sent, but when, to defects in the machinery, were added the disturbances

on the line from causes which were then unknown, it failed to commend itself. Perhaps the real reason for it not being persevered with was that it was really not wanted, but when the telegraphic business increased so enormously that extra wires were needed in every direction, apparatus which increased the capacity of the wires by sending through them a greater number of messages in a given time became a necessity, and attention was again turned to automatic telegraphy.

Wheatstone's system of automatic telegraphy is that which is generally used in England. Other systems are being experimented with at a few of the larger post offices.

The Wheatstone automatic telegraph equipment consists of three principal parts, viz., the perforator for punching the holes in the tape at the sending station, the transmitter, or sending instrument, and the receiver. *The perforator*, Fig. 27, consists of three levers or keys, five punches and a groove, and a feed arrangement to move forward the paper as it is punched. The paper is white and is dressed with olive oil when made. a.b.c., Fig. 27, show the keys which, on being depressed, punch holes in the paper. Key "a" causes three holes in one vertical line to be punched—Fig. 28. Key "b" causes one hole to be punched in the middle of the tape, and key "c" causes four holes to be punched—one above, two in the middle, and one below. "a" corresponds to the dot, "b" the space, and "c" the dash. The holes in the centre of the paper are smaller than the others. They admit the teeth of a little star wheel which rotates whenever one of the keys is depressed, and thus moves the paper forward a certain distance for each depression of either key. The tape is coiled on a drum in the box behind the punch. The drum is capable of rotation as the punches are depressed and the paper is drawn forward. The keys are usually depressed by means of two iron punches padded with rubber and held one in each hand. Where there is considerable work, perforators, operated by means of a typewriter keyboard with electrically or pneumatically worked punches are in use. By this means the labour of punching is reduced, and several ribbons can be punched at one time. This is an advantage when the message (if a Press message) has to be sent to a number of stations on different lines simultaneously.

(To be concluded).

ENTERTAINMENT TO WOUNDED SOLDIERS IN DUNDEE WAR HOSPITAL.

On May 26 the operators of the Dundee Exchange, together with the staff of the District Manager's Office, entertained the wounded soldiers of the local War Hospital to a few hours' excellent enjoyment. The District Manager, Mr. W. Brown, occupied the chair. He was supported by Mr. Mackenzie, Traffic Superintendent, and Mr. Cawood, Assistant Sectional Engineer. The chairman, in a few happy remarks, explained the object of the meeting, and also expressed the feelings of the staff in showing their anxiety to emulate the example of their colleagues in other parts of the country by entertaining the soldiers who had suffered so much on their country's behalf. An excellent programme was creditably carried out by the following ladies and gentlemen:—Misses Cunningham, May Johnstone, Norma Johnston, Mary Guild, M. Gregory, K. McLain, Paterson, Matthew, Wilton, Inwood, Ore, Burnett and Fleming; Messrs. McLain, Meikleham and Greig.

Those of the party who did not contribute to the vocal part of the programme were busily employed looking to the other side of the entertainment, that of keeping up the supply of munitions, tobacco, cigarettes, fruits, &c. During the interval Mr. Cawood, as representing the Engineering Section, in a few cheery words to the wounded, expressed his pleasure at being present at the entertainment, and explained that he hoped such entertainments would be continued. Before the opening of the second part of the programme, fruit and refreshments were handed round.

The concert was brought to a close by a vote of thanks to the chairman and the artistes and ladies who assisted, proposed by Mr. Mackenzie and supported by a wounded officer—an inmate of the hospital, who hoped for a return of the party at an early date. The entertainment was voted by the soldiers as being the best that had so far taken place.

Mr. Meikleham, Contract Manager, replied on behalf of the ladies, and promised that efforts would be made to repeat the programme at no far distant date. The evening's entertainment terminated with the singing of "God Save the King." Special thanks are due to Miss Martin, Miss Cooper, Miss Rea and Miss Donn, supervisors, and organisers who assisted in making the general arrangements.

The Telegraph and Telephone Journal.

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

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

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THE UNDERTONE.

THE lady who writes from France that when she met "a telegraphist from my own office it was like meeting my brother," unconsciously sounded a note which is of particular value. The discussion of industrial and economic questions which is in full fling all around us does not always reveal the fact that there is disquiet with a nexus which does not include something of the emotions in our relationships. The tradition which has come to us from the Manchester School had its humane side, but it was a cold humaneness. It had its considerateness, but that considerateness dealt with mankind as a congeries of individuals. There was no sense of corporateness, and fellowship was far to seek. We are beginning to realise that nationality includes something more than the mere accident of geographical propinquity, that industrial relationship includes something more than accidental assembly for the production of goods, that discipline, while being control, is control enlightened by a sense of responsible leadership, that flabby kindness is not necessarily the human kindness which sets out to make the best of our fellows and ourselves. For one-third of our lives we are placed together in telegraph offices and in telephone exchanges and in the rooms where the tasks of control and of accounting are performed. It is a pitiable narrow vision which regards that one-third merely as the bread-winning section of life. We bring our varied contributions to each other's well-being; we bear on each other's minds; we learn from each other. The psychology of crowds is a new psychology, but it is capable of being studied within the walls of telegraph offices and telephone exchanges, and no one of us comes forth, after spending the most definitely separate portion of his waking hours in such association, quite the same person as he entered.

Mr. Trenam used to say that the music of a telegraph office always affected him. Put into cold words it seems to be an extreme statement. Yet there are deep undertones in the iteration of sounders and a strange touch of thrill in the hum of Wheatstones. Other aesthetic apperceptions may be kindled by the sight of a well-equipped switchboard. Sound and sight are not merely sound and sight; otherwise the trichord would be three wires only and the water-colour drawing be merely blotches of gummy substance. The truth is that there is no crass matter. To put industry on one hand and poetry on the other is to introduce a dichotomy which is fundamentally wrong. Dr. Gardiner reminded us that rapid means of communication are an effect and not a cause. They were produced "by the sense of unity . . . class drew nearer to class, and the wants, the desires and the prejudices of each class were better understood than they had formerly been." We are learning these new values. We are seeing more deeply into the truth. We are awaking to the fact that fellowship is a fact.

To say this is not to expect a millenium. There will be disappointments. In truth there may be more agonies in such a realisation of fellowship than in the older conception of rule. But the frets and the failures are worth while. To forget the realm of the spirit is a sorer evil than to bear with sorrows and surprises in the search for the realm of the spirit. It is not a solvent for economic problems. Those will remain. But it is an atmosphere in which economic problems can be faced boldly and squarely, without distortion of vision. Two of our sisters went for a walk on a fine June afternoon through a sweet pine forest in northern France. They learned something of philosophy and one of them has put it in a line. In the lonely corner to their surprise they met — a brother telegraphist from their own office. In the past he was not a hero. He was only a fellow-worker. Suddenly he appears in a new light. The radiance of past years, which never had seemed to have any radiance, was upon him. "It was like meeting my brother."

THE GERMAN POST OFFICE.

THOSE of our readers who take the pains to read through the editorial remarks of *Blätter für Post und Telegraphie* on the German postal budget, of which we give a translation in our columns, may perhaps feel aware of a tone underlying them somewhat different from that of previous years. There are no allusions this time to iniquitous silver bullets or shameful plans of starvation, no references to a hedge of aggressive enviers surrounding the Fatherland, but chiefly expressions of gratitude to fighting and fallen comrades and a sense of pride in the maintenance under difficulties of services such as we also are engaged in maintaining. There is much indeed which might engage a certain sympathy from those engaged on similar work, and there is a familiar ring in the recital of "eternal variations of traffic, altered tariff conditions, new rules following on each other's heels, huge military telephone and telegraph traffic and extensive field-posts" which might apply also to this country. But what one notes chiefly as a sign of grace is a disposition to return from Nietzsche to the high-minded Kant. We are not of those who credit the Prussian military with a deep acquaintance with the iconoclastic and German

hating philosopher, but we have seen that certain of them took the "blond beast" passages in his writings with a crass literalness, and recent and repeated demonstrations of "ruthlessness" prove that they cling to a puerile apprehension of the nature of a superman. Nevertheless, we are pleased to learn from our contemporary that Kant's Categorical Imperative "the absolute unconditional demand of the moral law" still has its devotees, and that "German virtue" has not failed. We are afraid that incorrigibly bellicose critics will point out that "German" virtue is different from all others, but we let that pass. Such of our readers who obtain their ideas of Germany from books and newspapers published during the war, may not be aware that ancient German virtue is as great an article of faith in the Fatherland as German valour and German culture, and the fancy picture which Tacitus painted of the ancient Germans as a pattern for the degenerate Romans carries all the weight of an honoured tradition. Professors write learnedly to demonstrate that an ancient German hero such as Siegfried could not have had relations with more than one lady and any suggestions that he trifled both with Brunhild and Kriemhild (or Gudrun) are "interpolations in the text." But these somewhat recondite considerations are as far removed from telephony and telegraphy as the two-handed sword fights are removed from modern drum-fire. Better than the professions of unflinching German virtue we like the picture of the staff striving with might and main to keep the service efficient despite the hindrances and handicaps of war conditions. It has for us a human touch, and as we said before is without the vainglorious note of previous years.

HIC ET UBIQUE.

WE beg to inform our provincial readers that the General Post Office, St. Paul's and other bastions of the fort and port of London stand precisely where they did. Strange rumours get abroad after an air raid, and whether they are due to the imaginative, the credulous, or to a misdirected sense of humour on the part of the thoughtless we are always at a loss to imagine. Travellers with an itch to appear well informed pass them on. For ourselves our only desire is to ridicule all fantastic tales and nip exaggeration in the bud, but there are undoubtedly those who, however unintentionally, seem intent on magnifying the effects of these martial exploits of the enemy.

In the railway station alluded to in the official communique, says the *Daily Chronicle* referring to the raid on London, a warning was received at its telephone exchange some time before the raiders circled above. The girls were told that they could seek safety in the basement. But, at the same time, the importance of keeping the lines at work was emphasised, and volunteers for this purpose were specially asked for. I met one of the plucky girls who stuck to their posts.

Despite the thud of bombs close by, and the cries of the wounded, she remained on duty with perfect calm. A little while after the raid was over she came out into the station for a moment's relaxation. I was standing near her at the time. "I think that's a siren," she said suddenly, "I must get back to my post." And she went.

I was called to the telephone late at night, says a writer in the *Daily News*. "Telegram for you—handed in at Folkestone," said the operator. "I'll read it. . . . It's good news!" It was from a relative at the front, announcing his unexpected arrival on leave. But a telephone operator whose duty it is to telephone telegrams at night has good and bad news to communicate, and it is a happy thought to differentiate and relieve the anxiety of a late call at the earliest possible moment. I like this new human note at the telephone exchange.

THE development of the telephone in Switzerland proceeded steadily in 1916, the number of stations increasing from 97,847 to 104,133. Zurich showed a large increase, viz., from 13,935

to 15,156, Geneva from 9,087 to 9,672 (or over 10,000 with its sub-exchanges), Basle from 7,771 to 8,183, Bern from 6,061 to 6,789, Lausanne from 4,635 to 4,828 and St. Gall from 4,036 to 4,230.

SUBSIDIARY TELEPHONE SERVICES.

By M. C. PINK.

(Concluded from page 124.)

INCOMING TRAFFIC UNDER A "DELAY" SYSTEM.

If it were finally decided, in spite of the objections from the telephone service point of view, to adopt in London a system of allowable delay for telephone-telegram traffic, it would probably be best to pass that traffic through a suite of positions which were the equivalent of a private branch exchange. In order to meet first of all the accepted condition that subscribers' phonograms should be handled on a "no delay" basis and telephone-telegrams on a recognised "delay" basis, it would be necessary to establish two sets of junctions outgoing from local exchanges to the phonogram room, and to arrange for the Post Offices whose telegram work was transmitted by telephone to pass their demands by means of a word which would not be confused with the descriptions "phonogram (or telegram) service." The subscribers' phonogram work would continue to be handled on one or other of the distribution systems already discussed. The "delay service" junctions would be led to calling equipment, distributed—probably on an ancillary basis—over the positions of the private branch exchange type.

A speaking operator would be substituted for the practically dumb operator employed on a standard distribution board, for the purpose of notifying callers of delay in cases where a recording operator was not immediately available.

SINGLE OR DOUBLE CORD DISTRIBUTION.

On the present standard distribution board the calling junctions are distributed to recording operators by means of a single plug and cord circuit. Even in a recognised "delay" system a considerable percentage of the traffic would probably be distributed direct to available recording operators without any challenge on the part of the switching operator. The retention of the single cord distribution would, therefore, be desirable. This may however not be possible for the following reasons:—

Under existing distribution conditions, it is possible for any switching operator at the distribution board to see what recording operators' plugs are disengaged. The introduction of a challenge at the switching point in the case of a proportion of the demands would naturally slow down the working of the distribution operators and involve the provision of more switching positions. It is this course which introduces difficulty into the problem. On consideration it will probably be apparent that any extension beyond three switching positions would force the introduction of a double plug system of switching, the recording operators' headsets being associated with jacks provided with a visual engaged signal.

Assuming, however, that single cord distribution would be retained, provision would have to be made at the distribution point for special cords for speaking and holding purposes. The switching operator would have to know whether any recording points were free. If she had a free recording point when an incoming signal was received, she would switch the call through without challenge. If there were no recording point free she would answer with a speaking cord, and ask the calling Post Office to wait. When she was in a position to switch the caller through to a recording point she would withdraw her speaking plug and insert the free recording operator's plug. The insertion of either the speaking plug or the recording operator's plug in the jack of the calling junction should darken the supervisory at the calling exchange, and great care would have to be taken to obviate the danger of giving a false clearing signal to the calling exchange while a change of plugs was being carried out.

TREATMENT OF TRAFFIC OUTGOING FROM THE PHONOGRAM ROOM.

Up to the moment I have dealt only with traffic incoming to the phonogram room. It is now, I think, generally recognised by anyone at all conversant with the subject that the system of separating incoming and outgoing junctions used for phonogram service is a sound one from the telephone traffic point of view. It appears to be equally desirable from the staffing and phonogram organisation point of view.

The efficient handling of traffic outgoing from the phonogram room will become more and more essential as the system of delivering telegrams by telephone increases. The delay which arises between the receipt of a telegram form in the phonogram room for delivery and the time at which the first attempt to deliver is actually made by a phonogram operator is a matter which is entirely within the control of the phonogram staff and under the present conditions is no concern of the telephone service. Our function is to ensure that when the phonogram operator is in a position to pass a call she shall get prompt and efficient connexion through to the delivery office, wherever that office may be. Each phonogram operator engaged upon such work is in effect a telephone subscriber, and the efficiency of her connexions will depend upon the availability of the connexion channels or junctions in all directions.

This work could be catered for from the junction point of view in one of two ways. The delivery operator could be associated with what is virtually a private branch exchange in the phonogram room and having its own junction connexions to various places throughout the telephone area; or she could be connected to a public exchange and share with the subscribers as a whole on that exchange the availability of all the junctions serving it.

MULTIPLYING OUTGOING JUNCTIONS BEFORE RECORDING OPERATOR.

If the phonogram service were provided with outgoing junctions solely for its own use it would be possible to make the terminals of every outgoing line directly accessible to every outgoing phonogram recorder, just as the junction multiple field in a public exchange is accessible to every "A" operator. This course has, I believe, been suggested by certain provincial traffic superintendents. In this connexion, however, it must be remembered that on any system where the operator can only handle one call at a time the provision of elaborate switching plant tends to be very wasteful. The circuit conditions at the phonogram recording points would be considerably complicated. Moreover, the multiple would not, in the ordinary course, be required at all phonogram positions, although, in view of the fact that the number of outgoing positions must fluctuate to meet the maximum outgoing calling rate, it would be necessary for the junction multiple to be available on a large proportion of the positions.

Whereas on a large public exchange the aggregate traffic of all subscribers on the exchange would justify direct communication to practically all exchanges of any size on the local system, the outgoing phonogram and telephone-telegram work would only justify the provision of direct communication to a very limited number of the exchanges. All the traffic which did not justify such direct communication would have to pass over lines to convenient junction centres, and on such traffic the provision of elaborate switching plant in the phonogram room would have no counterbalancing economy in switching on the public system. Taking the conditions as they exist in London at present, only about 28 per cent. of the outgoing traffic would obviate the use of a second switching operator on the public system if handled on direct junctions.

For the reasons given, I am strongly of opinion that in London an elaborate switching system accessible to all outgoing operators in the phonogram room is not justifiable, and that in any future system of handling outgoing work the present method of associating the outgoing operator with a direct circuit to a public exchange having the availability of the whole of the junction field of that exchange, should be retained.

COMPARISON OF EXISTING CONDITIONS WITH IDEAL CONDITIONS.

I should now like briefly to run through the conditions existing on the phonogram plant at present, and see whether in any respect they fall short of the ideals which I have attempted to set out.

TRANSMISSION.

It is recognised that on several junction routes transmission over the telephone system is at present far from ideal. The Engineer-in-Chief aims at setting up transmission conditions between any two points within the London area which will provide transmission conditions no worse than those obtained over 25 miles of standard cable. Loading schemes have been proposed and in many directions they have been authorised, but the war has descended like a blight on all work of this description, and we have to struggle on until such time as the necessary labour and material can become available for providing the conditions aimed at.

JUNCTION CONDITIONS.

We are, I think, with one or two exceptions due to lack of external plant, keeping pace with the junction requirements of the phonogram system. Owing to the comparatively small volume of work handled it will be necessary for some time to come to handle a considerable quantity of traffic through junction centres over groups of lending junctions. I have shown that the efficient working of those junctions depends upon the prompt clearance at the incoming end. This is not always given under existing conditions. Moreover, for the efficient working of a large lending group of junctions, we must provide either a guarding engaged test on the outgoing end of the junction to prevent its being taken up for a further call until it has been released at the incoming end from the preceding call, or we must provide at the incoming end a distinctive signal which will indicate when a junction which has been hung up at the termination of one call has been again plugged up for a "follow on" call.

PROMPT CONNEXION TO AND CLEARANCE OF RECORDING OPERATOR.

These points have already, I think, been dealt with fully.

EFFICIENT MEANS OF CALLING THE RECORDING OPERATOR.

At present the Administration responsible for the handling of phonogram work in London prefers to retain a buzzer signal. I would like to mention that no necessity for such a signal is found in the case of the recording operator's circuit in the trunk exchange. A lamp signal is provided, and as the operator cannot cut her telephone out of circuit, she hears every time a connexion is made to her and at once challenges. I am of opinion that a similar condition would be found quite satisfactory in practice in the phonogram room, and would make the recording operators more vigilant.

SIMPLIFICATION OF RECORDING OPERATOR'S CIRCUITS.

The present recording circuit is provided with two three-position keys. With both keys in the normal position, the connexion of the recording circuit

to a calling junction gives a buzzer calling signal to the recording operator. The four positions of the keys, when acutated, perform the following functions:

Black key.

Position (1) removes the buzzer calling signal, connects the recorder's telephone to the calling line, and darkens the controlling "A" operator's calling supervisory signal.

Position (2) gives a clearing signal to the distribution board.

Red key.

Position (1) connects the recorder to the distribution operator's headset for order wire purposes.

Position (2) gives a magneto ring out to line.

If a buzzer signal is retained there must, of course, be some means of cutting it out during a call. With a lamp signal in place of a buzzer, there is no necessity for a cutting out; moreover, while it is true that if the recording operator is provided with a headset, the connexion of a call to her circuit is either given a continuous signal on her buzzer or by the throwing of her cut-out key her headset is connected with the calling line. On the other hand, if a pedestal set is used—and I believe this is not infrequently the case in the London phonogram room—it is possible for the stall operator to remove the calling signal from her position and yet leave the caller without any attention, while she, with her receiver off the hook, is writing up any matter in connexion with the transaction which she has previously been handling. I cannot help coming to the conclusion that the use of headsets and the elimination of the use of cut-out keys on positions employed in the handling of incoming traffic are necessary in the interests of efficiency.

The ringing position of the red key appears to be a survival of the conditions under which recording operators had to ring on outgoing magneto junctions when such junctions were connected direct to the distribution board in the phonogram room. It seems to be quite an anachronism that such ringing facilities should be retained at the present day. Not infrequently a ring is given out by a recording operator to a calling subscriber while he is waiting for attention. This is probably quite accidental, but the possibility of giving such rings should be removed in the case of London service.

With the elimination of the cut out and ringing positions of the keys, all the requirements for incoming traffic could be met by means of one key, which would provide access to the distribution operator by order wire and the means of giving a single clearing signal to the distribution board and beyond if necessary.

If the clerical interlude at the end of phonogram transactions on which I have already laid stress cannot be eliminated, another key for the purpose of giving a stall holding signal to the distribution board would be necessary, this complication is undesirable in any case, and it would be particularly undesirable if it had to be introduced in addition to the present complicated circuit.

On recording positions which might be required for the handling of outgoing work, it is necessary to provide a means of giving a loop to the public exchange for the purpose of calling and clearing.

ADEQUACY OF SUPERVISION.

I am afraid there has always been rather a divergence of opinion between telegraph and telephone officials regarding the amount of supervision necessary in the case of staff dealing with telephone traffic. I think it will be admitted by all that until comparatively recently the supervision given to the phonogram work was inadequate, although latterly I believe the number of supervisors employed has been increased. I do not know what experience of the working of telephone exchanges and the interaction, from the telephone point of view, between the phonogram equipment and the local exchange equipment the present supervisors possess. It is naturally desirable that they should have such experience.

OBSERVATION OF SERVICE AND TABULATION OF RESULTS.

The ordinary controlling type of supervision should be supported by listening observations on the working of the junctions and of the recording operators. In connexion with the trunk service, we have found that good results are only maintained by systematic observation and the tabulation and representation in curve form, of the various items of service, both qualitative and quantitative. I have here, and would be pleased to show to any telegraph officer who may be interested, copies of running curves, showing the average answering time, the average time taken to record a trunk connexion, the average time taken to clear, &c., based on some thousands of observations taken each month for many months past. No doubt some similar efforts of ensuring an efficient service are made at the Central Telegraph Office in connexion with the phonogram service, and in the discussion the meeting will, no doubt, be interested to hear from a representative of the C.T.O. the extent to which such methods are followed in connexion with the phonogram service. One essential feature, to my mind, in view of the fact that the originating aspect of the phonogram traffic does not come under the direct control of the Central Telegraph Office, and assuming that the incoming end remains under telegraph control, is the provision of some means of enabling the phonogram supervising staff to listen-in on junctions, as apart from individual phonogram positions, and to observe for themselves precisely what happens to the service at all stages.

It is the practice in the Telephone Service not to use any observations of this character for the purpose of criticising the work of any individual officer. At the same time an analysis of the results obtained by these means does put supervising officers on the scent of general difficulties, which would otherwise escape notice even under the most vigilant external supervision conditions.

STAFFING.

The nature of the staff which should preferably be employed in the recording and dictation of messages transmitted by telephone, is a subject which has been already fairly extensively dealt with at meetings of this and other kindred societies, the most recent contribution being a letter from Mr. R. Baxter, a telegraph man, in the current number of THE TELEGRAPH AND TELEPHONE JOURNAL. I do not, therefore, propose to raise this question again at the moment.

Some time ago a secretarial committee was formed to consider the best method of handling phonogram and telephone-telegram work throughout the country. Conclusions regarding the general junctioning arrangements of phonogram rooms were arrived at, and certain aspects of the equipment problem were considered in connexion with small phonogram installation. Unfortunately the conditions arising from the war have not permitted the committee to continue their investigations regarding the best equipment for phonogram service at the larger centres. My hope is that the notes on the subject which I have got together for the purpose of this paper may be of some use to that committee in pursuing their investigations when the opportunity again arises.

SUBSIDIARY SERVICES IN PUBLIC EXCHANGES.

It has already been stated that the services provided for administration purposes in public exchanges come within the scope of my definition of subsidiary services. It would, no doubt, be of considerable interest to a meeting of this kind to go fully into the details of the functions and the circuit arrangements of the information desk, supervisors' desks, observation desk (local and central), test desk, &c., provided for the purpose of facilitating the administration of exchanges and the treatment of other than ordinary traffic. The subject is, however, such a wide one that I fear I must pass by in this paper these particular items. There are, however, certain aspects of private branch exchange work which have been emphasised as a result of the war conditions, and which I think it would be of use to review in this paper.

PRIVATE BRANCH EXCHANGES.

The conditions arising out of the war have emphasised to large Government Departments, employing high grade staffs far exceeding in number those engaged on any private industry, the desirability of having a complete and efficient telephone system for intercommunication and external communication. The result is that under war conditions private branch exchanges have been developed to a size which was not contemplated before the war. In certain instances private branch exchange switchboards of the lamp signalling type have been installed to meet the requirements, and although some of them have been handicapped by the telephone bugbear known as "secret operating," now happily moribund, these boards have generally given very satisfactory results. In the majority of cases, however, boards of the standard C.B. No. 9 private branch exchange type, with eyeball signals for extension calling and self-restoring indicators for exchange and tie line calling, have been supplied.

Although it is found on practically every telephone service that when the amount of traffic handled reaches any appreciable magnitude it is desirable to segregate as far as possible outgoing and incoming traffic, no real provision for such segregation exists on the No. 9 type of board, which is at present regarded as standard for private branch exchange work. All positions are inter-changeable, and every position is designed to take either incoming calling equipment or extension equipment, or both. The standard positions for that equipment are fixed without regard to the question whether the board will be used solely for incoming or solely for originated traffic. We have in practice segregated incoming and outgoing work, but there is no doubt that if the installations at present in use had been carefully designed as permanent installations, the arrangements for handling traffic on the incoming positions could have been made very much better than those which are at present in force. For instance, the fundamental design of the position allows for the possibility of installing up to 200 extension indicators on any one position, and because of this possibility the recognised position for exchange line indicators has to be in a field above the 200 extension indicator field. On incoming positions where there are no extension indicators, it seems rather incongruous to maintain the position of the exchange line calling indicators right at the top of the board. In practice we have been able to get this dropped to a certain extent. The indicators are, however, not of a pattern which encourages their installation close to the jacks with which they are associated, and I think I am safe in saying that all traffic officers are looking forward to the provision, and recognition as standard, of an indicator which is much more closely associated with its relative jack than the present standard. Traffic officers will, in fact, never cease in their clamour for the designing of an economical system of lamp signalling in connexion with private branch exchanges of medium size. I admit the difficulty in proving in time values &c. the advantages of lamp signals over indicators in many instances. The fact remains, however, that in practice the operating at lamp signalling boards is much more easily handled.

The No. 9 boards also provide no ready means of traffic distribution. When, in connexion with traffic distribution required at a public exchange which was served by boards of this type, it was suggested some time before the war that the distribution should be effected by removing strips of indicators from one position to another, I fear our engineering friends were horror-struck. As usual, however, when they were convinced of the necessity, they arranged to meet the traffic needs. War emergency conditions have since frequently necessitated the carrying out of similar work on private branch exchanges; but the fact remains that this method of distribution is a cumbersome one, and could probably be improved upon, even on the indicator type of board which uses the multiple field for answering purposes.

INTERNAL SERVICE WITHIN A PRIVATE BRANCH EXCHANGE.

As a final item before closing my subject, I should like just briefly to refer to the subsidiary telephone services which have had to be developed for the proper internal administration and control of large private branch exchanges.

INFORMATION DESK.

The item which called most urgently for solution was the proper handling of information work, and the rapid supply to board operators of the extension number in the case of calls received for people by name. It will readily be seen that, particularly in the case of Government Departments which have extended rapidly or have even been the creation of a week or a month, the handling of inquiries for particular people and the connexion of calls to those people on private systems involving up to 800 or more extension points, has been no light work. It is wonderful how well the operators remember the names and numbers of people working on a private branch exchange. But however well their memory serves them, cases are numerous where they are unable to connect a call on demand.

To meet this condition we developed an order wire inquiry system. The inquiry order wire terminates on the inquiry operator's headset, and the outgoing end is associated with an order wire key on each of the switchboard positions. Taps from the switchboard operators' headsets are led through to order wire keys at the inquiry position. If the board operator receives a call for say "Mr. Smith" and does not know his number, she goes on the inquiry order wire and gives the number of her position and the name of the person required. She then proceeds with her next call. In the meantime the inquiry operator looks up the necessary information regarding "Mr. Smith" and when she is ready to give the number she goes on the order wire leading to the position which has made the inquiry and says, direct to the operated concerned, "Mr. Smith, extension"

Instances are now arising of private branch exchanges where one order wire is insufficient to deal efficiently with the work. In one case we have legislated for four inquiry positions. It has also been necessary to complicate the arrangements a little by giving inquiry operators facilities for making outgoing demands through the private branch exchange system. The existence of these outgoing lines and the variation during the day in the number of operators required for inquiry work, necessitate the provision of switching devices which are designed to throw the incoming order wire of one inquiry position on to an adjoining inquiry position, either when the first position is not staffed or when the operator at the first position throws the key associated with her outgoing line for the purpose of passing a call in connexion with her inquiry work.

These inquiry arrangements have proved invaluable in meeting and overcoming the difficulties inseparably associated with new private branch exchanges.

SUPERVISING ARRANGEMENTS.

In order that the supervisor-in-charge of a private branch exchange may keep in touch with the efficiency of the exchange as a whole, arrangements have been made to extend the board operators' headset taps and the inquiry order wires to the supervisor's desk and to provide listening-in facilities.

TREATMENT OF TRUNK CALLS.

It will no doubt be appreciated that the volume of traffic handled in connexion with many of the more important Government Departments has been enormous, and the system for handling this traffic has had to take full account of the special priority conditions which affect the trunk service during the war. When an ordinary subscriber makes a trunk call no question arises as to the identity of the caller when that call matures. In the case of a private branch exchange the conditions are very different, and it is essential that the private branch exchange operator handling the call when it matures shall know who has originated trunk calls from the private branch exchange. This necessity carries with it the centralisation of all private branch exchange records of originated trunk calls. To facilitate this centralisation arrangements have been made in the case of all large installations for a local trunk recording circuit to be associated with all originating positions on the private branch exchange and to terminate on the position which will handle the trunk calls when they mature. The special priority conditions referred to necessitate the passage of Government calls to a special recording staff in the Trunk Exchange. Small private branch exchanges gain access to this staff by use of a special exchange number passed over the ordinary public system. The larger private branch exchanges have been provided with direct record circuits to the special staff in the Trunk Exchange.

Practically all private branch exchange boards are provided with a break-jack multiple. With multiples of this type it is not possible in many cases for the operator handling calls incoming from trunks to offer the call direct to the extension involved. Even when she can do this, she breaks down the connexion which has already been set up and the other subscriber concerned does not hear the offer of the trunk call. The only way to offer a trunk call in the hearing of the two parties concerned is for the P.B.Ex. operator who is controlling the local connexion to enter the connexion by means of her ordinary speaking key. This fact, and the obvious necessity for avoiding delay on trunk calls, have led to the establishment at some of the larger private branch exchanges of an order wire system outgoing from the position handling trunk work to every third "A" position throughout the private branch exchange, to facilitate the rapid tracing of local connexions. In most cases the trunk operator, by her local knowledge, gets into touch immediately with the "A" operator who is in the best position to offer a trunk call. In any case a considerable amount of time in clearing is saved by this system.

In the case of the larger private branch exchanges the handling of trunk

traffic has been considerably facilitated by the use of direct groups of junctions straight from the Trunk Exchange junction multiple to the private branch exchange. These junctions are known by name and not number. The name constitutes what is virtually a trunk telephonic address. We have in London at present direct groups to nine Government Offices, comprising a total of 93 junction circuits. We found that, however useful a system of calling in advance might be in connexion with ordinary subscribers' lines, it did not assist in the smooth handling of the traffic on routes of this character, where one of the Department's own operators is in attendance at the incoming end and a rapid answer could at all times be assured. We boldly proceeded, therefore, to refrain from calling in advance on these routes, and only to attract the attention of the private branch exchange operator when there was something for her to do immediately. I am sure that this system has easily justified itself by reducing the holding time on trunk circuits and junctions, and reducing "hide-and-seek" trouble to a minimum.

TRUNK EXCHANGE.

I should have liked before closing to have referred specially in some detail to the subsidiary services provided in connexion with the proper control of the Trunk Exchange, but unfortunately time will not permit. I must again apologise for having cut about this subject in rather a shameful way, in order that I might have an opportunity of emphasising some of the aspects of various subsidiary service problems which are of special interest to myself, and trust that in doing so I have not tried your patience too much.

LONDON TELEPHONE SERVICE NOTES.

WE referred last month to the fact that some of our "Sappers" had left for France, and lest we should be tempted to write at length of air-raids by day and air-raids by night, we feel we should be well advised to devote this column to the reproduction of a letter which has reached a London exchange from one of the British Expeditionary Force, whose photograph appeared on the final page of last month's issue of this journal.

Somewhere in France, June 6.

We have at last arrived at our destination, but our travels lasted from Monday until Friday, and I shouldn't commend France as a country to travel in. I have never had such journeys in my life. I think the engine driver had friends residing in the inland villages, and he left us in the country stations—consisting of a plank and a ticket office—whilst he went visiting.

We came through country that defies description, I only wish I could paint it for you. If there were no other attractions it was worth while to have seen such beauty, but we are very very happy here; it is like a glorious holiday, and even the fact that we commenced our duties yesterday hasn't dispelled the "couleur de rose."

To go back to the beginning, we boarded our ship at 6 p.m., but didn't leave until 10 p.m., by which time we were all in our bunks, two in each, feet to head. We didn't undress of course. It was great fun climbing up the ladders to bed, but it wasn't fun when one began to feel wobbly during the night watches and had to accomplish the descent without the ladder, as that article was tantalisingly reposing against the bunk of the last comer to bed. Everyone said it was a very mild passage, but I managed to be ill all night. We were in the lowest part of the ship and just over the engines, or I might have been better; I was all right on the top deck, but we were not allowed to go up until about 3.30 a.m. By the way, as a warning to my successors, don't enter into any contract with the boat people for food. We bought our tea on board, cup of tea and a piece of bread and butter 4d., which was quite all right, so when we were asked if we would like to pay 1s. per head for a good breakfast, we agreed. A most appetising smell of bacon arose on the wind about 5.30 a.m. and increased our hunger, but when we got there—bread and butter, marmalade and tea! Bacon was apparently a first class edible, and not for common or garden "lower deckers." So they got 26s. for what couldn't possibly have cost more than about 5s. or 6s. As we only had one piece of bread and one cup of tea, we could have bought it for 4d. To be just, I believe it was supposed to be *ad lib*, what there was.

We landed at 6 a.m. and stood in line for about half an hour on the quay on a bitterly cold morning, but after that went to a Salvation Army hostel and breakfasted—fried ham and spice cakes after. As our next train didn't leave until 1.45, we were able to look round the town, which was very pretty, contrary to what I have always heard and expected from a seaport. We created quite a sensation there, for the French people thought we were out to fight and flocked in dozens to see us. I believe that was the general impression everywhere among them. The officer who brought us across left us here, with her girls, so that we had some excitements trying to purchase food for the journey as the train didn't get in until after 10 p.m. We were very proud of ourselves on conducting the business and paying up right money; only three of us went to the shop, and as the other two don't know French at all, I think my *Self-Educator* I had at home served me well, but I mustn't flatter myself or deceive you for we were completely stuck on another occasion. I was most mortified, but couldn't help laughing. We had changed our money into French at the English office, and for the rest of the journey had to think in francs and centimes. It was very strange at first, and even now I have to do laborious mental arithmetic when changing big notes. That first train journey wasn't as enjoyable as the subsequent one, for we had very scanty provisions and nothing to drink. There wasn't a station with anything even resembling a buffet! I could have appreciated the scenery a great deal more if I had been a spiritual and not a corporeal

body. The unexpected attends all travelling here. You may be comfortably settled for a long journey, surrounded by air-pillows, clad in bedroom slippers, the contents of your suit case strewn around, when someone decides that that particular carriage shall go somewhere else, and out you have to bundle in frantic haste, for once the French arrive at a decision—it's "at once." Or just for a little diversion, they take the engine off one end and put it on the other for a yard or two. Both these, and many more incidents, varied our peregrinations. Some Tommies in adjacent compartments were very good to us. One got his water bottle filled with coffee at a cottage and nearly lost the train in consequence. Another took our towel to the village pump for us to perform our toilet—for there was nothing on the train, despite its being a long distance one. We arrived at the W.A.A.C. hostel of another seaport at 10:0 p.m., and whilst having our supper, several forms in night attire fell upon us. They turned out to be our other half—the six who went out the previous week. They had not heard we were coming to them, neither had we known, and there was much excitement in consequence.

We remained there a day and a half. On reporting to the signal officer the first morning, we were informed we should have gone somewhere else and were not wanted there, but probably we should have a few days holiday while he communicated with the "other" place. We were rather disappointed, as the girls said it was "topping" there, but our regrets have vanished now!

The hostel there was a pre-war hotel and very pretty. The bedrooms opened on to a balcony that ran round the building and looked down on to a flagged court with glass roof. The food at this place was better than at the London hostel, but I wish I could show you the vessels from which we drank our tea. They were large basins known to those conversant with Army household lists as "bowls, soup." I should think they were about two pints size. We used to collapse at every meal on beholding the girl opposite grasp her "bowls, soup," in both hands and become temporarily eclipsed behind it.

The country around was very lovely, and of course the sea was there; we very reluctantly set forth again upon our travels at 3.45 on Thursday afternoon. We had a lot of changing on that journey, at one station we had one and a half hours to spare and spent it well in dining at a country inn, new laid eggs and one of those loaves you buy by the yard. At another station we had to wait from 10 p.m. to midnight. There are no conveniences for spending spare time on French stations. The so-called waiting-rooms—I wouldn't go within a mile of, if I could help it. We spent our time in the Y.M.C.A. canteen over a cup of tea. It was about a mile and a half away, down a beautiful tree-lined road which I should like to have seen in daylight. We can use any Y.M. hut in the country, but only the officer's canteen of same—and yet, we may not speak to officers! We had rather a nasty time when we got our train to go on from this particular place. The trains are immense things, and would be absolutely unmountable in a hobble skirt; they are bad enough from the platform, but unfortunately very little of them is actually at the platform and one has to mount from the line. A military policeman was taking charge of us and trying to find us a compartment, and he sped down the line, we after him, bearing our rugs, overcoats, knapsack and cases. It is difficult to run at all in full pack, but when it is pitch dark and all the space between the lines is strewn with bricks, mounds of rubbish and tin cans, &c., it is *tres horrible*. I measured my length, while my case went flying under our train and my rug nearly under a passing train on the other side. No one gallantly picked me up or tended my wounds. The other girls were nearly in the same plight and we "fell" on. In the end we had to sit in the corridor of a first class upon our luggage; but only four of us were in, with about two cases, when the train started. These French people on the trains wait for no one. I marvel there are not more accidents; they start off with passengers half in and half out.

This is the most admirable place for "getting off," you simply can't help yourself. You all know I'm a confirmed old maid, but now, there will be a rush of applications.

I paid the penalty of dalliance by being caught in a most terrific thunder-storm the other night and had to walk four miles through it. I was never so wet in my life. I was due at office on night duty at 10 p.m. and had to go in all sorts of weird and borrowed garments. The woods path home won't see me again. I shall keep along the tram lines. We arrived at our present quarters about 4 a.m. and, for the first time, were expected. The officer in charge at our own signals office met us and was most genial. We think it was very good of him to arise at 3.30 to meet some of his future staff. He showed us all round until 4.45 when the officer in charge of our W.A.A.C. camp arose to greet us, very good of her too, don't you think? I think we are not "soldiers" in any sense, for everyone provides for our comfort too much. We had breakfast and then slept till 12 o'clock, dined, and at 2.30 inspected our new office. It is all in the camp but a little walk away. They are providing a new switchroom and retiring room, procuring crockery and arranging for us to be able to make tea, &c. I don't think the people at the place where our other girls are, are doing anything at all for them, but then we are under ideal officers, at home and at work. We would not now go back to the place we were so loth to leave. I forgot to mention that two of the six girls there came on with us, as eight are wanted here and only four there. The four left behind are Miss W. (E. G.), Miss W. (C. K.), Miss J. (Vi.) and Miss N. of the Observation Office. We eight are sleeping in one big hut and the dining and bathrooms are other huts, of course bigger. Camp life is fine and much preferable to hostels. I hope if any of the girls from our exchange come out they will be lucky enough to go to a camp.

We never go down to the town, save to catch a car to the sea, for which we have to obtain passes. On Sunday we took sandwiches and spent the day there, and as the bathing huts are not open yet, bathed from the beach. We came back to hot dinner in the evening. We shan't have that alternate

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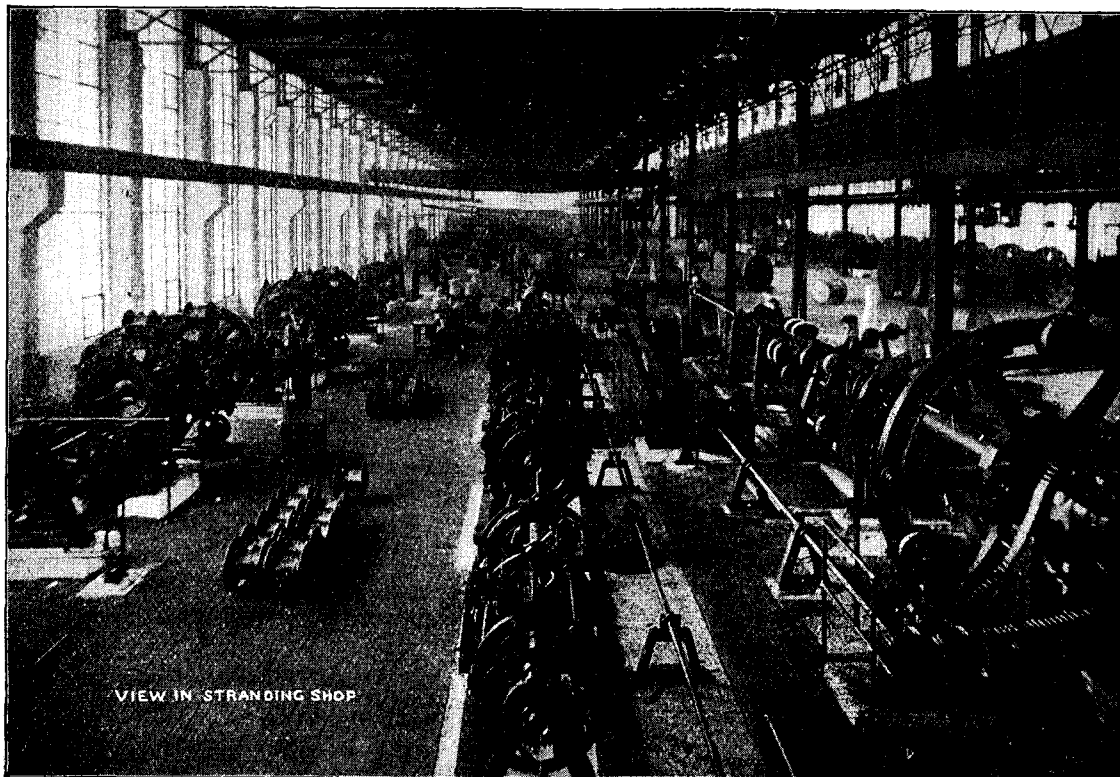
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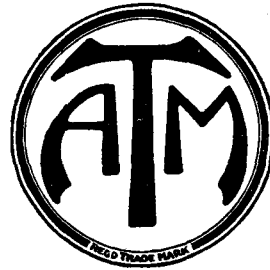
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Sunday off we expected. Our Sunday is the same as any other day and you take the duty of the week on that day. We have most peculiar duties.

(1) 8 a.m. to 11 a.m.	1 p.m. to 5 p.m.
(2) 8 a.m. " 12 noon	1.30 p.m. " 4 p.m.
(3) 10 a.m. " 1 p.m.	3 p.m. " 7 p.m.
(4) 11 a.m. " 1.30 p.m.	4 p.m. " 8 p.m.
(5) 10 p.m. " 7 a.m.	Alternate days.
(6) 5 p.m. " 10 p.m.	
(7) 10 p.m. " 8 a.m.	
(8) 7 p.m. " 10 p.m.	

It becomes more complicated even than it looks, because No. 1 duty is to be taken permanently by our senior girl, so that when it comes to our turn for that we take night duty instead, thereby getting two weeks of night duty right off. I can't say what I think of it yet, except that only one week out of the eight leaving earlier than 7 p.m. isn't exceedingly great. We intend making out our own duty list and submitting it, as we were asked to do. The work is not difficult, but the trunk calls are exceedingly numerous and rather complicated. One of our girls who came from trunks got London the other day; I wish I had been present. There are a lot more signal girls coming very shortly, so we hear, but I think they are likely to be telegraphists rather than telephonists. I should be delighted to greet old friends.

We haven't had any washing done for us yet, but we have quite a nice time on our wash days.

I got challenged coming off duty at 10.20 last night. It gives one a very funny feeling to have a bayonet within an inch of one's chest. I stammered out "Friend" in a very weak tremolo and felt quite thankful when that weapon was removed. I think he was a new sentry who didn't know us, and it is too dark to see a uniform or our blue and white R.E. signals armllet. We get very good food here and plenty of it. There doesn't seem to be any shortage. The teas one has out are most delicious and very cheap. The bread and butter is really lovely, and also one can get all sorts of cream pastries, except on Tuesdays and Wednesdays, when no sweets, pastries, &c., may be sold. We breakfast here at 7 a.m. which is rather horrid when one left office at 10 p.m. the previous night and is not due on until 10 o'clock at night. It would be still less pleasant on a winter's morning with the ice to break, but perhaps we shall have a different arrangement when some more come. I think the winter here will be very trying, but we must "wait and see." I really think I had better bring this to a close now.

You won't have to take the next in serial form, because there will not be so much to tell you. (I really believe I could write a book. Any suggestions for a title?)

I shall expect to hear from all and any, please, with all the news of the office. It seems a very long time since I left you all. I'm afraid I'm a very untidy writer, but I have had a good many interruptions of course, and have written in awkward positions, though I couldn't promise a well-written letter under the most favourable conditions. I hope I haven't been too prosy.

Duty calls me, and though we haven't a Dey Time, we have to sign on, so good bye, all of you, from your first member "on active service."

LETTERS FROM TELEPHONISTS IN FRANCE.

We have pleasure in publishing two letters despatched to friends from telephonists recently sent to France. Save for the excision of some purely personal lines here and there, they are practically unedited and present a lively picture of the journey over and the conditions on the other side.

I.

Now where shall I begin? I have got such a lot to tell you and I want you to pass it on. I last wrote to you when we were leaving our last destination. Well, there were eight of us had to go, the six who went out together and two others. We had to leave by the 3.50 p.m. train and we were given one set of rations to take with us, as it was a 12-hour journey. We bought two packets of chocolate, thereby nearly losing the train, but at last we started. The country was perfect, the orchards and buttercups were too beautiful. We were told we had two changes, the first one arrived at 4.30 and at that place we went into an hotel opposite the station. It was such a mouldy-looking place and filled with troops, so we were just turning away when a woman came out and signed and waved to us that we could have a private room, so we went in and ordered tea, eggs and bread and butter. She told us it would take too long to make tea and we could have coffee. We had one of those long French loaves and tons of butter and one egg each. The coffee was stone cold, but that didn't matter, and the whole lot only came to equal to 1s. 3d. English money each—good, wasn't it? We then got into the train again with a Stratford policeman, previously a shopwalker at Whiteley's (so he said). He told us "umpty poo" was French for "only a little" and several other things like that. Our next change was at 10 p.m. when we had to wait till 12.20, so we left our baggage in charge of the M.P. and went for twenty minutes walk to the Y.M.C.A. It was a lovely night, the station was crowded with French soldiers going up to the front. We dodged the SZ policeman as we were bored stiff, but he did render us a service later on. Well, we went to the Y.M.C.A., and sat in the officers' quarters and ate our cheese sandwiches, and they got us some tea. Then we started back to catch our next train. I did wish it was daylight. It appeared to be such a sweet place, and had a cathedral. When we got back we were waited for by the M.P. and our policeman who said we must go all down the line as the train was such a distance. It extended miles beyond the platform, so when it started to turn the corner we took our baggage and walked to meet

it. It was pitch dark and the soldiers were carrying some of our stuff, and we had to hurry like anything, M. fell over some wire and rolled about among the sleepers until she found herself again. We did die with laughing. The M.P. said, when he heard the scuffling, "Hullo! someone fell over," and went marching on. You have to climb up three steps to the train and I got in with five others. The men were passing our luggage up when off went the old train leaving S. W. and the two soldiers without luggage standing on the line. It got up quite a pace before it stopped again, right off the end of the platform the other end, the two girls came racing full speed along and got in. Just as the train started, finally this time, these two soldiers came tearing along with a truck with our attaché cases and rugs on. It was a corridor train and two of the windows were open, and, as the train went along, one man ran with the truck while the other threw the luggage in at the windows while I caught it—my finger nails were nearly all broken—and then the policeman got in himself, panting, with his own kit, and we never had time to thank the M.P. or anything. The train was full, and all night we sat on our luggage in the corridor. We reached our journey's end about 4 a.m., and we were met by such a nice old officer who shook hands with all of us and made us feel quite at home. Then there was a corporal with a motor-bike and side-car to take our luggage up to the hostel. The officer said it was a bit early to wake Miss Campbell up, so we went for a mile round the place with him until 4.45, then he knocked up Miss Campbell and we commenced our day. First I must tell you about the place. For 2½d. on the car we can get to a sweet little seaside place, and the car goes through lovely country. We are in huts and the whole hostel is huts, and it is up on a hill lovely and breezy. We shall simply love being up here. Our sleeping hut takes all eight of us; there is plenty of room and we have a stove in it for the winter. The soil is very chalky, and there are fine bath rooms, all in rows in another hut, and there is hot and cold water but at present the pump is broken. The food is a treat and I feel satisfied this morning for the first time. At the present moment we are sitting on camp stools outside our door writing. Miss Campbell is intensely nice and we have cricket and they are marking out a tennis court and there are going to be dances. We have a piano—it is awfully cracked, but it is a piano. They are making a new switchroom all white inside, and there are two new switchboards being fixed. At present the boards are exactly like SZ, so I am glad we went there before we came out. The garden in front is not there yet, but we are making it as soon as we get a chance. After we had our breakfast yesterday we went to bed until 10.30 a.m. Then we got up and reported to the office at 2.30 p.m. and had a cup of tea. Then we went and sat on the sands and some of the girls paddled. To-day we are going down to the office, two at a time for 2½ hours each to see the working. I think I must close now, I have told you as much as I can. There are only about 30 girls here at present, but we are all pally together, and I think I shall have a very nice time.

II.

Above address will find me now, but we expect to move on again to-morrow or a few days afterwards. I will now try and give you as much description of our journey as I can. We had a very calm crossing; we had two in a bunk, only we didn't sleep much as it was a glorious night, but when we went on deck at 3.30 a.m. it was bitterly cold and raining. We had breakfast at 5.30 which consisted of bread and marmalade and coffee or tea, then we landed at 6 a.m. We did not leave again till 1 p.m. so during the morning we walked miles, as we were free by 8 a.m. It was a very nice place indeed and we were stared at terrifically. Some kids coming out of school saluted and said: "Good-night and right turn!" I suppose these were the bits of English they knew. When we got back to the S.A. we only had tea and biscuits, and we were very hungry. It was lucky we have plenty of cakes and chocolate of our own else we should have come off very badly. We left the officer and the household draft who were going on to another place, and then we six found the train which we wanted and made ourselves comfy, as we had to spend nine hours in it. It started at 1.40 p.m. After the train had been going some time a guard in a pale blue blouse came and said something to us, and walked on. A few minutes afterwards he came back waving frantically, and some soldiers in the next carriage came to lug us out as it was "all change" and there was only three minutes left. We simply died with laughing. There was M. and C. S. in bedroom slippers, all our hats and shoes were off, and our haversacks unpacked as we were having our tea. The soldiers clutched the luggage, and, by the way, S.'s attaché case was half unpacked and M.'s air pillow was out, but at last we got into another train, and then these soldiers lost the carriage that they were in, so we could do nothing but invite them into ours as there was plenty of room, but they said they were sure we didn't want them all the time, so they would separate up and all meet at the carriage window at every station and as there were 28 stops we saw a good bit of them. One was about 35 or 40 and the others were boys. We were locked in our carriage but at each station they undid the lock with a knife in case we wanted to get out, then they brought us their billy can filled with lovely hot coffee. All the stations were little country halts, we sang like anything as we went along, and clapped ourselves when we finished. Eventually we arrived here at 10.30 p.m. There was no one to meet us, and the station was just closing. We reported to the Transport Officer who took us up to the hostel where they had all retired to bed. He knocked them up and the door was opened by Miss Thompson, the draft officer with whose draft we should have gone out. Apparently she was the only one resting, as we heard rushing feet and in a minute all of our own girls heard we had come and we did have a welcome.

Now I must tell you about the hostel. It is a place just like being on the stage. I shall never cease to regret your absence, but I will do my very best to explain it to you. The building faces across the top of a cobbled street and the entrance is like that of a livery stable or church. The gate

opens into a courtyard and the house is built round the courtyard, but the top has been glassed in now and made into a hall although the landing windows look down into it. Everything inside is scrubbed wood, and the walls are whitewashed. The stairs are scrubbed too and so are the tables we feed at. There are no cloths and we drink our tea out of six pint bowls. That suits me OK, and you can have them refilled too. When we got in last night we had bread and cheese and tea. We were ravenous, so we filled right up with it, but it was rather plain after having had nothing official since breakfast. The administrator here is very nice. She had not been told we were coming, but there is only our own draft here so there was plenty of room. We have lovely beds but no sheets and the blankets are a bit whiskery but very clean. There is absolutely nothing in the bedrooms but three beds and a piece of tin to do our hair by, and the bathing arrangements are too killing. They are on the first floor, which is a big stone room, curtained off in cubicles with a kind of tarpaulin, and behind these are two taps and a drain, and a tin bath about a size larger than the one we have at home. Then in the next room, which is also of stone, are cubicles again in which are wooden tables with tin bowls and jugs on for ordinary cat-licks. We have roll call at 7.30, then breakfast, dinner from 12 to 3, tea at 4.30, supper at 7.30, and roll call at 9 p.m. Our girls have started work but only do a few hours a day at present, as the men are still here. The girls are having the time of their lives, they say. We reported at the office to-day and are now waiting to know when we move on. Until then we are just finding our way about. All the girls look intensely brown and well. I do hope the Censor will pass all this?

CORRESPONDENCE.

TELEPHONE ADVISORY COMMITTEE FOR EDINBURGH.

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

I AM the secretary of the above committee, that is, I am the "Buffer State" between subscribers and the telephone office! This office was created after a visit from Colonel Ogilvie, and I am bound to say it has worked most excellently. At first the complaints generally received were many, but now they are reduced to a minimum, thanks chiefly to the very great care and courtesy exercised first by Mr. Worte, and latterly by Mr. Millar, our District Managers here.

I receive the TELEGRAPH AND TELEPHONE JOURNAL regularly, direct from London, and I should like to say how very much I appreciate the JOURNAL. In the June number I am specially struck by the paper by Mr. Pink, on page 122, especially the parts headed, "Commercial Aspects in General" and "Possible Development of the V ritten Message." Had I known that Mr. Pink was writing such a paper, I should have asked him for these particular paragraphs to insert in the annual report of the Chamber of Commerce—although we have cut down our report to a mere bagatelle this year. I should like particularly that he would keep this in view for next year and favour me in the month of January with something upon these two lines. I feel that his paper should have a much wider circulation among business men than it will likely have by appearing in your journal. Indeed, I should like to see every Chamber of Commerce have it printed in their annual report, because that would have an educative advantage, and we business men cannot have these things too much brought before us.

J. MILNE HENDERSON,
hon. secretary.

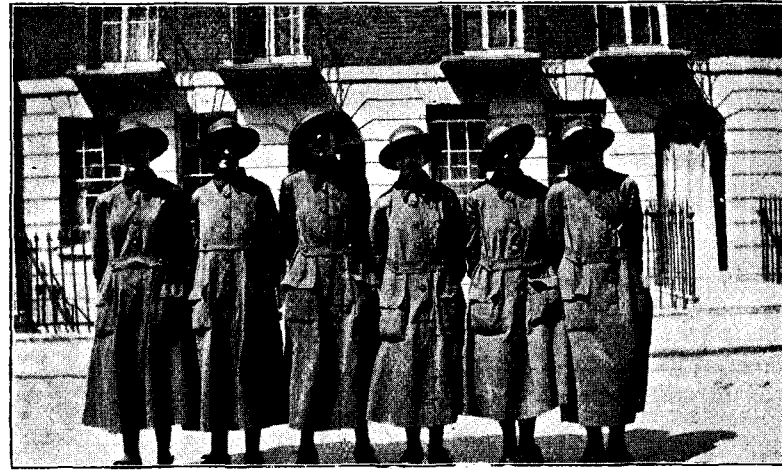
Edinburgh Chamber of Commerce and Manufactures,
22 Hanover Street, Edinburgh, June 5.

PRESENTATION TO MR. FORSYTHE.

MR. S. G. FORSYTHE, Postmaster, Belfast, was presented on May 29 with a beautiful illuminated address in album form on the occasion of his departure to take up his new position at Leeds. Dr. J. Walton Browne, D.L., occupied the chair, and referred to the esteem entertained for Mr. Forsythe by the postal officials and the general public during his period of service in Belfast. The District Manager, Mr. Archer Smith, on behalf of the Belfast telephone staff, spoke of the high regard in which Mr. Forsythe had been held and wished him all possible success and happiness in his new sphere. Messrs. S. S. Brown, Assistant Postmaster, G. Laslett, Engineer, J. H. Wigg, local representative of the Board of Works, John Donnelly, Acting Superintendent of Telegrams, and R. J. Aiken, Inspector of Postmen, also spoke.

ENTERTAINMENT TO WOUNDED SOLDIERS, NEW CROSS.

At Camberwell Conservative Club, Hanover Park, on Saturday afternoon, the staff of the New Cross Telephone Exchange in Briant Street gave their fourth entertainment to wounded soldiers, the guests on this occasion being 40 from Maudsley Extension Hospital at Denmark Hill. A programme of songs &c. was contributed to by the Misses N. Gillam, D. Ely, Esther Telling, E. Brubach, M. Watley and A. Harrison, Messrs. T. Quaif, H. Hawkins, H. Smith, G. Bourne and T. Kerwin, and Messrs. Dapp and Walker. A Pierrot troupe (the Misses N. and L. Townsend, D. and E. Burbach, C. Woods, M. Harding, J. Maynard, D. Eley, M. Ketley, D. Dowsett, H. Waddington and D. Taylor) were responsible for an excellent entertainment. Miss H. E. Gillam worked hard as hon. secretary, and the committee comprised the Misses Epps, Painter, Ferrier, Liddell and Maynard.—(Kentish Mercury.)



MORE WOMEN FOR FRANCE.

PERSONALIA.

LONDON TRAFFIC STAFF.

Miss MINNIE MICHLE, of the Trunk Exchange, has resigned in view of her approaching marriage and was presented by her colleagues with a silver tea service and many other useful gifts.

Miss V. WOOLMER, of the Putney Exchange, has resigned and was presented by her colleagues with an ebony-back hair brush and hand mirror.

Miss E. B. TITCHENER, of the Museum Exchange, has resigned to be married and was presented by her colleagues with a case of fish knives, a case of spoons and a biscuit barrel.

Miss W. HUNTER, of the East Exchange, has resigned in view of her approaching marriage and was presented by her colleagues with a cut glass bowl, a silver tea strainer and many other presents.

Miss E. A. HOLLAND, of the Dalston Exchange, has resigned to be married and was presented by her colleagues with a tea service.

PROVINCIAL STAFF.

Miss J. S. CHALMERS, Clerical Assistant, District Manager's Office, Aberdeen, recently resigned to be married. She was presented by her colleagues with a case of silver teaspoons and butter knives.

Miss B. A. HENDRY, Clerical Assistant, District Manager's Office, Aberdeen, having passed the Civil Service Examination for a Woman Clerk, London, was presented with a case of brushes by her colleagues in Aberdeen prior to taking up her new duties.

Miss TOMS, Travelling Supervisor, Hereford Section, Gloucester District, has resigned on account of marriage. She was presented by the staff of the District Office and Traffic Section with a cut glass centre piece and a china coffee service.

Miss RICHARDSON, Clerical Assistant, District Manager's Office, Gloucester, has resigned after six year's service to take up other employment. She was presented by the staff with an amethyst and pearl pendant.

Mrs. ROBERTS, who after resigning her established position as Clerical Assistant in the District Manager's Office, Gloucester, to be married, was re-employed in a temporary capacity, resigned on May 19 to take up other employment.

Miss F. E. L. HEAPS, Travelling Supervisor, Exeter, who, after fourteen years' service has resigned to be married, was presented by the District Manager, on behalf of the District Office staff and telephonists at the exchanges in the district, with a dinner service and other gifts.

Miss KATHLEEN WELCH and Miss JEAN HENRY have been selected for duty in France as telephonists. Both are accomplished French linguists. Miss Welch also having a good knowledge of German. There is plenty of healthy rivalry amongst the Belfast and District telephonists for the honour and privilege of serving their country, and it is expected several more will shortly receive instructions to proceed to London for preliminary training. Belfast is proud of Misses Henry and Welch and hopes they will both be spared to return safe and sound. That they may be successful in France as they have been in Belfast is the unanimous wish of the staff.

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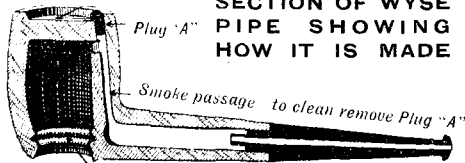
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BRITISH TELEGRAPH PRACTICE.

(Continued from page 129.)

IV.—TELEGRAPH INSTRUMENT ROOMS.

THE standard arrangement for telegraph instrument rooms in the United Kingdom is to have narrow tables two feet wide with the telegraphists facing in one direction in each half of the room towards the middle of the room. In the smaller rooms, or in rooms of such a shape as to render that course desirable, it is sometimes arranged that all the telegraphists shall face the same way. The distribution of telegrams is conducted from the middle of the room so that the circulation may be as rapid as possible, and for this reason the tubes from the counters and from other offices are brought to the central point. There is some difference of opinion as to the arrangement of instruments on the tables. In some instances the geographical arrangement seems to be an advantage, in order that when a wire is interrupted the telegrams may be readily transferred to a wire providing an alternative route. On the other hand it might seem to be an advantage so to arrange the circuits that the physical conveyance of transmitted telegrams could more readily be accomplished without the messages having to pass back to the central distributing point. Generally speaking a compromise is effected. The broad geographical arrangement is adopted, while this principle is departed from in the case of those instruments the telegrams for which are received in considerable bulk from another instrument, and these wires are placed in close proximity. Another disturbing factor lies in the desirability of associating certain types of instrument together to enable team working to be adopted. For example, Creed instruments which call for the perforation of punched slips can most efficiently be grouped together so that the keyboard perforator operators may be used collectively to prepare perforated slips for different circuits.

The conveyance of telegrams from point to point with due rapidity is one of the problems of modern telegraph practice. In the main the messages are collected by hand and conveyed by hand to the central point where they are sorted and conveyed by hand to the instrument where they are signalled forward. In some larger instrument rooms, such as the Central Telegraph Office and Manchester, subsidiary distributing points are arranged. Where collectors are able to do so they are expected to pick out such of the messages as they collect and place them at the appropriate instruments on their way back to the central point, but this is only practicable in a comparatively small degree.

The use of mechanical devices for the conveyance of telegrams has been the subject of much thought during recent years and a complete system has been introduced at Birmingham. It is admittedly unsightly: to some extent it obstructs supervision, but, in the main, it certainly does succeed in providing an equable distribution of the traffic, and, while human distribution is more rapid in certain instances, the general efficiency of this machine distribution is now beyond question. But in the balance of interest, having regard to its unsightliness, to the obstruction in the supervision, and to the fact that it robs the younger telegraphists of the valuable knowledge of circulation which is given to them by experience in collecting and distributing, it is doubtful if this plant will again be adopted in its present shape. Partial arrangements to provide point-to-point conveyance have been adopted, either in the form of Lamson carrier, or in the form of cord carrier, or in the form of house tubes, or in respect of the addressing tables where telegrams are prepared for delivery, in the form of band carriers. Any one of these devices undoubtedly facilitates the collection and distribution of telegrams over the area of a large telegraph instrument room.

For some years the Western Union Company in New York, with telegraph instrument rooms on two floors, used a mechanical carrier, but in the new office this Company has adopted a two-fold system, partly mechanical carrier to certain points for the outgoing traffic and partly a band carrier for the incoming traffic, and for the actual distribution and collection of telegrams young girls on roller skates are employed. The result in point of efficiency seems to be that the messages are more rapidly collected and distributed than with any complete system of mechanical carrier. In Berlin, owing to the greater width of the tables which are in use, it has been possible to equip a mechanical carrier which runs along the tables and passes from table to table under the floor and is therefore not open to the criticisms which can be justly levelled against the Birmingham system. But the Berlin system is not applicable to England without widening the tables and the gangways between them and enlarging the instrument rooms to such an extent as to negative the value of the change. In the London Trunk Exchange an efficient system of pneumatic distribution has been installed. The tickets with one end turned down are placed in the tubes and are blown at high rapidity to different portions of the room. The adaptability of such a system to telegrams has been considered, but the cost of heavier paper would be prohibitive. In the main, so far as experience up to the moment is a guide, transmission by tube with carriers is the most satisfactory for longer distances, and by a point-to-point Lamson pick-up carrier for shorter distances.

For the purpose of supervision instrument rooms are divided into sections, and each section is under a supervising officer of appropriate rank. The sections again are grouped into divisions and each division is under an officer of superior rank. The whole instrument room is under the charge of a superintendent. The demarcation of responsibility is not difficult, for whenever a question arises in one section which affects another section the divisional officer is the court of appeal; and whenever a question arises in one division which affects another division the superintendent is the court of appeal. The questions most likely to arise are those affecting the dislocation of traffic when a wire is interrupted and a choice of another route for that traffic is necessary. But, in addition to this, moments of pressure arise when additional staff has to be borrowed from another section or division, and the relative higher supervising officer is expected to consider the balance of interests in each case.

A modern problem has arisen in connexion with the change of telegraph circuits to telephone. For some years before the transfer of the local telephone systems to the State the long distance telephone room, which was usually in the Post Office, was obviously the suitable place for these circuits, and for those other telephone circuits over which the public pass their telegrams or accept them by telephone. The growth of the use of the telephone for this purpose, however, rendered this an undesirable arrangement as the telephone rooms became too noisy. The next development was to equip the phonogram circuits, as they are generally called, at one end of the telegraph instrument room so that the operators faced the noise of the room, and it was found that the noise was not sufficiently disturbing to prevent the arrangement from being a success. The advantage, of course, is that all the telegraph work, whether performed by telegraph instrument or by telephone, is done under one control, and rapidity of transit to and from the phonogram circuits and the telegraph instruments is assured. There is some feeling, however, that either the noise in telegraph instrument rooms will have to be subdued, either by placing the instruments on a substructure of concrete or on a slate bed, or by providing suitable covers, or by putting the "sounder" instruments in headgears so that the noise may be confined, if the introduction of telephone circuits into the telegraph instrument room is to be continued; or on the other hand, it may be that the more rapid and the more noisy instruments will have to be placed in separate rooms. Recent tests have proved that the noise of telegraph instrument rooms

depreciates the efficiency of telephone hearing more definitely than had seemed to be the case, though the convenience of doing all the telegraph work in close association is still recognised.

The present position of telephones used for the transmission of telegrams is quite tentative, and various experiments are being made not only in respect of the place where the circuits should be installed but also in respect of the need for a distributing switch, and in respect of the arrangements for incoming and outgoing traffic. The whole question of the use of telephones for telegrams has been complicated by the necessity for a rapid extension during the war in order to facilitate the withdrawal of Morse telegraphists, and while it seems likely that the telephone will take, permanently, a more prominent place in the telegraph organism than in the past, it is by no means certain that it will continue on the scale at present adopted in national exigencies. There is also another factor in the promise of low speed printing telegraphs to be used in connexion with high speed printing telegraphs, and if the promised machines for sub-offices can be superposed on telephone circuits it may be that the future lies rather in this direction than in the use of the telephone itself for the transmission of telegrams.

V.—TELEGRAPH INSTRUMENTS.

The object of this chapter is not to describe telegraph instruments themselves but to indicate the use to which different types of telegraph instruments are put in the British Telegraph Service. Telegraph machines may be divided into two classes, those which produce arbitrary signs either visible, or audible, or both, and are read by the skilled telegraphists, and those which print the actual messages in Roman letters on a tape or on a telegraph form. Broadly speaking the first class of instrument up to recent years was characteristic of English and American practice, and the second class of instrument was characteristic of French and German practice. Of the first class of instrument with symbolic signs there have been the single needle, the double needle, the Morse printer, and the Morse sounder, but a policy of unification was inaugurated some years ago in the British service and by the conversion of a large number of circuits to Morse working that system was made entirely predominant. The second class of instruments includes, apart from slower printing instruments used for the distribution of news, the Hughes instrument and the Baudot, with several adaptations of Baudot to which further reference will be made later.

Both in England and in America there has been a reversion to printing telegraphs largely due to the research which has been given to the Baudot system and to the application of signalling methods based upon typewriter keyboard practice rather than upon special methods of signalling. Before this is discussed, however, it is desirable to look further into the question of the modern application of Morse working.

Morse working by hand, *i.e.*, by the signalling of long and short signals to indicate letters and figures still holds a very important place in the British telegraph system and probably will long continue to do so. It has been developed to a high pitch of efficiency by means of electrical devices which permit both-way working (duplex), both-way working plus an additional channel in one direction (triplex), double both-way working (quadruplex). Further than this, ingenious devices have been made to permit the use of channels of quadruplex circuits at intermediate points. Thus, a quadruplex connecting A, B and C can be used as both-way working between A and B, both-way working between B and C, and both-way working between C and A. The carrying capacity can be easily estimated from the fact that each way working is normally regarded as being able to convey 40 telegrams per hour. The fundamental weakness of the Morse code lies in the symbols for figures. These symbols have successions of dots or of dashes, and it seems to be the case that there is a psychical or a psychological tendency to form each succession of dots or dashes a shade larger than the preceding. In consequence there is some risk of error with the figure code, and for many years this has been safeguarded by the repetition of the figures in an abbreviated form. Later studies seem to indicate that undue reliance is placed on the repetition, and that the original signalling is not so precise as if it were relied upon. The tendency therefore is against repetition except in the case of abnormal messages.

The most interesting development of Morse, however, was Wheatstone, which is an automatic Morse worked at a very high speed. In the 'eighties before the introduction of the underground system, speeds of 500 and even 600 words a minute were not uncommon. In its economic use of wires the Wheatstone still holds its place, but obviously it presents a difficulty in arranging for the hand transcription of the symbols received at such high speed on the tape, and that method of transcription is necessarily slow. An attempt has been made to meet this difficulty by means of typewriters, and for some years this method was used in the British service, the telegrams for transmission being "gummed," *i.e.*, the tape with the arbitrary symbols was attached to the form and was read by the signalling telegraphist, and telegrams for delivery were typed. The most successful solution was the Creed instrument which translated the arbitrary symbols into Roman type.

The Creed apparatus, instead of receiving Wheatstone signals only by inked symbols, receives them by a perforated slip in addition to the inked symbols by Wheatstone, and this re-perforated slip is put through a printing instrument which translates the symbols into Roman letters on a tape, which in turn is gummed on the form. The machine works at a maximum of 150 words a minute so far as re-perforation is concerned and somewhat less so far as the printing is concerned, and the printed tape is gummed on forms ready for delivery to the public. These speeds look much lower than the possibilities of Wheatstone as shown above, but by means of careful economic working, and bearing in mind the fact that modern underground circuits are themselves limited in point of view of speed, the Wheatstone Creed itself is not at a disadvantage. The re-perforated slip can be used not only for producing

the printed-slip but for signalling forward on other circuits, and this use of it promises to be one of the most interesting aspects of the future development of telegraphy. The Wheatstone both in itself and in its Creed form, does not give the output in telegrams which might be expected from its nominal speed. It has been discovered that in net productivity ordinary Wheatstone reaches about 60 per cent. and Creed about 70 per cent. In special circumstances these figures have been exceeded and there can be no doubt that further study will reveal the factors which militate against a better net product.

In the application of Wheatstone to Morse working there has been a diversity of practice. Wheatstone has been used as an occasional recourse, and in this aspect, has been aptly called "spasmodic" Wheatstone. It is a method of working which has obvious disadvantages, and is only brought into use to meet heavy accumulations of traffic, and then it presents a staff difficulty as the writing of the slip is a heavy burden. On the other hand Wheatstone is sometimes worked on a continuous basis, being called "systematic" Wheatstone, and for this purpose the addition of type keyboards (see below) for perforating and of typewriters for writing is an advantage. The most satisfactory system of "systematic" Wheatstone is with the Creed, as described above. This method is being worked in America, in Russia, in Australia, and is characteristic of Scandinavian working. It shows signs now of being replaced on shorter lines by the multiplex method.

The original production of perforated slip by hand was by means of an instrument controlled by three keys, one of them producing the perforations to make a dot, one of them producing the perforations to make a dash, one of them producing the perforations to make a space. This obviously had its crudities, and much ingenuity has been expended in recent years in providing instruments which will produce these perforations with a keyboard on the typewriter model. Two such instruments are in use in England. One of them is called the Gell; the other is called the Kleinschmidt. The Gell is a British machine and the Kleinschmidt is an American. By means of these machines telegraphists are able to perforate for onward transmission an hourly load varying from 60 to 100 telegrams.

Before leaving Morse telegraphy it is necessary to refer to the use of typewriters. In America the typewriter is used normally in connexion with Morse sounder working. It is normally a more rapid machine than Morse hand signalling, and in America various devices have been introduced to produce sequences of short signals automatically, so that hand signalling by Morse can approach the capacity for speed with the typewriter. These devices are not viewed with favour in England largely because it is feared that they develop telegraphists' cramp, and it cannot be said that the use of typewriters for writing telegrams received from the Morse sounder has been developed in England to the extent which at one time seemed probable. The typewriter is used, however, most efficiently for translating inked Morse signals on tape both in respect of commercial messages and messages for newspapers, the latter being readily manifolded, as many as twenty copies being made at one time in the Central Telegraph Office.

An interesting adaptation of a type keyboard instrument for Morse signalling was developed a few years ago. It was called the "Yetman," and it was so arranged that the depression of the keys actuated drums which signalled the long and short Morse impulses for the appropriate letter. The aim of the machine was to find a relief for those telegraphists who suffered from telegraphists' cramp and to provide them with a method of signalling other than the conventional Morse key. The Yetman was undoubtedly successful, within its somewhat narrow range, and would probably have been developed in England had it not been for the rise of methods of telegraphy which did not use the Morse symbols.

The characteristic of the various instruments which are included under the generic heading of Morse—with the single exception of the Creed attachment—is that they call for mental interpretation of the symbols. Other instruments to the consideration of which we now come do not call for the mental interpretation of the symbols, but the telegraph machine itself translates the electric impulses into letters. The distinction is not a new one. It developed quite early in the history of telegraphy, and the separation of telegraph development into two main streams is not dissociable from the fact that in the United States of America certain financial interests operated in the encouragement of the Morse as a rival to the Hughes printing machine. This machine will always receive its tribute of respect from telegraph men. It still holds an important place in continental telegraph: it is still a factor in international telegraphy and has only of recent years been displaced in the British system. It operates by means of a keyboard, broadly speaking, akin to that of a pianoforte; the keys operate the rotation of a typewheel with type on its periphery, and at a certain moment the paper-moving wheel is raised so that the tape is pressed against the appropriate letter. In the hands of skilled operators who are able to take advantage of the sequent conveyance of letters in one revolution of the wheel it is capable of a high output, ranging from 60 to 70 telegrams per hour, and it has been worked both ways on one wire. The telegrams are produced for public use by gumming the printed tape on a form. The development of instruments which use a wire to better purpose has been the deciding factor which has told against the Hughes, and it is not too much to say that its departure is viewed with keen regret.

Treating the Hughes as an intermediary, we come to modern telegraphy, and to the striking development of the Baudot instrument and of improvements on, or developments from, the Baudot. The Baudot system uses as its central principle a code made up of five elements for each letter and popularly called the "five-unit code." This code includes for each symbol variant permutations and combinations of positive and negative impulses to make up the invariable total of five. The signals are transmitted by means of five keys, and an arrangement is in operation to indicate to the signalling

telegraphist the rhythmic pulses. This arrangement is called the "cadence." The receipt of the impulses at the incoming end of the wire selects the appropriate moment for pressing the paper against the typewriter whereby the letters are printed on a tape. But there is a major selection. Not only are the signals dispatched from one instrument to another, but a group of instruments is arranged on one wire so that each can transmit to each of a group of receiving instruments. To do this a distributor is arranged, the function of which is to gather and allot the signals to the appropriate instrument. This calls for a controlled synchronism and the distributor is governed by special signals which are transmitted at every revolution, and the "cadence" thus becomes an indication to the signalling telegraphist of the moment at which his signals can be included. In addition to this distribution, a British engineer has succeeded in making the already multiplex machine work both ways simultaneously. Hence it comes that between London and Birmingham there are twelve channels on one wire, six in either direction. Between London and Brighton and between London and Bristol there are ten, five in each direction. The suitable speed is 30 words per minute, though this is not a limiting speed and the output can be regarded as 65 telegrams per hour per channel.

The newer inventions take this Baudot as their basis. The Murray multiplex is the foundation improvement. It abolishes the five keys and in place of them it adopts a perforating system with a keyboard of the typewriter model. The advantage is that the operator is quite free from the cadence: the perforated tape does the signalling and the telegraphist keeps the machine supplied. It is found that this can comfortably be done with a machine running at 40 words per minute on each channel. Further the Murray multiplex prints each message on a separate form and not on tape, though to do so certain signals are necessary to bring the type carriage back at the end of a line and to pass from one form to another at the end of a message. The output of this machine in its latest form may be stated as 80 telegrams per channel per hour. The Western Electric Company have a machine with the same main features, but instead of separate forms it uses a continuous roll of paper, but it requires special signals for the end of a line and the end of the message. It adopts the principle of correcting the synchronism from the signals themselves as they pass, thus saving the transmission of correcting signals, but the value of this on short lines is not yet proved. It was adopted by the French Government for Baudot working on long lines to Algiers. The Western Electric Company's machine is in extensive use in the United States where very high outputs ranging to 100 telegrams in the hour are frequent, and the speed per channel has been increased to 45 words per minute. Both the Murray multiplex and the Western Electric provide eight channels for each wire, a total speed in England of 320 words per minute, 160 words in each direction. It would seem that the mere raising of the speed per channel to more than 40 words per minute brings with it the necessity for some method of printing other than printing on tape, either printing on separate forms or on a continuous roll. Somewhere near 40 words per minute seems to be the limit of "gumming," in a satisfactory fashion. The Western Union Company has installed multiplexes of an admirable kind on the land-lines, to be worked in association with its Atlantic cables, the first development of multiplex working for cable traffic.

The Siemens' instrument is a German invention also based upon Baudot, but it chooses a both-way high speed principle rather than the multiple channel system described above. It uses perforation with a typewriter keyboard, but with an alphabet designed to fit the German language and to reduce the alternations of current in passing from one letter to another. It works out 1,000 letters per minute in each direction and prints on a tape. It has an ingenious self-regulating system for finding synchronism. It provides that each keyboard perforator, by being plugged up to the receiving apparatus, becomes a re-perforator and produces a perforated slip identical with that originally used at the forwarding end, and this slip is available for onward transmission of the telegram. This feature of re-perforation is also being adapted to the multiplex instruments described above, with the addition of being controlled from the signalling end so that the signalling telegraphist by including a particularised signal can provide a perforated slip for those messages which have to be signalled forward by the receiving office. It makes the machine readily adaptable for the triangular system which is described as a feature of the German telegraph organism.

Other devices in use in instrument rooms may be referred to briefly. Telegraph circuits which carry a light load are not ordinarily joined to an instrument but to a switchboard, called a "concentrator," where they are connected to instruments when necessary. A similar arrangement is in force in the slacker hours to enable telegraph circuits to be grouped together, and this is known as "night concentration." The reduction in the floor space in use and consequently in artificial light, and the resultant saving of staff, are all of considerable importance in the aggregate, and as news circuits are more busy in the evenings it is obvious economy to arrange "night concentration" in proximity to the news work.

At some offices repeaters are installed for the reinforcement of the current on very long lines, and these repeaters need careful and skilled attention in order that imperfections in the regulation of the apparatus may not interfere with the working of the wires. These repeaters are often necessary for special circuits made up for news work and for events of special public importance, but the recent development of Creed re-transmission has reduced the need for long complicated circuits serving a number of offices.

A few other instruments remain to be mentioned. The general policy of substituting telephones for lightly loaded telegraph instruments has been carried so far that only a few of them remain. There are still some Wheatstone A B C instruments, the feature of which is that a pointer indicates the letter. A few single needle instruments remain, chiefly connected to railway stations,

and among them are isolated cases of acoustic instruments of the same type, called "double-tapper." Some members of the public, especially in London, rent telewriters or telautographs, for the despatch and receipt of their telegrams, and there are a few instances of instruments of the Siemens' printer type, an instrument which is very largely in use in Germany for light loads. In the main, however, British telegraph practice confines itself to Morse sounder with Creed or multiplex printing machines for the heavier loads, and though the development seems to be in this direction of multiplex printing for main routes it is not probable that the predominance of Morse will be affected for many years. The French system uses printing telegraphs of the Hughes and Baudot type as the normal, with Morse as the exception: the United States is developing printing telegraphs of the modern multiplex kind, with a fair amount of Wheatstone with Barclay or Creed additions, but with a large field for Morse: Canada uses Morse and Wheatstone; Scandinavia, Wheatstone, Creed and Morse; Germany, Hughes, Siemens, Wheatstone and Baudot; Russia, Wheatstone, Baudot, Murray; India, Baudot, Wheatstone, Morse; Australia, Creed-Wheatstone with multiplex printing in promise and Morse. With these varied instruments is telegraph practice being evolved throughout the world.

(To be continued.)

TELEGRAPH TRAFFIC.

BY R. BAXTER.

(A comparison of past and present conditions and a view of the effect of the war upon a North Country office.)

THE recent passing from service of the last link, so far as this office is concerned, with the Post Office telegraphs and the business conducted by the "old companies," called to memory the leaf of a publication which shows that in 1871 the traffic of a week equalled that of a day at the present time (see Statements I and II).

Many have been the stories told and listened to with rapt attention of what telegraphists were wont to do in the "old company." Shall we say to present-day telegraphists? Judge for yourselves!

All honour, however, be to the men who doubtless found it difficult to forget the old magnetic code in favour of the Morse. We scions of a later day revere their memory, for they were men of good heart. They were our guides, counsellors and friends in matters telegraphic, and by sitting at their feet we learned to use our hands aright in our endeavour to manipulate the commutator of Bright's, Bell or D.P.S., the Morse key, and the sticks when punching with ordinary perforators.

These instruments may doubtless soon be things of the past also.

Examination of the various statements furnished with this article will show that during the last four years there has been a gradual fall of the traffic conditions.

It is gratifying to be able to record that the past three months have shown an increasing tendency.

It will, however, be noticed how difficult it is to meet the fluctuations of traffic. A glance at the figures for say March (Statement II) clearly illustrate this.

It may be said that season force will meet the situation, but unfortunately this force is not always available for *days* of pressure as it requires to live when not needed.

Season force has been a saving grace during war conditions. I hope it may eventually be fairly rewarded when the day of peace will introduce the question, How?

Of the manipulative staff 44 per cent. of the most expert force has gone to serve in a more pressing position with the Colours, yet the average daily output per operator has not so greatly changed. Compare the average of the highwater mark year 1907 with that of 1916 (Statement III).

This speaks well for the whole staff established and temporary. It proves that they are working with a will, trying to do their bit.

That this is also true of officers at the out offices also will be readily acknowledged as each message received at the office under consideration is sent by an out-office officer and each one sent is received by an out-office officer.

We trust that each officer, and office will take this expression

of opinion to his or herself and itself, as an indication of the appreciation of the efforts put forward.

This article has been submitted for publication in the hope that similar statements so far as other offices are concerned may be forthcoming for purposes of comparison, as the future is doubtless pregnant with conditions that will need the full glare of the limelight if success is to be hoped for in dealing with them from Departmental and labour points of view.

STATEMENT I.

LANCASTER AND CARLISLE, THE LAKE COUNTRY AND FURNESS.

CARLISLE.

Nov. 4, 1871.

I take first in order the communications of Carlisle because, from the geographical position of that town, any arrangements which may be made for the service of the district treated upon in this chapter must materially

be influenced by the facilities which Carlisle possesses for disposing of the work collected at that centre. Apart from this consideration, Carlisle claims the first attention, because its work will, during the tourist season, and, in fact, at other periods of the year, rank far beyond that of any other office in the district. According to the September return, Carlisle forwarded in one week 368 messages; it received 450, and it transmitted 1,833; total, 2,651 transactions. These figures, when compared with the detailed statement appended to this paper, represent, it will be seen, by no means the greatest amount of business which, even during the past year, has been dealt with at Carlisle, and as it does not appear, after a careful examination of the question, that any portion of the transmitted work can be diverted from that office, it would follow that, with the normal increase of business and the growth which is likely to follow the improved arrangements to be described hereafter, it is probable that during most of the summer weeks of next year the Carlisle office will have to deal with from 3,000 to 3,500 messages; the total may even touch 4,000 messages.

It will be seen at a glance by the map that Carlisle is approached, and therefore has its telegraphic service, mainly by three principal routes.

STATEMENT II.

CARLISLE.

Comparative Statement of Telegraph Traffic.

Month.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
January	58,910	54,022	49,629	57,383	51,546	53,981	56,926	51,003	56,102	47,428
February	53,461	53,884	45,954	51,887	46,949	50,607	53,051	49,242	51,905	48,561
March	63,444	55,859	52,625	62,476	54,838	55,885	59,379	52,335	59,737	52,011
April	66,638	63,247	61,612	62,377	59,527	65,305	61,448	62,224	59,800	55,798
May	71,459	61,202	61,570	63,272	63,644	67,989	67,795	63,051	†66,547	56,282
June	70,143	72,645	67,735	74,548	74,364	65,291	64,894	70,254	60,544	58,811
July	89,220	83,139	73,862	81,352	76,847	81,785	81,435	82,801	71,866	64,561
August	89,679	80,973	75,464	88,073	+102,155	85,668	84,451	85,181	73,253	70,905
September	79,081	74,963	72,985	80,331	79,307	76,411	77,826	67,672	72,101	56,146
October	76,518	68,384	65,978	69,928	67,183	70,548	68,657	64,232	63,997	60,906
November	62,109	54,144	53,678	58,064	55,003	59,396	51,781	54,280	50,471	54,686
December	56,695	55,304	55,563	62,744	52,720	58,551	54,338	61,444	52,788	58,255
Totals	837,357	777,766	736,655	812,435	784,083	791,357	781,981	763,719	739,111	694,350

† Railway strike.

‡ Gretna railway disaster.

Transmitted counted 1.

Approximately 72 per cent. traffic is transmitted.

Service messages, average 150 a day, not included in totals above.

News messages average 150 a day up to 1912, then dropped to present average, 80 a day through newspapers using telephone.

		Average.	
A	250 a day.
B	1,500 "
C	300 "
SG's	150 "
News	80 "
Phonograms	50 "
(1916) total	2,330 "
(1871) total...	2,651 per week.

STATEMENT III.

CARLISLE.

Average Telegraph Traffic and Staff Statement for Ten Years.

Staff and Traffic particulars.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Traffic counting transmitted 2, news 3, and telegrams delivered by telephone as 2 each	1,040,000	985,000	931,000	1,011,000	982,000	990,000	968,000	941,000	899,000	887,000
Average manipulative force ...	29.5	29.5	28.5	29.5	29.5	29.5	28.5	27.5	26.0	25.0
Transactions per operator per annum	35,254	33,389	32,666	34,271	33,288	33,559	33,964	32,381	34,576	34,280
Transactions per operator per day	112	107	104	109	106	107	109	103	110	110

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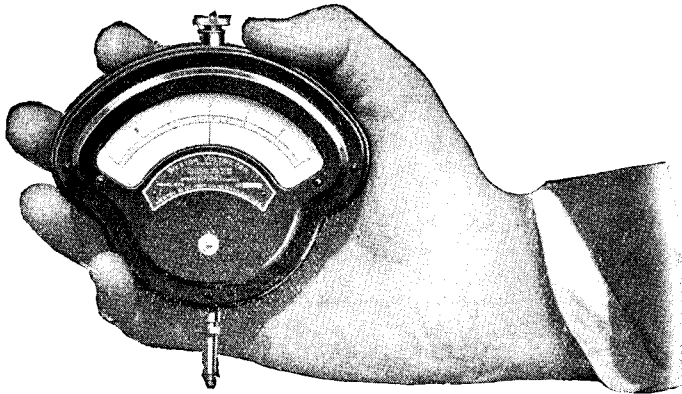
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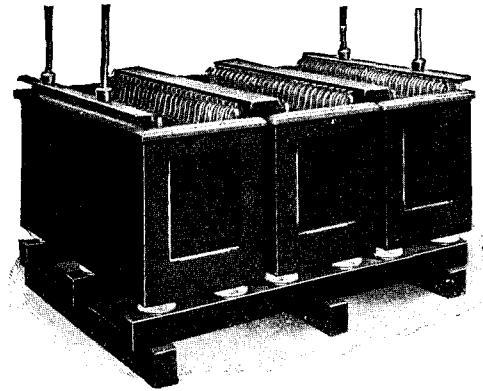
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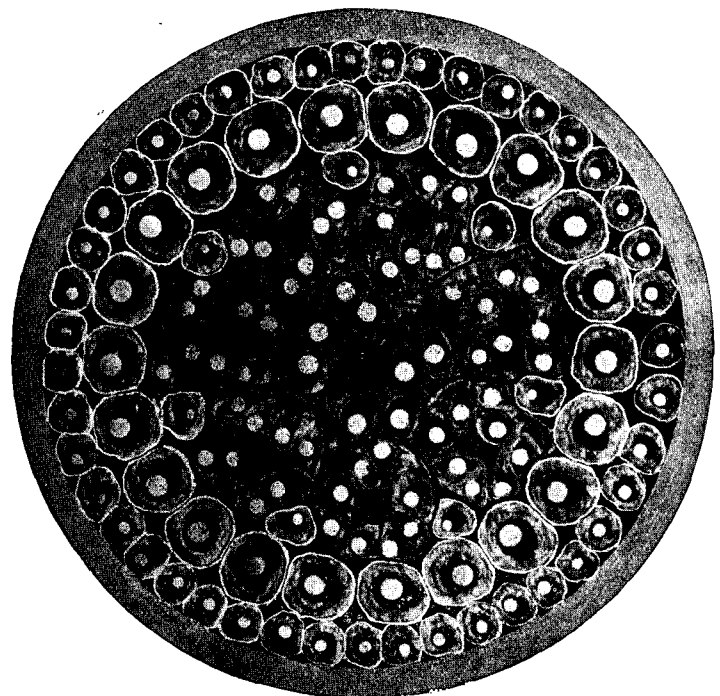
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ESTABLISHED 1875.



(1) That from Lancaster to Carlisle, which route embraces both the road line of the late Magnetic Telegraph Company, and the wires erected on the London and North-Western Railway; (2) by way of Newcastle, following the line of the North-Eastern Railway; and (3) that from the north by the Caledonian and Glasgow and South-Western Railways.

I will deal first with its southern communications; that is, the wires *via* Lancaster. At the date on which this chapter is written, viz., Nov. 4, Carlisle depends for its through communications by this route on a direct circuit to Liverpool, and on a Manchester circuit, which also connects it with Penrith, Kendal, Lancaster and Preston. In a few days, however, a new wire, forming part of an intended circuit between Belfast and Manchester, will be temporarily appropriated as a Carlisle and Manchester direct circuit. The need for this circuit has been already abundantly made out, and I think it is necessary to do no more than state that it is essential that this temporary arrangement should, so far as Carlisle is concerned, be made permanent. In what way the loss that Belfast will thereby sustain should be made up will, no doubt, be considered, and settled elsewhere. Carlisle, then, it will be observed, will be in possession of one clear wire to Liverpool, and one clear wire to Manchester. It will no longer be necessary that it should keep up communication with Manchester by means of the omnibus bell circuit before referred to; and when I call attention to the position of Penrith, I will show how, in my opinion, that circuit can best be turned to account.

The circuits between Carlisle and Newcastle are three in number. One is used chiefly as a news wire, which, starting from Newcastle, terminates at Dumfries, having Carlisle intermediate. The second wire is about to be used as a Belfast and Newcastle circuit, with Carlisle intermediate, and on the remaining wire Hexham is interposed. For the purpose of securing to Carlisle at least one clear circuit with Newcastle, I propose that Hexham should be cut out from this wire, and provided with a separate circuit by means which I will presently describe. The wire thus cleared, and which I think is at present fitted with needles, should be supplied with sounders or double-current Morse apparatus, or at any rate with something better than single needle instruments.

With regard to those communications northwards, it should be explained that Carlisle possesses two circuits to Glasgow, one by the Caledonian line, and the other by the line of the South-Western Railway. Neither of these circuits is clear, one having Dumfries and Kilmarnock, and the other Ecclefechan, Lockerbie, Moffat, and Biggar in circuit. An opinion is entertained at Carlisle, and I think reasonably so, that the Carlisle office ought to enjoy the exclusive use of at least one wire to Glasgow, and it would also be considered a very great improvement over the existing state of things, if a circuit, either direct, or perhaps with one intermediate station, could be provided as between Carlisle and Edinburgh. Although it cannot be said that a wire to Edinburgh would be completely filled at this moment with messages dealt with at Carlisle, yet a respectable number would even now flow over a Carlisle-Edinburgh circuit if it existed. On Nov. 1, at a time it must be remembered when the tourist season had come completely to an end, 130 messages were sent between Carlisle and Glasgow. Of these, examination showed that 50 were for Edinburgh, 40 for Glasgow and 40 for Ireland. With regard both to Glasgow and to Edinburgh, but especially to Glasgow, I may mention here, that the communication which further on will be recommended to be opened up between Barrow-in-Furness, and Carlisle, will bring upon the Carlisle office a certain number of additional messages for each of the two northern cities. Between Barrow and Glasgow and Barrow and Greenock there cannot be less than a score of messages per diem, and north of Europe telegrams which would now circulate from Barrow *via* Manchester for Newcastle or Glasgow could more conveniently circulate through Carlisle for Edinburgh and Aberdeen. Taking then as a basis, the present number, viz., 50 messages a day between Carlisle and Edinburgh, and 40 per day between Carlisle and Glasgow, I think we may compute with an approach to accuracy the numbers that would be dealt with on these two circuits as follows:—

	Edinburgh circuit.	Glasgow circuit.
Number of messages per day in November 1871	50	40
Add for the general difference between the number of messages in August and November	10	10
Barrow messages	10	20
	70	70
Normal increase 29 per cent.	20	20
Total for each circuit	90	90

I think these figures go sufficiently far in proving that there are grounds, even upon traffic account, for the new circuits, inasmuch as 90 messages, or even 45 per diem, represent a handsome annual receipt for a wire little more than 104 miles long. ($45 \times 313 = 14,085$ messages — at £58 a thousand, £812 or $\times 2 = £1,624$ a year.) It is not, however, solely on the produce of the Carlisle message traffic that I rest this proposal. It is, in my opinion, worth incurring some expense to strengthen the principal transmitting centres, so that they may be able to rely, not upon one route, but upon several; not on a few other transmitting centres, but upon many; and for this reason, among others, I think that the Department will do well to give as nearly as practicable direct circuits from Carlisle to Edinburgh and Glasgow.

I have consulted with Mr. Tansley, the engineer for Scotland, how this can best be done. He would prefer not to touch the Carlisle, Dumfries, Kilmarnock and Glasgow wire, and obviously the northern section of this wire is wanted by Dumfries and Kilmarnock for message work with Glasgow. We can, however, re-arrange, without incommensurate cost, the Glasgow

wire, which runs by the Caledonian line. A spare length is available from Glasgow to Carstairs, 31 miles; a new wire should be run to Biggar and Moffat, 34 miles, taking those two offices out of the through circuit. Then from Carlisle a new wire, 25½ miles in length will have to be run to Ecclefechan and Lockerbie, so that at the cost of putting up 59½ miles of new wire, a very valuable circuit will be obtained, whether for the immediate purpose in view, or for through working in case of need, 104½ miles long.

Next, as to the Carlisle-Edinburgh circuit. Short of putting up a wire throughout by the Waverley route, there is some difficulty in proposing a really satisfactory arrangement. But while I would aim at a clear wire eventually, I think, in the first instance, the needs of Hawick and Carlisle may fairly be taken together. I understand, although I have no very precise and definite information on the subject, that messages to and from Hawick are much delayed by inadequacy of circuit accommodation; that having to run the gauntlet of a circuit which comprises Stow, Galashiels, Melrose and Jedburgh, as well as Edinburgh and Hawick, delay could hardly be otherwise than the rule. I propose then, that a circuit by a new wire throughout shall be made up between Carlisle and Edinburgh, with Hawick intermediate. As Carlisle, it is estimated will next summer throw upon this wire 90 messages per diem; as Hawick is a considerable place, which in the September week sent and received 214 messages, or say 35 messages a day, and as this will be not only the main northern outlet of Hawick, but also its only road to the points for which Carlisle transmits, I think there is no fear but that the circuit will be fully occupied.

AIR RAID ACTION.

By J. W. KENNEDY.

THE screeching and banging of exploding bombs, with that irritating squelching double thud at the end, the rattle of guns, the feeling that any moment—particularly the next moment—one may be crushed out of existence, the horrible helplessness and uncertainty of those who, themselves subjected to danger, have no means of reply; such are not experiences that our pre-war notions of our women staff would have led us to expect could be endured—not that we had any reason to impute cowardice to them, but simply because the very idea of the possibility of such endurance being required of them never entered our minds. They, on their parts, had become inured to the idea that the even tenour of their official duties was unlikely to be disturbed by anything in the nature of adventure. And if they had a grievance against fate, it was that the large things of life, the things which call for the stronger qualities, were not required of them. The adventurous among them sighed for the chances of other days. The strong of spirit yearned for wider worlds to conquer.

Some such retrospective thoughts were mine on Saturday morning, the 7th inst., as I looked round the London Trunk Exchange while bombs were actually dropping in the immediate vicinity, while the presence of airmen over and on both sides of the building was reported, and while the smoke from exploded bombs was distinctly seen from the windows, and through it all the supervisor nearest to me hovered over her section like a strong spirit seeking to help those under her charge.

I can paint no picture of stoical insensibility. Some nervous cries there were as the bombs dropped, white faces were the rule, but in many of these the lines of determination were the strongest. Silent tears were dropped, but only for a moment. No one near me left her post, and calls were passing and cords connected with the music of death in our ears. So near and insistent was the horrible thud of the bombs that most of us thought that some part of the building had been struck. It seemed to us that the rattle of guns continued longer than even during Zeppelin raids. Some day it may add some value to our lives to know that there were times when, for duty's sake, we faced the chance of death. It must add infinitely more to the lives of women, whose finer nervous and physical organisation makes them feel more acutely.

The conduct of the women staff in the General Post Office South in this and other raids, both day and night staff, established and unestablished, has been worthy of all praise. I have nothing but whole-hearted admiration for their fortitude and courage.

WORKING A WHEATSTONE IN GERMAN EAST AFRICA.

BY EDGAR C. GATES, R.E.

On Jan. 10 all was ready for speed trials. The preliminary arrangements had not been propitious. One receiver had suffered badly from *mal de mer* and several pinions vital to mechanical accuracy were found on examination to have been bent. The other only "spare" available had early developed a relay fault in the form of a loose tongue contact, and this was only remedied by recourse to main force and a pair of lineman's pliers; but it worked!

The line, 117 miles long between Morogoro and Dar-es-Salaam, constructed under the supervision of an experienced Indian officer, was excellent. Its resistance was a shade under 5 ohms per mile and constant except for trifling variations which occurred with clock-like regularity throughout the day. The table on which the set was fitted was part of the German P.O. equipment and as hard as iron. One large gimlet, a big screwdriver, a small sledge, and a jack-knife completed the tool chest at hand. But the wiring having been tested and proved good we waited impatiently for the familiar signals. "Shall I try 'O.S.' to you?" we read. We found the fault already referred to and then came through the first Wheatstone slip run in German East Africa. When it came to our turn however our transmitter displayed a marked bias and it required infinite patience to proceed with its adjustment by the light of a hurricane lantern. Nothing remained but to postpone any further trial till daylight. With a little good fortune the bias was reduced to a working minimum and at 50 words a minute signals were readable. With a new transmitter something more like a satisfactory result was obtained. At simplex Morogoro read Dar-es-Salaam with perfect marks at 250 words a minute. At simplex, in the reverse direction, Dar-es-Salaam read Morogoro at 350. Then came a duplex trial. A balance was obtained with 2,250 ohms in the rheostat and .5 m.f. in the condenser. At 150 words a minute simultaneously the result was excellent.

But, my technical readers will ask, what voltage did you use? Well, according to all test books 100 volts is the E.M.F. required for Wheatstone working. The only power to be obtained locally was from the usual type of dry cell "N" size, and the experiment began with 45 of these. The power proved unequal and better results were obtained with 30. At a rough estimate this gives us 45-50 volts and the results were as good as could be obtained under home conditions. This number has since been slightly increased as some of the cells have deteriorated. Of course this state of things could not be regarded as final. A further length of line as far west as Dodoma was added to the circuit now lengthened by another 180 miles. Again success attended the trials and a YQ speed of 150 words per minute was easily achieved.

The Wheatstone has once more justified the soundness of its inventor's principles. Its use is extending in the area of operations and in four months it has made converts.

It is food for congratulation to think that one has been of the party that participated in its original installation.

"Old Slip" opens the doors of memory and spreads the wings of fancy. One man can think of nothing nearer originality than "Old Mother Hubbard." Another exercises his taste in verse while for a third the nearest scrap of printed matter provides his raw material. The telegraphist who punched the first bit of "O.S." out here may be judged by his selection. It ran:

"Awake, for morning in the bowl of night
Has flung the stone that puts the stars to flight.
And lo! the hunter of the East has caught
The Sultan's turret in a nooze of light."

[It is interesting to note that the original of this contribution is written on the backs of German order forms (Bestell-Zettel) for goods traffic on the Tanganjika railway.]

TELEGRAPHIC MEMORABILIA.

WILL the patient patrons who usually peruse the scribblings in this column be good enough to read "guerdon" instead of "querdon" in my quotation from the Italian poet last month, more for the sake of Dante's reputation than for my own, which is not perhaps A.I. in the calligraphy line!

Quite recently the depredations of some rats in the C.T.O. led to the short circuiting of a pair of lead covered twin wires connecting to a fire alarm. Upon raising the flooring "it was noted" that only this pair had been touched although many others were laid along the same route. Curiosity prompted further investigation and an obliging lineman of no small reputation furnished the following explanation and personal experience:—"Rats apparently object to anything being placed in their path. If you place your wires parallel to the 'run' of these animals it is seldom that anything happens, but if you cross that 'run,' ten to one they will nibble through. The only way to get over their objection if you can't avoid crossing over is so to arrange your cable as to leave them a free way. He had one experience where they cut through lead cabling containing over ten pairs, and the only device which overcame their prejudice was to arch the wires at the point where the smaller cable crossed over the main cables, leaving nothing actually for them so much as even to step over, but in place a path *under*, what evidently appealed to them as an obstacle that should be removed. Since that arrangement these wires have never yet been touched although well within easy reach of their wonderful teeth."

Endless would appear to be the uses of the telephone, and although the following is not likely to prove the means of increasing the revenue of the Post Office Service, it is probably of sufficient interest to be placed in the note book of any telephonist interested in the utilities of his or her craft. It is sometimes necessary to place electric motors in positions not easily accessible for inspection so that when trouble arises from causes which may include excessive sparking or irregular brush action it becomes necessary as one of the ordinary verifications to inspect the commutator, &c. This, where, as in a special instance, the motor is itself fixed in a distant or none too accessible loft or roof, would frequently involve much trouble and probably loss of time. In this particular case an engineer conceived the idea of fitting up a telephone by the side of the motor, leading the wires down to a receiver in the basement engine room. As sparkless running invariably gives out a peculiar hum, and deviation from this regular sound would indicate that there was sparking or scratching &c. at the motor brushes, a brief listen at the detective phone prevented many a weary and fruitless climb to the regions above, and on the other hand seldom failed to record real trouble when such existed.

In season and out of season Mr. Donald Murray, with the sure eye of the prophet that *knows* to guide him, has advocated the superiority of the phonic wheel motor for driving Baudot and kindred telegraphic distributors. In "Press-the-Button-Telegraphy," in debates at our now vacated home on the Victoria Embankment and before the High-Speed Telegraphy Committee he has not failed to voice his belief and to give reasons for the faith that is within him regarding the absolute efficacy of this type of synchroniser. He has now the satisfaction, not always accorded to men in their life-time, of seeing his ideas fully adopted and his views accepted as correct. Now that the device is in actual use one can scarcely realise that there should have been any need for a lengthy struggle over the matter. Frequently a fair practical trial of new ideas, methods or machines is worth tomes of paper and cubic yards of breath spent on debating impossible *pros* against *cons* which are never likely to arise. It is understood that the Ceylon Administration is actually trying or about to try the system on their Colombo-Madras circuit, and it will be surprising if the Indian Government do not follow suit. It is just the simplification needed for that Eastern land where they love to see the wheels go round with the minimum pother and fatigue.

One little word of praise should however be accorded to Baudot's beautifully scientific governor which, given the conditions of its native air!—the use of a certain special lubricant and which by the bye we have never been able to completely copy this side

of the Manche—has been known to work for half a year without re-adjustment and, further, has been the means of maintaining absolutely perfect Baudot communications during a quarter of a century on circuits which may be numbered by hundreds.

Numerous will be the regrets at the departure of Mr. John Lee from Headquarters, none greater, one would esteem than those who have been associated with him in the conduct of this journal as also those who have come in contact with his cheery personality on the committee of the P.O. T. & T. Society. "Will ye noo come back again?"

Consequent upon these regrets are those which one is bound to associate with the departure from the C.T.O. of Mr. T. Mackenzie who leaves his telegraph home in G.P.O. West to succeed Mr. Lee in that wider sphere of activity, the traffic branch.

There are some folks whom one fixes as part and parcel of certain institutions, even built into them, so that when circumstances move these same individuals with the most perfect ease out of the cycle of their long-time normal activities, one wonders how far the revolution will affect the fabric itself. Mr. Mackenzie will know from these ruggedly expressed lines that he leaves a distinct gap; many will lose a friend and the gain of the branch which has annexed him will therefore prove the loss of the London Central Telegraph Office.

Again have the twin Services been put to the test as never before in history have British telegraphists and telephonists, and again have they issued from the trial with an enhanced reputation for self-control and self-discipline. Lord Roberts once had occasion to say that "the men are splendid," had he witnessed last month's trial of nerve and sense of duty he could not but have given our sisters in the Services equal pride of place.

Comparatively very little notice has been taken in the daily press of the interim report of the Whitley Committee on what practically amounts to the treatment of post-war industrial problems. The probable causes of this apparent neglect are twofold, first the shortage of paper which almost prohibits the appearance of any matter that does not touch directly on present conditions, and secondly the shyness of the home-bred Britisher in approaching new methods of dealing with old problems.

The report is practically one appeal to all grades and ranks, from wealthiest employer to poorest employee, from highest official to lowest graded officer to come together and to take counsel with one another regarding the best methods of dealing with the post-war problems of their particular craft, and how best to develop that particular craft or calling along safe and efficient lines to a perfection of mutual and national advantage undreamed of in any pre-war period.

Here truly is the golden bridge of mutual trust and co-operation. No words of the writer could improve on the closing words of the report itself: "We venture to hope that representative men in each industry *with pride in their calling and care for its place as a contributor to the national well-being* (italics mine) will come together in the manner suggested and apply themselves to promoting industrial harmony and efficiency and removing the obstacles that have hitherto stood in the way."

Grave indeed will be the responsibility of those who render at least a trial of the Committee's suggestions impossible.

J. J. T.

REVIEWS.

The Calculation and Measurement of Inductance and Capacity. By W. H. Nottage, B.Sc. Published by The Wireless Press, Limited. Marconi House, Strand, W.C. 137 pages. Price 2s. 6d.—The importance to those dealing with alternating currents of methods of calculating and measuring inductance and capacity is self-evident. Directly we commence to deal with variable currents the inductance and capacity of our circuits begin to exert their influence, and the effects due to these properties of the circuits become more and more marked as the frequencies with which we are dealing increase, till when we come to telephonic or wireless work they are all important.

In the present book the author has collected in one volume

the formulae for expressing the capacity and inductance of the various combinations of conductors most usually met with in practice, including the important case of wireless telegraph aerials, together with the methods of measuring these quantities which are most generally employed.

As a work of reference to anyone concerned with these matters it should prove of great use, bringing together as it does information to obtain which otherwise would necessitate reference to many separate books or to original papers.

Preliminary Mathematics. By Prof. F. E. Austin, B.S., E.E., Hanover, N.H., U.S.A. To be obtained from E. & F. N. Spon, Limited, 57, Haymarket, London, S.W. 169 pages. Price \$1.20.—This book is a course in elementary arithmetic and algebra, up to quadratic equations, simple series and logarithms.

The subjects is treated clearly, and a large variety of examples is given.

In our opinion, however, the price is somewhat excessive. Equally good books can be obtained in this country at considerably less cost, and we are afraid that, unless the publishers can see their way to reduce the price, Prof. Austin's book will stand but a poor chance in competition with them.

The Elementary Principles of Wireless Telegraphy. By R. D. Bangay. Published by The Wireless Press, Limited, Marconi House, Strand, W.C. Part I: 212 pages. Price 1s. 6d. Part II: 241 pages. Price 2s. The two parts bound in one volume: Price 3s. 6d.—In 1914 a small book of 160 pages appeared bearing the above title, and published at the modest price of 1s. It was a reprint of a series of articles which had appeared in the *Wireless World*, and was intended to be useful to amateur wireless telegraphists, and to Boy Scouts and similar organisations.

The remarkable clearness with which the subject was discussed, however, rendered the book of great use to a much wider range of readers. It was by no means the ordinary "popular" type of book, and yet was so lucidly written that a reader, without any preliminary knowledge of the subject, could follow the argument with ease.

This small volume has now grown to two, each considerably larger than the original, and the excellent style of the first edition has been well maintained in the present one.

The whole subject is covered, from a preliminary introduction on the fundamental principles of electricity and magnetism up to a description of the action of the rarefied gas "valves" which have recently come so extensively to the front in wireless practice, both for sending and receiving purposes. This section on valves is one which will specially appeal to the student of wireless telegraphy.

The author has a really remarkable gift of arranging his statements in logical order and of making his explanations complete. The reader does not have to waste time trying to bridge the gaps in the argument so often left in text-books by the words, "It is evident that . . ." or similar expressions, remarks with which the novice is only too familiar as presaging a long and perhaps fruitless effort on his part to discover the reason why, but the whole argument is placed before him step by step in such a beautifully clear manner that we feel sure that the absolute beginner will have no difficulty in mastering the whole of the book. We can assure the advanced student, also, that he would be well advised to read it. He will, we feel certain, find after having done so that his ideas on many points will be more vivid, and better arranged in his mind, than they were before its perusal.

ENTERTAINMENT OF WOUNDED SOLDIERS AT BROMLEY.

The staff of the Bromley Exchange recently entertained about 30 wounded soldiers staying at Church House. Great credit is due to the committee for the excellent arrangements made and for the good entertainment provided. Songs and instrumental music were rendered by Miss Gertrude Kingston, Misses Gardner and Smith, Mr. and Mrs. Brooker, Mrs. Lydia Martin, Miss Woodham, Miss Holloway and Miss Muriel Fleck. The musical programme was followed by a tea, which was much appreciated, and by a smelling and hat-trimming competition. After the prizes had been awarded and the votes of thanks had been given with cheers and counter-cheers, "Auld Lang Syne" brought the entertainment to a close.

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

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LONG DISTANCE TELEGRAMS AND TELEPHONE CALLS.

SOME observations of the Postmaster-General of South Africa in his report for the year 1916, extracts from which we reprint in this issue, have the effect of drawing a distinction between the different spheres of usefulness of the long distance telegraph and telephone. "It has to be recognised," he says, "that for the longer distances the telegraph will remain the chief medium for all ordinary purposes," while later on it is remarked that for communication between towns within a range of about 100 miles the telephone is an ideal medium. This is, perhaps, only equivalent to saying that as telegrams are usually charged for at a flat rate, and telephone messages according to distance, it follows that the shorter the distance the closer the charge for a telephone call will approximate to that for a telegram, and the preference will go to the telephone. "The economic effect," it is said, "is that whilst a reply paid telegram from Johannesburg to Cape Town can be carried for 2s., the charge for a telephone conversation between these two places (if a trunk line existed) would, at the present tariff, be 14s. 6d. per three minutes." The question, of course, is purely an economic one, and no purpose would be served by spending 14s. 6d. on a trunk call if a 2s. telegram would answer one's purpose. But it is precisely here that the difference between the two modes of rapid communication comes in. A reply paid telegram covering a message in each direction is hardly comparable with a telephone conversation which allows of numerous messages in each direction, and in which weighty matters can be discussed, objections met, instructions given, and varied or confirmed according to the tenour of a correspondent's replies. A dozen telegrams and the space of several hours would be required for the same purpose, by which time the "economic effect" would be operating in favour of the telephone. It is perhaps not desirable that long trunk lines should be loaded with messages of secondary

importance; there is economic fitness in their being reserved for the rapid handling of such calls as justify their comparatively high cost, for as the Postmaster-General points out long telephone lines are expensive both to build and to operate. The telephone on the other hand cannot approach the utility of the telegraph in conveying long press messages with marvellous accuracy, nor is it so suitable, regard being had to cost, for communications requiring no answer, or merely a pure negative or affirmative. There is properly no antagonism between the two Services—one is indeed complementary to the other; but we do not think a case can be made out in normal times against the building of costly long distance lines between important cities, which will generally be found to be able to furnish sufficient traffic, even at a high rate, to justify them, for the advantages of a telephone call in an emergency, or when pressing matters are on hand, are of an irreplaceable kind.

HIC ET UBIQUE.

WE offer our heartiest congratulations to Mr. John Lee, Deputy Chief Inspector of Traffic, on his appointment as Postmaster of Belfast. Mr. Lee, as our readers know, is a member of the Editing and Organising Committee of this journal, but possibly they do not all know how large a part he has played in its success. Whilst we shall miss his personality at Headquarters we shall happily not lose his help, for he is continuing to act on the committee and will co-operate with us from his new post. He is succeeded as Deputy Chief Inspector of Traffic by Mr. T. Mackenzie, Assistant Controller of the Central Telegraph Office, to whom our sincere congratulations are also offered.

THE *personnel* of the telephone branch of the Secretary's Office (especially the higher ranks) has been scattered amongst other Departments since the war in the widest possible manner. Mr. L. T. Horne, the Assistant Secretary, has gone to the Pensions Ministry, Mr. R. J. Mackay (Principal Clerk) to the War Office, Mr. J. W. Wisenden (of the Editing Committee) to Army Signals, Home Defence, Mr. W. Henderson to the Ministry of Pensions, and Mr. E. Hewkin to the Admiralty, and Mr. H. J. Maclure to the Ministry of Munitions. Several second and third class clerks are also on loan to other Departments, not to mention the large number of men who have joined the Colours; and none of these officials have been replaced except that Mr. A. G. Ferard has taken Mr. Horne's place as chief of the branch.

THE air raid of July 5 found the London telephonists staying at their posts as gallantly as ever during the bombardment. We can really find nothing fresh to add to our admiration of their behaviour. Certain exchanges, which it would be invidious to mention, came off with especial credit.

THE present reduced size of the JOURNAL makes it unfortunately necessary to hold over many articles of interest—some of them for several months. We ask the indulgence of our contributors and readers, and assure them that we do not wish to damp the ardour of those who have anything to contribute. We are always glad of the opportunity of considering fresh articles and hope to publish all the more outstanding ones in due course.

AIR RAID WARNINGS.

WE cull the following "ingenious idea" from the *Evening News* :—

Briefly the scheme is this: When the warning of an impending air raid is received by each telephone exchange, one operator could ring every call-bell to the rhythm of the tune of "The Campbells are coming, hooray, hooray," verbally transposed by rearrangement to mean "The Germans are coming, they're on their way."

This rhythm, he says, could be rung four times with intervals of 30 seconds,

and the number of single strokes following would tell in how many minutes they were expected to arrive.

When the signal "All clear" is given the call bells would ring the rhythm of "God Save our Gracious King."

This scheme necessitates no alteration to the call bells of the telephone. All that would be necessary would be (the inventor says) to electrically connect at the exchange all centres and subscribers to a small 2½-inch or 3-inch diameter brass disc adjusted to the existing telephonic apparatus at the exchange, and to revolve slowly when released at a given speed.

In the event of a raid the warning could then be despatched simultaneously to the telephone centres and subscribers.

SOME STRAY THOUGHTS ON TELEGRAPH PROBLEMS.

(Contributed.)

In considering various instructions referring to the use of telephone circuits for telegraph traffic, the writer has been not a little impressed by the use of such expressions as "provided that ordinary telephone traffic is not prejudiced thereby," and it may be useful to examine this proviso in conjunction with certain other matters affecting the efficiency of the telegraph service from a purely telegraph point of view. It is of course possible that many Morse circuits converted to telephone working for the period of the war may revert to sounder working at a later date, but many—probably the majority—will continue to be served by telephone so long as the ordinary telephone traffic is not interfered with. It seems clear that the telephone administration has been strong enough to insist upon a creditable standard of efficiency in the telephone service in order to keep faith with the public and maintain its revenue-earning capacity, and it would appear from this that the telegraph service is to be regarded as a sort of poor relation, to be tolerated rather than encouraged; to wait in the kitchen rather than be received in the drawing-room.

The telephone officials are not to be blamed for this state of affairs; they realised that it was their function to attract more and more revenue-earning traffic, and that in order to do so a minimum delay service must be maintained—which is evidence of sound business methods. But should not the same argument apply with equal force in the telegraph service?

In the old days the telegraph service was worked on what was to all intents and purposes a minimum delay basis; those were the days of booming telegraph traffic and efficient means of dealing with it. Then came the "average" system, with its corollary of closed working points, and higher individual outputs. It is commonly believed, perhaps without justification, that this system was inaugurated on the grounds that the telegraph service was not a paying proposition, but if such was the case the economists responsible for the change failed to realise that a public accustomed to a reasonably good telegraph service would not make the same use of a poor service, and that the best and indeed the only way to make the telegraph service pay was to encourage the public to fill the wires instead of driving them into the arms of the growing trunk telephone service, which was what actually happened. It may, therefore, be assumed that the starvation of the telegraph service necessitated the erection and maintenance of costly metallic circuits and telephone equipment to meet the artificially created demand for trunk telephone facilities, whilst expensive telegraph plant was thrown out of use.

It is not argued that the average system is wrong in principle, and indeed, the chances are that with up-to-date apparatus, a new tariff, and more scientific management the present working rate is capable of substantial improvement, but it seems that the new regulations were applied in such a way that the true inwardness of the scheme was misinterpreted by the staff who were probably not ripe for such a revolutionary change in any event, and were certainly not prepared to accept it with good grace, considering the manner in which it was introduced.

Before dealing with other changes which may have led to the deterioration of the telegraph service, it would perhaps be well to examine briefly the financial side of the undertaking. The demand for a cheap telegraph tariff resulted in the passing of a Bill in the early days of State ownership fixing the charge at a minimum of 6d. up to twelve words with ½d. for each additional word. That the change might result in a financial deficit was not, perhaps, a matter of much moment, seeing that Parliament had already affirmed the principle of a cheap and rapid telegraph service at the cost, if necessary, of the taxpayer. Later on, well knowing that the concession would further increase the already large deficit, Parliament decided that telegrams should be delivered free of charge up to a distance of three miles from the terminal telegraph office and within the town postal area of the terminal telegraph office which, in many cases, extends to upwards of five miles from the terminal telegraph office.

A similar state of affairs exists as regards Press traffic. One Postmaster-General after another has pointed out that Press traffic results in a large annual deficit, but so far the Press have been strong enough to resist any increase in the tariff. It is argued, with some truth, from a political point of view, that any increase in the Press tariff would cripple some of the smaller newspapers, which are useful as a means of educating public opinion, making it impossible for them to compete with the wealthier and more influential newspapers.

From this it would appear that Parliament has always recognised that the telegraph service should be conducted at some cost to the taxpayer, and

it is obviously impossible to make it a profit-earning concern under present conditions, when so many services have to be rendered at less than cost price. It would almost appear that, instead of attempting to fill the wires, the policy for some years past has been to depreciate the quality of service in order to decrease the annual deficit for which Parliament is responsible—a policy which has probably been a much bigger factor than telephone competition in the reduction of telegraph traffic.

Many think that the "average" system as applied increased the transit time at the larger offices—the writer can remember the time when it was almost a crime to show on the tablet check delay exceeding ten minutes—and there can be little doubt that the wholesale extension of telephone working has produced a like effect at the smaller offices. In November 1914 telephones were in use at 6,257 offices throughout the United Kingdom, at 5,806 of those offices the telephone was the sole telegraph instrument, and at 1,746 of them the telephone instrument was being used for public calls as well as for telegrams. Many more Morse sounder, Bell and A B C circuits have since been converted to telephone working, and at the moment the total probably exceeds 7,500.

Amongst the reasons advanced for the introduction of telephone working are:—

- (1) The telephone permits a sub-postmaster who has not learnt the Morse sounder to deal with telegrams, and enables him to do without the services of telegraphically qualified assistants.
- (2) The use of the telephone lessens the difficulty in finding assistants and saves the cost of training.
- (3) The change from Morse sounder to telephone reduces the risk of cramp.
- (4) A considerable development of through switching is possible and the transmission of telegrams accelerated. Human labour at intermediate points is saved and the risk of error is reduced.
- (5) The provision of circuits for joint use of the telegraph and telephone services reduces the cost of equipment and maintenance, and enables the administration to extend facilities to more or less sparsely populated districts on a scale not attempted in any other country.

If we examine these five reasons we shall find that the desired object is not always achieved and that in some cases the gain is not commensurate to the cost in efficiency and probably in revenue.

- (1) It cannot be disputed that the smaller sub-postmasters have benefitted by the introduction of telephone working; the benefit, however, decreases as the size of the office increases, both from the point of view of economy as it affects the sub-postmaster and from the standpoint of efficiency as it affects the efficiency of the telegraph service.

Generally speaking a sub-office with a fairly heavy telegraph traffic carries a heavy postal traffic. The class of assistant required at a busy sub-office is usually qualified both postally and telegraphically, and these persons—who naturally hesitate before accepting employment at an office where there are not any facilities for telegraph practice—usually command the highest rate of wages a sub-postmaster can pay. The sub-postmaster of such an office, whose Morse circuit has been converted to telephone working, may therefore be called upon to pay maximum wages, although the unit scale payment of telegraph work dealt with by telephone is about one-third less than if it were being dealt with by Morse sounder.

It is not always possible at busy sub-offices to at once answer the telephone, and the already low telephone operator average as compared with the telegraph operator average, is seriously affected through inattention. Telegrams transmitted by telephone must be repeated by analogy, and the time occupied in repeating or listening to the repetition of a telegram over a telephone circuit is a serious factor.

- (2) In the experience of the writer a capable telegraphist is usually a better all-round assistant than one who has never learned to work a Morse sounder or one who can only work it indifferently well. There are several reasons for this which need not be touched upon in this article. A slow or incompetent assistant must be a sore trial to the sub-postmaster in charge of a busy sub-office attached to a private business requiring his personal attention; he cannot afford to employ inefficient assistants.
- (3) The assumption here is apparently that the more telegraphing a person does the greater the liability to cramp. This is a somewhat startling conclusion; research has not yet revealed all there is to know of telegraphist's cramp, but it seems clear that persons of a certain temperament are peculiarly susceptible to the disease and that they would probably succumb whether they sent five or fifty telegrams in a day. If the latest instructions regarding the training of telegraph learners are faithfully observed there should be very few cases of telegraphist's cramp in the future.
- (4) Experience proves that through switching does not accelerate the transmission of telegrams nor does it eliminate human labour at intermediate points to any extent. Telegrams may only be dealt with over trunk and junction circuits when the lines are not required for telephone calls. It happens frequently that the lines are engaged when a call on telegram service is passed and delay piles us in extraordinary fashion; moreover each inquiry regarding the call takes up an operator's time and

in the end the human labour involved is considerable. Nor is it correct to say that telephone transmission reduces the risk of error, for all returns obtained prove the contrary.

- (5) This is probably true only as it affects new installations. The conversion of Morse sounder circuits to telephone working has thrown spare a large quantity of telegraph apparatus, and necessitated the provision of new phonogram equipment and junction lines.

It seems reasonable to argue that telephone working has reduced the efficiency of the telegraph service. There is nothing to be said against the introduction of this method of working small places where facilities could not be given except by means of a joint call office and telegram circuit, but since these small places are called upon to pay their share of the annual deficit, it would be unreasonable to refuse the facilities except in extreme cases. But it does seem unfair that a telegram handed in at an office where the joint circuit is moderately well filled should be held up pending the conclusion of a 1d. or 2d. telephone call or calls.

It has been said that the fall in telegraph traffic is the natural result of telephone development. With that the writer agrees to some extent, but whereas almost everything possible has been done to develop the telephone service, the telegraph service is perhaps in a worse position now than it was twenty years ago.

In the telephone service no delay services have been created between places having intimate commercial relations; between certain hours trunk calls are accepted at half price when the ordinary fee is 6d. or over, and local and trunk calls may be established at any hour of the day or night.

In the telegraph service public facilities have been restricted, the same fee is charged at all hours of the day or night, and except for the introduction of the telegraph night letter at one or two places there is no progress to record save the introduction of high speed apparatus. A large number of telegrams suffer additional transit delay not only at originating and terminal offices served by telephone, but at intermediate stages, especially where the telephone is the transmitting medium. Telegrams dealt with over jointly used circuits are subject to delay which increases in proportion to the public demand for calls—they must always give way to the telephone user, and the risk of error on telephone circuits is greater than on Morse sounder circuits.

The telephone is the luxury of the few, the telegraph the necessity of the multitude; there is room for both services in healthy competition, but the public are losing the telegraphing habit because of the lack of facilities and the comparatively poor quality of service compared with that given a few years ago.

How then is the telegraph service to be made more attractive?

The writer is not opposed to telephone transmission, but if telegrams must be dealt with by telephone and the telegraph service debited with the cost of the telephone facilities at a fairly high rate, then telegrams should not be held up until such time as the lines are not required for public calls; proper junction and trunk facilities should be provided to deal with the telegraph traffic as efficiently and as rapidly as they were formerly disposed of by Morse sounder.

If it is impossible to restore the old facilities for the handing in of telegrams it seems worth while considering whether telegrams should not be accepted at exchanges outside the normal head and sub-office hours of attendance for telegraph business for transmission by telephone to the nearest telegraph transmitting office, either without payment of the trunk or local telephone fee or at half telegraph rate plus the trunk or local telephone fee.

The introduction of high speed telegraph apparatus naturally raises the question of urgent and non-urgent tariffs. There has been a tremendous development in telegraph traffic in America during the last year or two as a result of the introduction of a differential tariff and the British Administration might do worse than embark on a similar project. Then there is the question of a local and long distance tariff raised by Mr. John Lee in his paper read before the London Telegraph and Telephone Society a year or so ago.

Finally, there is the question of free delivery. There is much to be said for the point of view of the public, that where a charge for delivery is made that charge should not exceed the actual cost of delivery. A charge of 4s. is demanded for the delivery of a telegram in Withington, a suburb of Manchester, outside the normal hours of attendance at the sub-office, which is four miles distant from the Manchester head Post Office. The cost of delivery is at the most 4d. plus the cost of the messenger's time, and yet a message for Fallowfield, an adjacent suburb three and a half miles from the Manchester head Post Office, but within the town postal area, is delivered free, although the time occupied in delivery is almost as great and a 3d. tram fare is involved. It is a well-known fact that the public decline to send telegrams for suburban places just outside a town postal area when they are informed that a portage charge will be necessary to ensure delivery, and if the actual cost of delivery only were charged on every telegram for addresses not normally in the head office delivery, whether in the town postal area or not, it is practically certain that the evening telegraph traffic would show a considerable increase.

There is a story of a smart boy messenger, whose intellectual gifts had been cultivated at the department's expense, when called to account for dilatoriness in collecting telegrams replied, to the astonishment of the officer concerned, "Never mind sir, we are getting them through almost as quickly as parcels nowadays." It is not contended that things are quite so bad as that, but an unprogressive service is a menace to the community and it is up to those of us who take a pride in the good name of the Service to put forth every effort to maintain and even improve upon our old reputation in the telegraph world.

TELEGRAPH APPARATUS.—AN INTRODUCTION TO THE STUDY OF TELEGRAPHY.

BY A. SIRETT.

(Concluded from page 133.)

Fig. 29 represents the lever which takes the place of the hand-worked Morse key. The centre part marked "U" is insulated from the larger portion marked "D." If "D" is joined to the line, "U" is joined to earth. In Fig. 29 A it will be seen that the current from the positive pole of the battery passes through the stop "C'D" to the lever "D" then to line and to the distant station, thence to earth and back to the part marked "U" and by

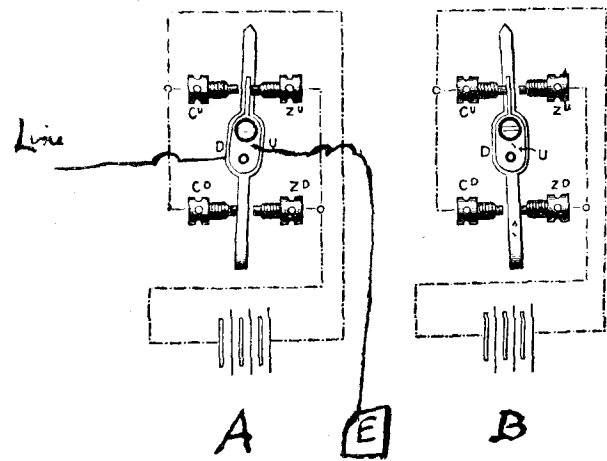


FIG. 29.

way of the stop "ZU" to the negative pole of the battery. In Fig. 29 B the path of the current is reversed. Fig. 30 illustrates the mechanism which operates the levers described above. At the top the perforated slip is drawn along by means of the spur wheel which is kept rotating by clockwork. The teeth of the wheel fit in the centre holes of the tape. The two vertical levers "S and M" press against the tape, and every time a hole comes along they pass through. The same clockwork which drives the spur wheel keeps the rods moving by means of the rocker "Y" and the two pins "P.P." The contact lever first described is

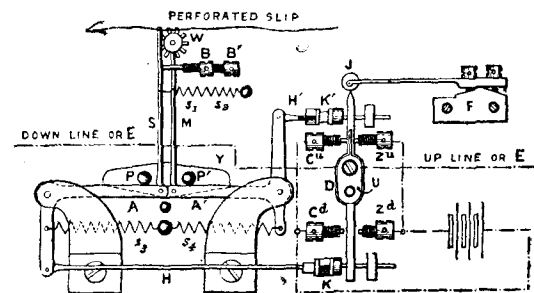


FIG. 30.

connected to the rods by the angular levers "A.A'" and the rods "H.H'." If three holes appear in the tape in a vertical line the rod "M" being kept in motion by the rocker beam "P.P'" and in constant pressure against the tape by the spring "S3,S4," will pass through the hole on the top row and immediately it is withdrawn the rod "S" will pass through the lower hole. These two movements will cause the lever "D.U" to move from "Cu to Zu" and from "ZD to CD" and back again. By so doing, a dot has been sent to line, and the line has been left charged. To send a dash, "M" first passes through the top hole and is withdrawn and the current remains on until the hole below is

reached when lever "S" passes through, reverses the current and so ceases the dash.

This machine provides the means of rapidly reversing the direction of the current, and the punched tape governs the reversals and so forms the signals.

Now consider the Receiver—Fig. 31—by means of which the signals sent by the transmitter are recorded. It is a direct inkwriter of a very sensitive type. The paper is drawn forward between the two rollers "A and B" by means of a train of wheels driven by a large weight. Before passing between the rollers the tape is brought near to a small inking disc. The speed of the clockwork is regulated by an expanding fly similar to that in the striking mechanism of some clocks. The fly is so arranged that by means of a lever the speed of the tape can be adjusted to suit recording at any speed between 20 and 450 words per minute.

To understand the electrical part of the receiver, we will refer to a diagram of a relay—Fig. 32.

This is the sensitive part of the apparatus. The sensitiveness depends to a great extent upon the fact that there are no springs to govern the moving parts. Permanent magnetism takes the place of springs. The vertical rods "S.N" are two soft iron cores. Each rod is wound with two wires and forms a separate electro-magnet. "Y" is a non-magnetic spindle free to move on the top and bottom points. It carries two tongues of soft iron. These are kept in a state of magnetism by the presence of the permanent horseshoe magnet "S.N." While no current is flowing in the coils of the electro-magnets, the cores are kept magnetised by the presence of the permanent magnet. The attraction at the "N and S" poles being equal in each magnet, the tongues are held in position midway, as shown, without the aid of springs. When a current is sent from "U" to "D" or (U) to (D), the magnetism in "N" is strengthened and that in "N2" is reversed, having "S" at the top and "N" at the bottom. Like poles repel and unlike poles attract, therefore, the tongue at the top will be attracted by "N1" and repelled by "S2," and the bottom tongue attracted by "S1" and repelled by "N2." It will be seen there is a power of attraction brought to bear on the tongues at two points on one side and a force of repulsion at two points on the opposite side.

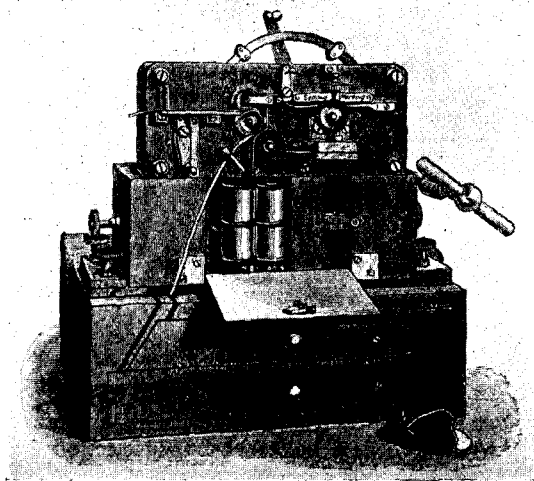


FIG. 31.

In place of the lever working between the stops "S.M," Fig. 32, an axle with a revolving marking disc, to which axle motion is imparted by the clockwork, moves the tape forward between the rollers "A.B," Fig. 31. As the tongues "S and N," Fig. 32, are moved to and fro by the passage of the current, so the disc is made to press against the paper tape and record the dots and dashes sent. Ink is supplied to the disc by another wheel which revolves in a small reservoir. The Wheatstone apparatus has been vastly improved and its efficiency increased by th

Engineering staff of the Post Office. It is now and it always has been the finest type of apparatus in regular use for the transmission and distribution of news and for the rapid disposal of large quantities of traffic in emergencies, such as arise when a breakdown occurs owing to snowstorms, &c., and suddenly curtails the number of wires. In such circumstances one good wire between two offices equipped with Wheatstone duplex apparatus is capable of employing from fourteen to eighteen clerks at each office. A working current of 100 to 120 volts is required and from 300 to 350 telegrams per

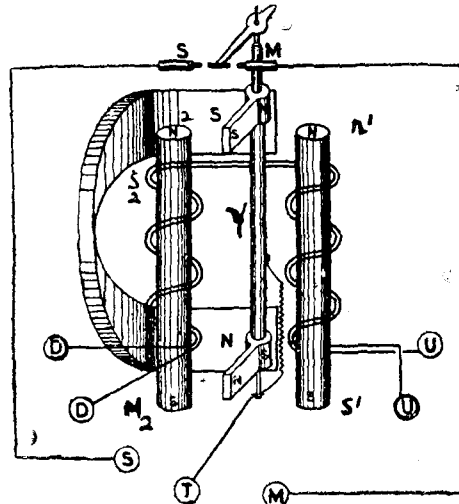


FIG. 32.

hour can be dealt with. A perforator, with punches electrically driven and with a typewriter keyboard has been introduced within the past few years and is now displacing the hand punches, or hand perforators. The great advantage of this keyboard is that the complete Morse character is produced at the touch of each key, whereas with the hand perforator each dot, space and dash has to be punched singly. The gain will be understood when I say that on an average the letters of the English alphabet in Morse code consists of 3.1 dots and dashes. The alphabet "A to Z" contains 82 dots and dashes plus 26 spaces. It thus involves 108 strokes by hand, but when the keyboard perforator is used, only 26 depressions of the keys are required. The labour is, therefore, reduced to practically one-fourth.

Another advantage in Wheatstone working is, that offices sending out news to several towns can arrange to have a Wheatstone receiver connected at each town to the one wire from the sending office which then passes the punched slip through a transmitter, and each of the offices on the circuit receives the message simultaneously.

Duplex Working.

Up to now I have dealt with simplex working only. That is the transmission of only one message at a time over each circuit, but circumstances arise when it is found that the traffic between two offices is too great for one instrument at each office during certain hours of the day, but does not warrant the erection of a second line.

Duplex working is then resorted to. It is simply a means of sending a message from station "A" to station "B" while "B" is sending one to "A" on the same single wire. If duplex working does not afford sufficient channels for the traffic, quadruplex working has to be arranged. That is a means for sending two messages from station "A" to station "B" while "B" is sending two to "A" on the same wire at the same time. If that is not sufficient multiplex working is adopted which affords three or more channels in each direction on one wire.

You may also be surprised to learn that in some cases telegraphy and telephony are carried on simultaneously over the same circuit. To explain this system and the systems of duplex, quadruplex and multiplex working would occupy far more time than I have at my disposal to-night. I must, therefore, reluctantly pass them over.

At the present time the attention of telegraph engineers is directed towards machine telegraphy which is practically an attempt to electrify the typewriter and so dispense with the Morse code and the Morse telegraphist. Several systems are being put to the test. These machines type the messages at the receiving station, some on tape, and some on the telegram forms ready for delivery to the addressee. There is a wide field open here for the inventor. The machine required is one in which the transmitter is of the ordinary typewriter keyboard pattern, which will transmit messages to the distant station where the receiver is a typewriting machine which will type the message direct on to the telegram form ready for delivery. Only one line wire must be used between the two stations.

We have traced rather rapidly the development of the telegraph instrument along the following lines:—

(a) *Chemical*.—From that in which the receiver watched for bubbles of gas to appear in the water to point to him the letter sent, to that using chemically prepared paper on which letters were formed by decomposition, and later to Bain's receiver using chemically prepared paper tape on which the Morse code was indicated by marks made by the passage of the current through the paper.

(b) *Mechanical Recorders*.—From Gauss' and Weber's early printing telegraph using two ink-markers to mark the tape, to Morse's embosser which made depressions on the paper tape representing the Morse code; to the direct inker invented by Thomas John and later to the high speed Wheatstone transmitter and receiver.

(c) *Visual*.—From the early instrument of the Admiralty to that in which the mirror was used to detect the small movement of the magnet and to the needle instruments of 6, 5, 2 and lastly, 1 needle.

(d) *Mechanical Non-Recorders*.—From the early pointer telegraph of Wheatstone to the A.B.C., and also from the early instruments requiring 27 line wires to modern systems under which two, four or even six messages can be signalled at the same time over one wire. In addition there is the modern sounder which is an off-shoot of the direct inker. It was found the signals could be read from the clicking of the armature lever and that the printed tape was no longer necessary on circuits worked at hand speed.

I think you will agree that we are greatly indebted to those scientists and inventors who struggled on in the early days when little was known of electricity, to perfect apparatus which was eventually to be the means of linking up all parts of the civilised world, and without which it would be almost impossible to conduct business to-day. The particular feature is that the Morse code has stood the test through all these years, is now used in wireless, and it remains to be seen whether the printing telegraph and the telephone together can supplant it.

TELEGRAPHS AND TELEPHONES IN SOUTH AFRICA.

THE following is an extract from the report of Postmaster-General for the year 1916:—

The effect of the war on the Telephone Service has been scarcely appreciable at the larger exchanges where spare circuits for the partial accommodation of new subscribers generally existed. The actual development that has taken place throughout the system during the year represents an increase of 10.1 per cent. in the number of subscribers' stations and of 13 per cent. in earnings. This is equal to 58 per cent. and 78 per cent. respectively of the pre-war rate of yearly increase.

There are, however, many applications for telephone facilities throughout the country which the Department is still unable to meet and this position is not likely to be changed for a considerable time to come. The existing conditions in regard to the difficulty in securing supplies of switchboards, copper, steel and other essentials from overseas may, indeed, involve an entire suspension of development in some directions. The best possible use is being made of material in the country, but careful conservation is necessary. It is also a serious consideration that the prices of all telephone material have risen to very high figures (the cost of some important items has increased over 200 per cent.) and the time is, therefore, inopportune for any heavy capital expenditure.

On June 1, 1915, the charges for trunk conversations were amended as follows:—For each three-minutes conversation:

Old charges.		New charges.	
For each 25 miles ...	3d.	For each 15 miles up to 120 miles ...	3d.
		For each 25 miles thereafter	6d.

The old rates were those adopted by the Transvaal Administration in January, 1910, and they were made of general application shortly after Union. They were the same as the rates formerly in operation in Great Britain for distances up to 100 miles, but from 14 to 33½ per cent. lower than the British rates for greater distances.

The British rates in question involved a heavy annual loss and they were recently raised 33½ per cent. It is not surprising, therefore, that in South Africa, with its relatively much higher construction and labour costs, the old charges proved unremunerative. They resulted in a loss (even after allowing full credit for the value of Government calls) of approximately £28,000 a year.

The new charges have resulted, so far, in a drop of 10 per cent. in the traffic and an increase of 24 per cent. in the revenue.

The fixing of a high rate of charge for the longer distances is due to considerations of cost. Whilst copper wires weighing 150 lbs. to the mile will give satisfactory speech within moderate limits, heavier wires and stronger poles are needed for the longer distances. The operating costs, too, are increased on account of the larger number of intermediate exchanges at which the calls have to be dealt with.

Apart from the revenue effect of the change, the periods of waiting for connections have been greatly curtailed and this is a point of considerable advantage to busy users. Under the old rates the construction of expensive additional lines to meet heavy rushes of traffic during a few hours of the day was always a serious difficulty.

Whilst the Department is fully alive to advantages of telephonic communication—its plans provide for the ultimate linking up of all important centres throughout the Union, both urban and rural—it has to be recognised that for the longer distances the telegraph will remain the chief medium for all ordinary purposes. In the case of the telegraph a single iron wire can, by the use of suitable apparatus, be made to carry several messages in both directions at the same time, whereas the telephone requires two copper wires and can carry only one conversation at a time. The economic effect is that whilst a reply paid telegram from Johannesburg to Cape Town can be carried for 2s., the charge for a telephone conversation between these places (if a trunk line existed) would need, at the present tariff, to be fixed at 14s. 6d. per three minutes. This is a high figure; but at the rate charged by the American Telegraph and Telephone Company for conversations between New York and San Francisco the charge would be even higher, viz., £1 per three minutes.

On the other hand, the telephone is the ideal medium for communication between towns within a range of about 100 miles, and the smallness of the increase in telegraph revenue since the Union is no doubt largely due to a realisation of this fact by the public.

TELEGRAPH AND TELEPHONE STATISTICS.

	1915.	1916.
Telegraph offices open ...	1,656	1,695
Miles of telegraph wire ...	54,256	54,031
Miles of telephone wire ...	97,148	104,707
Telegrams dealt with ...	6,165,568	5,692,873
Telephone exchanges ...	1,923	2,038
Telephones in use ...	32,144	35,463
Telephone calls ...	62,076,867	64,629,878

OBITUARY.

WE regret to record the death, in action, of Mr. A. E. J. POWELL, Male Clerical Assistant in the District Manager's Office at St. Albans.

Mr. Powell was only employed in the St. Albans Telephone District Office for a period of nine months prior to his voluntarily joining the Colours on Nov. 27, 1915, his previous Government experience being in the Office of the London Controller (Telephones) in a temporary capacity, and with the Local Government Board. During the time he was at St. Albans, he gained the regard and esteem of all the members of the staff, and for several months he acted as local agent for the TELEGRAPH AND TELEPHONE JOURNAL. He was attached to the Lewis Gun Section of the Prince of Wales's Own (Civil Service Rifles).

The news of his death was received with great regret, and our deepest sympathy is extended to his relatives.



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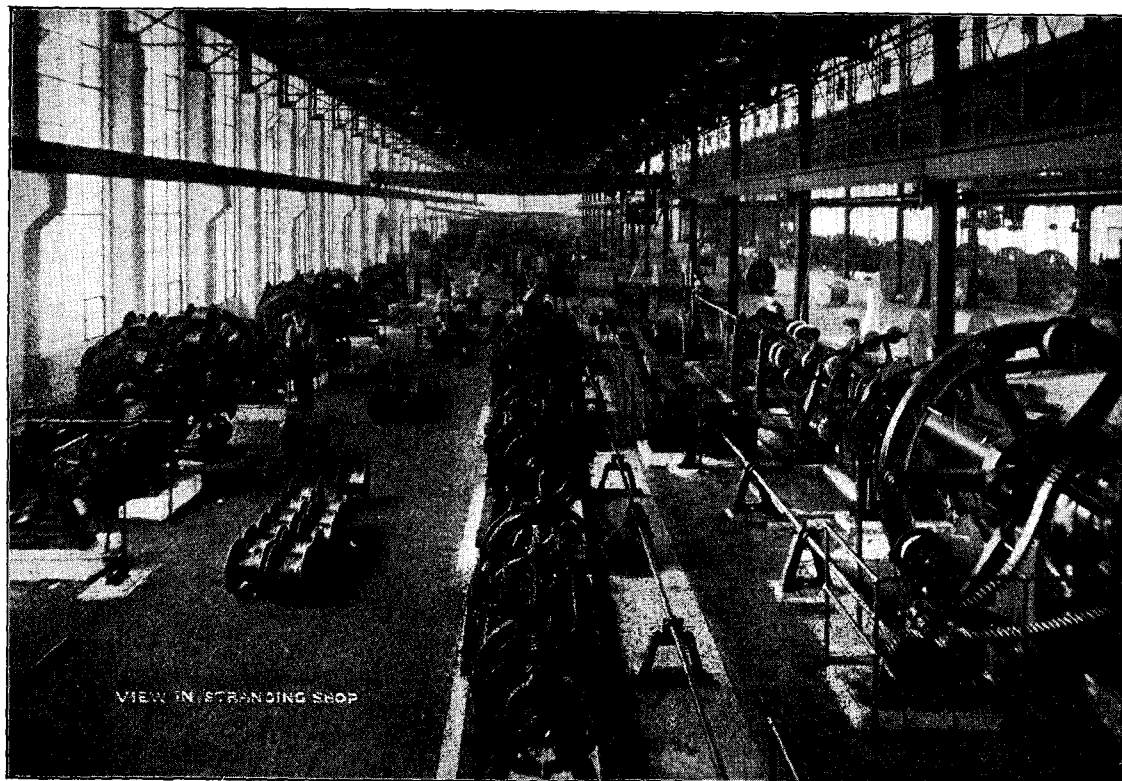
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THE ROMANCE OF THE TELEPHONE.*

BY D. WALLACE.

WHAT a vista of possibilities the above title opens up to our mind's eye! Whether it be the flippant raillery that passes from drawing-room to drawing-room in aristocratic Mayfair, or in the prosaic pursuits of the butcher, or fishmonger, selling his wares; or again, the flashing of a tragedy of war—all this tends to weave round the telephone, that wonderful instrument so much misunderstood, a halo of romance dear to both novelist and poet. The telephone was not invented, as a good many people imagine, by Edison, but strange to say the electro-magnetic telephone as used at the present day, with of course improvements, was invented simultaneously by Graham Bell and Elisha Grey, in (of course) America, in the year 1876. Edison, of course, and many others, improved greatly on the idea, until finally we have now in almost general use, both in the business and social world, that delicately adjusted little instrument, which will flash the spoken thoughts of those who are living high in the social world, or perchance the chimney sweep just as well, who is intent on a 1s. 6d. contract sweeping job, as the case demands. It requires only one general condition, that they all speak clearly and distinctly.

This instrument then, the telephone, one of the marvels of the modern inventive genius of man, this instrument tends to a welding together, and the production of that universal oneness, which is, I think, the final goal towards which mankind, perhaps at times with blind, and faltering footsteps, stumbling on still "marks time forward."

The use of the telephone service at the present time is both in the business and social world almost universal for up-to-date people. A man well knows that he must instal a telephone service, or his business gets left practically at a standstill. Life as it was 40 years ago without the telephone was comparatively speaking I think a drab, monotonous, and uneventful period of existence, without real pulsating life, as to-day. Perhaps the pessimist will argue "this was a decided advantage," but it cannot be agreed by all thinkers that this is so. The residents in lonely and sparsely populated localities, as well as the inhabitants of cities and towns, are to-day brought into actual speaking contact with each other, in a marvellously short space of time. "Yes, yes, all very well," again croaks the pessimist, "but what about our nervous systems, can they stand the strain?" Undoubtedly, if the nerves be regulated by the exercise of the individual's will power, and the nerves accordingly relegated to their proper sphere of action, and if instead of pitying, patting, and cajoling "my poor nerves," as occurs too often at present, a bracing up was experienced, it would be of infinite advantage. When decision and will power come in at the door nerves fly out at the nearest exit.

From personal experience I can state that as several years of my life were spent on an island in the South Pacific Ocean, where the nearest telephone was at New Zealand, over 1,000 miles away, I found the monotony, when not engaged in official duties, far more severe on my nerves, than the present hum of business in the telephone world.

Again the daily papers will show the momentous importance the field telephone has played in the present great war, in passing information as to the movements of troops, and the consequent satisfactory re-arranging of gun fire, in order to demolish the enemy's batteries.

As is to be anticipated the country with the biggest telephone service at present is the United States of America, with no less than 9,720,000 working telephones. Germany being next with 1,420,000.

Germany you will observe, like America, is quick to seize every fresh mechanical and industrial improvement invented by man's genius. We have another truth of this proved to us, and for us, unfortunately, in the colossal array of her armaments in the present war.

The United States then stands with almost 10,000,000 tele-

phones, and Germany with 1½ millions, the following being the position of other countries:—

Great Britain	774,000
Russia	400,000
France	310,000
Sweden	237,000
Austria	230,000
Australia	173,000

that is representing Australia and New Zealand. In the latter country, of course, there are only roughly speaking 1,000,000 inhabitants.

The most modern form of telephone service is the automatic telephone exchange at present used considerably in the United States, but only a comparatively small number of exchanges on this system are as yet established in this country.

The working of the automatic, as its name implies, is automatic, no operators being required to make the connexions for local calls. The subscriber, by a most simple movement on his part of a lever, setting in motion an almost uncanny arrangement of apparatus, by which he can connect with any other number on his own exchange, *i.e.* the exchange to which his own line is connected, by simply moving a pointer on a dial, to form the number he wishes to call up.

The most important forms of apparatus in a telephone exchange are, as we all know, the switchboard and generators, the switchboard being the termination of all subscribers' lines, and it may be safely compared to an immense brain, from which radiate all the various arteries and veins, in the form of trunk lines, junction and local lines.

The average man's brain really might be compared to a switchboard with nerve lines running to all parts of the body, by which messages are at once telegraphed to the brain (we cannot use the word telephone here, which is the voice sound, the word being derived from tele—afar, and phone—the voice). If you cut your finger, or sit on a pin, or someone pinches you, what happens? A message is at once telegraphed from that locality of your body to the central exchange switchboard—the brain—or if this did not happen you would feel no pain, which will prove that your nerve line was out of order, or paralysed, similar to, say, an earth fault on a telephone line.

By extension under Government control, it is hoped to bring in time the telephone service to every hamlet and village in the British Isles, and even people of the older school now come forward regularly and discuss the question of telephone supply, or at least they did so previous to the national crisis, generally entering into contracts for their country residences.

Not long ago I had an interview with a dear old lady, who thought she would like to have the service, but wanted to hear more about it, and she was not satisfied with correspondence on the subject. She had been, or imagined she was, an invalid—there are a lot of this kind in this locality, as you are aware—and she inquired with all sincerity, "Do you not think the wires would be a means of carrying infection?" I assured the old lady I had never heard of bacteria doing a march of one and a half miles on a copper wire before, or words to this effect, and finally she was satisfied, and has since been quite pleased with her telephone supply.

Most of you are aware that the extensive business of the ex-National Telephone Company was transferred to the State at the end of 1911, which involved payments of approximately sixteen millions of money, and a transfer of a staff to State employ of roughly 18,000. The Post Office has been held up to considerable criticism in many districts owing to the fact that in certain localities telephone service could not be offered as quickly as it was thought should have been done. The Department, however, was hardly to blame exactly in this, inasmuch as the extension of telephone service necessitates a very early preparation years ahead in connexion with the arrangement of engineering work, providing the necessary cables, apparatus, &c., and the National Company, being well aware that its license ended at 1912, did not proceed on the lines of expenditure it had previously done—hence a flood of extra engineering work fell on the Post Office all over the country at the beginning of 1912.

* Prize paper read before the Brighton Telephone and Telegraph Society.

When we sum up the many advantages the telephone brings into the lives of the people of to-day, as against 40 years ago, when we realise that the General on a battle-field can get in touch with, and direct all operations by his system of field telephones, when we think of the vast importance it is to the central figure in the Criminal Investigation Department of any country, in tracing and running to earth the law breaker, or again when we consider the advantage the captain of industry in the midst of commercial activity holds by being in touch with the markets of the world, or to descend to more humble spheres, when you consider the possibilities it holds for social intercourse, the undoubted blessing it brings to the sick and relief to the wounded, in calling for medical help, you will, I feel, one and all agree that in the telephone the nation possesses an enormous advantage in the conditions of its life, compared with those in existence previous to the advent of the telephone, which thus, as a time and energy saver, is incomparable, creating an unequalled factor in the evolution and advance of the human race, and a romance in its history.

LONDON TELEPHONE SERVICE NOTES.

OUR first note must be to extend to our telegraph *confrères* our heartiest congratulations on their escape recently from a great danger. We trust that with them it is the case that:

"Danger well past remembered works delight."

We understand that in accordance with a Departmental ruling, it will in future be written of the telephone switchroom staff on occasions of similar danger,

"Faithful aloft they did their duty,
But now they've gone below."

In any case it is gratifying to remember that our experience has shown that the telephone staff is thoroughly "British" in its ability to "carry on," let the conditions be what they may. It is a past of which to be proud.

We should like to be permitted to extend our congratulations also to Mr. John Lee on his appointment to the Postmastership of Belfast. He will certainly be missed in London, and we can only hope that before long the "Ivory Gates of Hope" will be observed to be moving on their hinges to admit his re-entry to the Metropolis—if indeed they have not already begun to open.

We have recently been the recipient of gratuitous copies of several issues of a periodical styled *Civil Service Gazette*. If the standard of its contributions is to be judged by that appearing in the number of June 25, and encircling the portrait of the present Secretary to the Post Office, we can understand the necessity for a free distribution. The comment on the Telephone Service and the telephone staff appear to us to be as absolutely silly as anything we have ever read. Here is an extract—"Telegraph delivery girls may thus work up to be telephone girls, for whom there is always a great demand, owing to their marrying propensities, in regard to which it has been ungallantly suggested that the life and work of an operator are so unattractive that no change to any state different can be for the worse." Well we know that the telephone operator has a great deal to put up with from the average subscriber, but our experience gained over a number of years shows that the telephonist is for the most part entirely unaffected by such gratuitous impertinences. She is largely successful by her gentle tones and infectious good humour in soothing the most savage of these subscribers, and when met face to face, she is doubtless irresistible. It is no wonder she gets married. Indeed, it is only by constantly lowering the age of entry, that the Department is able at all to secure its paragons before they are appropriated for the responsibilities of domestic control. Even many of the very youngest prior to their entry into the Telephone Service have become parties to matrimonial understanding, and the facility with which they acquire the expression "engaged" and "I will give you a ring" (a slight departure from standard this) seems to suggest that they are but repeating expressions with which their ears have become familiarised.

A party of wounded soldiers and three nurses from the Post Office Hospital visited the Carter Lane Exchanges on Monday, July 9, and were afterwards entertained to tea at G.P.O. (South) Refreshment Club. They all seemed thoroughly to enjoy their visit.

(H)UNSEEMLY IDEAS.

WE commend to our readers the extract from the *Evening News* which appears in another column.

It apparently is not enough for the inventor that he should be regarded by the more conservative minds as the author of all the "frightfulness" which is the modern equivalent for war; but he insists on harassing our feelings and shocking our nerves with syrens, bombs, rockets and last, but not least, an unmelodious rendering of an old Scottish song on every telephone bell in London. We feel sure that our Scottish friends will deal faithfully with the suggestion that the Campbells can be confused with the Germans, and knowing the Scottish attitude of "*sans merci*" in such cases we rest assured that the punishment will fit the crime.

We hear often in the Press from impatient subscribers who have suffered from an occasional failure of a call. They always forget the many successful calls and involve the thunders of Jove on all who have any connexion with the administration of the Service. But we shudder to think of the uproar that would arise if on every circuit, in use and out of use, we suddenly superposed an irregular ringing current which to those musically minded might bring memories of the rhythm of a song and to the majority merely memories of the vagaries of telephones in general and their one in particular.

We like the inventor's phrase "all that would be necessary," and we seem to have heard it before. Yes, all that would be necessary would be connect together all the telephones in London and to the uproar of many voices add the rhythmic ringing of the Campbells are coming. And a very good all too! They could not make more noise if the Campbells actually came. Meanwhile the telephone service would fail when it was most wanted.

PERSONALIA.

LONDON TRAFFIC STAFF.

Miss W. R. CLINNICK, of the Regent Exchange, has resigned on account of marriage. She was presented with a case of silver fish knives and forks and teaspoons, as well as many other useful presents.

Miss F. RUSSELL, of Regent Exchange, has resigned to be married and was presented with a biscuit barrel by her colleagues.

Miss A. E. F. ALDEN, of London Wall Exchange, has resigned on account of marriage. She was presented with a case of teaspoons and various other items by the staff.

Miss V. N. WOODS, of London Wall, was presented by her colleagues with a silver cruet on leaving to be married.

Miss E. L. HAWKINS, of London Wall, has resigned on account of marriage and was presented with a dinner service.

Miss O. HUNT, of the Trunk Exchange, has resigned to be married and was presented by her colleagues with cutlery and other useful presents.

Miss E. M. VOICE, of the Trunk Exchange, has resigned on account of marriage, and was presented with a travelling case and other useful presents.

Miss E. CLITHEROE, of Trunk Exchange, on leaving to be married was presented with cutlery and other useful presents by her colleagues.

Miss A. E. Cummings, of Trunk Exchange, has resigned to be married and was the recipient of cutlery and other useful presents from her colleagues.

Miss E. O. JOHNSON, of Hampstead Exchange, on resigning to be married was presented with a tea service by the staff.

Miss R. MARTIN, of Hampstead, has resigned on account of marriage and was the recipient of a tea service from her colleagues.

Miss E. A. DAVIS, of Kensington Exchange, has resigned in view of her approaching marriage and was presented by her colleagues with a cut glass salad bowl and other gifts.

Miss F. E. KINMAN, of Paddington Exchange, has resigned on account of marriage. She was presented with cutlery by the staff.

Miss A. M. FISHER, of Battersea Exchange, has resigned in view of her approaching marriage and was presented with a tea service and several other useful presents.

PROVINCIAL STAFF.

Miss A. G. DAVIES, Clerical Assistant, District Manager's Office, Swansea, resigned on June 30 in view of her approaching marriage and was presented by her colleagues with a case of fish knives and forks. She was also the recipient of several other useful gifts from personal friends among the staff.

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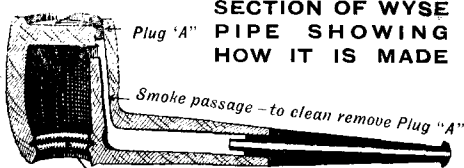
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SEPTEMBER, 1917.

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BRITISH TELEGRAPH PRACTICE.

(Continued from page 143.)

VI.—THE TELEGRAPH ORGANISM.

The geographical distribution of the industries and of the population raises a problem in respect of the best arrangement of telegraph wires. This problem has further complications. The relation of the capital to the rest of the country renders it necessary that in the case of every town of importance there should be direct telegraph communication with the centre of political and social life. This is especially the characteristic of the United Kingdom and it also applies to France. Germany is a little more fortunate in what may be called the subsidiary capitals. Munich, Frankfurt, Cologne, and Breslau are available as centres of zones, and Berlin does not loom over the horizon of the nation to the same extent as London or Paris looms over England and France respectively. Washington being an artificial capital, stands apart, and to all intents and purposes the commercial importance of New York over-tops the political importance of Washington in respect of telegraph and telephone communication. In the United Kingdom London has direct communication with towns much smaller in respect of population and of commercial importance than the towns even in France. At first sight this would seem to indicate that the Central Telegraph Office in London ought to be the clearing-house for the whole telegraph system, since every considerable town in the country could pass its telegrams for every other considerable town *via* London. The question of the length of telegraph wire used is not so important as might appear, though rather more stress has been laid on this fact in recent years. The theory of telegram-mileage has not been considered in England with the same minuteness as in Germany, but even so it would seem to be unwise for a town in Scotland to obtain communication with another town in Scotland by means of one transmission at London. The double use of long wires for a telegram which is quasi-local in character is clearly a disadvantage, but the disadvantage is less serious when the wires have to be provided for direct traffic to and from London and are insufficiently filled by that traffic. But another factor enters. The Central Telegraph Office in London is the largest telegraph office in the world; it is built on a costly site and accordingly it has seemed to be desirable to prevent it becoming altogether unwieldy. And so, instead of using it as a convenient clearing-house an arrangement is in force whereby the transmission of telegrams at two offices of a certain size in the country is regarded as being equivalent to one transmission at the Central Telegraph Office.

The radiation of wires from provincial offices is based on point-to-point traffic. A Liverpool wire to Southampton, a Manchester wire to Brighton, a Birmingham wire to Bournemouth are all allotted on the ground that Liverpool itself has a certain number of telegrams for Southampton itself and so forth, and the other traffic which falls on the wire is so allotted as a subsidiary matter. Broadly speaking, 200 telegrams a day is regarded as the criterion, but once the wire is allotted on this basis the circulation is so arranged that other telegrams find that route the most convenient. Thus, a telegram for Southampton from towns which have direct wires to Liverpool will pass to Liverpool, but those telegrams will not be regarded as the essential criteria for allotting the wire between Liverpool and Southampton. This allotment of wires on the basis of direct traffic to the terminal points is bound to raise a somewhat complicated question. Theoretically we might expect some kind of symmetrical division of the country whereby there would be zones served by central offices, but the cost of transmitting a telegram by hand is such a considerable proportion of the total cost of conveying a telegram to its destination that attention

has been focussed on the necessity for saving transmissions, and accordingly we find that the special commercial intimacy of two centres justifies a wire the need for which does not appear at the first glance. For example, Middlesborough has a wire to Glasgow based upon the traffic caused by intimacy in the iron trade; Liverpool has wires to Halifax and Huddersfield based on intimacy in the fabric trade; Bristol has wires to Cork based on the shipping interests; while, as an example of peculiar local intimacy, Manchester has a wire to Colwyn Bay where many Manchester people reside, and Liverpool has a wire to Llandudno, which is more favoured by the people of Liverpool. Special industries, such as the fish trade, cause certain towns to have wires which seem to be somewhat surprising; Grimsby radiates to Leeds, Manchester, Liverpool, Birmingham, Bristol, Newcastle and London; Milford Haven has direct wires to Birmingham; Wisbech has special wires during the fruit season, and a separate telegraph organism is arranged for a district near to Southampton when strawberry-picking comes. On the other hand the Evesham fruit trade tends to telephone rather than to telegraph communication. Other examples of special intimacy difficult to understand without special investigation of the traffic conditions are Newcastle and Dumfries, Brighton and Bristol, Liverpool and Londonderry.

While these are the general principles, some wires have been allotted definitely to prevent transmission in London and not on the basis of direct traffic as defined above. For example, Birmingham has wires to Reading, Maidenhead, Brighton, Ipswich and Lowestoft; Leeds has a wire to Norwich, and Manchester has a wire to Cambridge and another to Newmarket. All these wires afford facilities for Midland and Northern towns to despatch their telegrams to the Southern and Eastern counties without transmission at the Central Telegraph Office.

This telegraph organism being in existence, the question arose as to how the general circulation of telegrams could best be arranged, and for some years it was done by providing for each telegraph office a separate circulation list for all the towns in the United Kingdom, the telegrams being arranged to fall on routes which would convey them efficiently apart from any question of geographical or topographical directness. It seemed at a later stage, however, that the cross country circulation, *i.e.*, the circulation of telegrams excluding those to and from London itself, might be arranged on the basis of a few rules. With this object in mind the first rule decided upon was that where alternative transmitting points were available that transmitting point which was nearest to the midway should be adopted. For example, a telegram from Aberdeen to Brighton might be telegraphed to London and thence to Brighton, or it might be telegraphed to Manchester and thence to Brighton and as Manchester was nearer to the middle point, transmission at that office was adopted. The second rule was that as far as possible the direction of the wires used should be nearest to an imaginary direct wire, which might exist between the two points. For example, a telegram from Southampton to Cork should be transmitted at Bristol and not at Liverpool. In a sense this is a special case of the fundamental rule of transmission at the nearest to the middle point, but it is necessary to state it specifically in order that there may be no misunderstanding. The third rule was that transmission at two of the larger centres such as Birmingham, Manchester, Liverpool, Bristol, Cardiff, Newcastle, Edinburgh and Dublin should not be adopted to avoid transmission in London, but of course any one of these places together with a transmitting office other than these places is regarded as equivalent and no more than equivalent to a single transmission at London. The whole of the telegrams of the country therefore are transmitted according to these principles, and any office having telegraph access to more points than one is able to decide which route is to be adopted for any particular telegram by a consideration of these regulations. It is probable that the new telegraph plant which is coming into use will modify the theories of telegraph circulation which hitherto have obtained, though

on this point there is much uncertainty inasmuch as it seems likely that the new multiplex instrument can be adapted by separating the channels so as to give a number of towns direct access to one main centre over one wire. There is no reason, for example, why multiplex instruments from London to Manchester worked on one wire should not give direct communication between London and Blackburn, London and Preston, &c., and it may be that the further development of this appliance may tend in the direction of allotting even more direct circuits to London than are in use at present. It is probable, however, that the New York precedent of using these machines to produce a perforated slip for the local or radiating transmission of the telegram will have some place in every telegraph organism.

As press work mostly radiates from London, and, as press messages are usually for a large number of newspapers published in different towns, a system has been devised, and has been working many years, which provides for the simultaneous transmission of telegrams by the Wheatstone method to a number of towns, for example, one wire from London serves Birmingham, Manchester and Liverpool, and all the three towns read the signals simultaneously. This is called the "YQ" principle and it provides a system of distributing news which until recent years had not been criticised. During the past few years, however, there have been indications that multiplex instruments, with their capacity for direct printing, could be adapted to a news supply system which might have advantages over the single direction "YQ" system. On the other hand the use of Creed instruments on the receiving end of the news wires seems to indicate that the "YQ" system is capable of development in such a way as to relieve the service of the heavy burden of writing the messages from the Morse tape.

The third method of circulating telegrams in this country is of recent growth. Since the transfer of the National Telephone Company's system to the State, the possibility of switching telephone circuits through and transmitting the telegrams by telephone direct to the terminal station has been developed. In these cases the fundamental rules of circulation are not followed, the central aim of the through switching being to reach the terminal point and it is not a matter of much consequence, provided the telephone circuits will permit the passage of the traffic, if somewhat circuitous telephone routes are used. As telephone traffic aggregates in the mornings this system is most likely to be useful in the afternoons and evenings, and it has the central advantage that offices can obtain direct connexion with a large number of terminal offices, when they require a direct connexion, and save the cost and labour of transmission at intermediate offices.

Special circulation arrangements have been devised for the traffic arising out of race meetings, important cricket, football and other athletic events. Usually a telegraph office is opened either at the grand stand or at some other convenient place within the enclosure. Wheatstone "YQ" wires to the more important towns are installed, *i.e.*, London, Birmingham, Manchester and Liverpool, and the whole of the traffic is forwarded to the offices for disposal, being allotted to the town most favourably placed, in relation to the grand stand office, for disposing of the work, so that a special circulation has to be drawn up for this traffic.

It is clear, therefore, that the characteristic of the British telegraph system is to have direct wires between points where the traffic justifies direct communication. By this means the advantage of duplex and of quadruplex working is reaped. There are some cases where one wire connects three offices, by means of a "split" or an "extended" quadruplex giving two offices direct communication independently of the other two. The alternative is to connect a number of points with one wire. An illustration is given above in the case of the "YQ" distribution of press telegrams, but a similar arrangement is in force in America whereby many offices are connected on one wire. These circuits are called "way circuits," and there are instances where as many as 40 offices are connected together. In England it is a favourite device on railway telegraph systems, and in France and in Germany it is used for subsidiary routes. It has proved very useful in Ireland since it enables telegraph offices in scattered towns to be connected with a main centre by means of one wire. It is obvious that whenever two offices of such a group are working together all the others are unable to get communication; it is equally obvious that the efficiency of the wire is limited to simplex working. There have been signs for some years of a tendency away from this system. In Australia it has definitely been abandoned and the "repeating centre" system substituted, which is really a zone system, much on the British model, whereby main centres are connected to main centres and the traffic for the smaller centres radiates from the main centres. Occasionally wires connecting small offices, such as sub-offices, with the main centres, are of the "way circuit" type, called, in England, "omnibus circuits," but these are now restricted in number as the telephone has largely taken their place. In Germany the connexion of main centres is carried out by a triangular system. Thus Berlin, Breslau and Frankfort each are connected by a wire equipped with a Siemens' instrument. If one of the three wires happens to be interrupted the telegrams for that route are diverted to the other routes and the method of re-perforation is adopted so that the transmission can be accomplished with the minimum of human labour.

Provision must always be made in every telegraph service for the diversion of traffic when particular routes are interrupted. Underground telegraph wires are a safeguard, but not a complete safeguard, against interruption. The route from Washington to New York was laid as the result of a serious dislocation of lines by a snowstorm on the occasion of Mr. Taft's inaugural speech. In England there are various underground routes, reaching the main centres and extending to cable points on the coast. In Germany an old underground system constructed for strategic reasons in the 'seventies has been rendered useful again by the use of Siemens' instruments. In spite of the extension of underground circuits dislocations of the service still occur, and underground routes have a specific disadvantage in that

they do not provide as high speed as overhead wires. Traffic is diverted on such occasions according to definite principles, but these principles are not always applicable as the consequences of interruption vary considerably. In the main an effort should be made to find a secondary route which conforms as nearly as possible to the fundamental principles of circulation. It should not include the use of wires of undue lengths; it should add the fewest possible to the transmitting points; it should choose transmitting points as close as possible to the centre of the route chosen instead of the interrupted route. But other considerations impinge. The desirable route may be heavily pressed; the desirable alternative transmitting centre may be suddenly burdened beyond its capacity; a comparatively free route, even if somewhat roundabout, may present an open channel, and this frequently applies to London. The superintendent who has to face the problem of diversion, must take all these factors into consideration, and he has to do so hurriedly. But he will do wisely to give especial weight to the three first principles and to hold himself strongly against the temptation to seek first of all to clear the traffic from his own office, heedless of what may happen to it afterwards.

The method of calling offices is of less importance under the system of zones or transmitting centres than under the earlier method. A steady flow of telegrams renders calling unnecessary once work has begun. It is provided that every telegraph office has a designation in the form of a cipher group. The larger centres have two letters, as LV for Liverpool and MR for Manchester, and the smaller centres have three letters. In most cases these codes are used both as the abbreviated symbol of the office on the forms of signalled and received telegrams and as the letters used for calling by Morse. In the case of series of smaller offices on the one wire the use of groups of three letters might seem to be cumbersome and arbitrary calling letters "D," "G," "K," "O," are used for the offices in sequence. At the moment an effort is being made to unify the arbitrary groups used to indicate telephone exchanges and telegraph offices, in view of the fact that recent developments have so closely welded the two organisms in local districts. This fusion of telegraphs and telephones locally has been carried farther in England than in any other country. It is hardly too much to say, by way of conjecture, that local telegraphy is now become so closely a part of the telephone organism as to have lost its separate identity, except in places where there is abnormal telegraph traffic due to a special industry.

VII.—THE DELIVERY OF TELEGRAMS.

The forms on which telegrams are written have been the subject of much discussion. There has always been a feeling that it was not necessary to make an office copy of telegrams which are delivered to the public. As an extension of this argument it has always seemed desirable that the same form should be used for telegrams which are telegraphed forward as for those which are delivered. The problem has been faced differently in different countries. In the United States, where the privately-owned telegraph companies need a copy as a safeguard in case of legal action against them, it has been usual to make an office copy by a copying process. This has the advantage of enabling the telegraphist, by the use of either a copying pencil or a copying ribbon on a typewriter, to write telegrams for onward transmission or for delivery in precisely the same way, leaving the differentiation to the point where the telegram is or is not copied by process. The system was tried at Manchester, as a substitute for duplication by carbonic, but it was not successful in the case of ordinary telegrams though, as will be seen, it was more promising for press telegrams. On the Continent one copy only is made, but there is a somewhat elaborate system of preparing abstracts, and this proves to be costly. The British system of carbonics held the field until a few years ago when a counterfoil system was introduced at certain offices. By this means the same form was used both for transmission and delivery, but in the case of telegrams for delivery a counterfoil, with the essential particulars, was prepared. A further stage of development is now being considered. It seems to be practicable to use one form only in the great bulk of cases and to prepare a skeleton in the small percentage of cases where some entries for accounting purposes are necessary. This will be a great simplification of process and the extended trials have already proved that it will be warmly welcomed. The simple form will be equally available for transmission, for delivery as a telegram, or for delivery as a confirmation of the message after it has been telephoned. Its adoption will place the British system in the foremost place in respect of the simplicity of the method of preparing telegrams for delivery. Efforts have constantly been made to combine the form and the envelope, but hitherto unsuccessfully. It is a commonplace of continental practice.

Fundamentally each telegram is delivered immediately on receipt. That also is a British characteristic. Continental countries are contented with periodical delivery. In practice, in England, messengers are entrusted with a batch of telegrams, and it has been necessary to do this during the war, but the conception of a telegram as a missive to be delivered at once still holds good. It may seem to be an extravagant conception in practice, especially with the liberal arrangements for free delivery up to the boundary of the town postal district or to a distance of three miles, and no doubt it occasions a heavy burden of cost. Possibly, as we shall see in the chapter on tariffs, some differentiation ought to be made in the charge, since every telegram is not of the same urgency, and considerable economies might be effected by a differentiated delivery. The truth is that we have not yet quite surmounted the old conception of a telegram as a missive notifying a catastrophe, and therefore calling for extreme urgency in every case in handing it to the public. Greater familiarity with the telegraph, greater intimacy in the day by day use of it, may lead us to such an appreciation as will not expect every messenger to convey one and only one telegram.

The telegrams are enveloped in large offices by telegraphists whose

function it is to translate the address of those telegrams addressed by a registered word, to indicate what special instructions are recorded, to safeguard those cases where there are requests for delivery by telephone. Registered addresses are a subject of long discussion. It is questionable if, for inland practice, they are a suitable device. The American administrations insist on full addresses in each case, but they allow a certain number of words, and it is to be remembered that most American cities lend themselves to a briefer address than English cities. Probably the history of telegraph charges in England made a system of registered addresses inevitable. To pass suddenly from free addresses, before 1885, to including the addresses in the chargeable total, was perhaps impossible without some intermediary in the shape of an abbreviated and registered address. Prominent citizens might insist that their name alone was a sufficient address, and a system of registration is a convenient way of meeting this demand. One guinea per annum is the charge, and as it includes the registration of special instructions for the delivery of telegrams at different times, it cannot be regarded as exorbitant. The "indicator" word, which is used for London telegrams, is an ingenious method of indicating the office of delivery, and it is telegraphed free of charge, but probably it might have been better had some system been devised years ago of allotting certain words to residents in different areas. It is hardly practicable now to give the applicant full discretion in the choice of his word: names have to be regarded with disfavour lest preference should be shown to one of many bearers of a particular name.

The machinery for dealing with registered addresses has been modified. At one time rather elaborate printed books were issued, and they had to be fairly strong in view of the handling and also they had to be in duplicate—sometimes in triplicate—to enable corrections to be made. The card index system is now being developed. It seems to be promising, though more research is necessary before it can be said to be above criticism. At one time specially printed envelopes were used to a considerable extent, not without risk of error. The tendency now is to restrict them to those cases where there is a heavy daily use. An American system of printed gummed slips has been tried, and much the same system is favoured in Scandinavia, but it was not favoured in England. There seems still to be much to be said for what may be said to be the old-fashioned system of addressing each envelope. The truth is that the addressing of telegram envelopes is not subject to any of the principles which have governed the addressing of commercial envelopes, and no system for simplifying the work has overcome the initial difficulties. The variety of addresses, the variation from hour to hour, the necessity for scrutiny, the special handling of reply paid and money telegrams, all these add complications which hitherto have prevented the application of machinery to the task of addressing telegrams.

The addressing of telegram envelopes may seem to be easy work, not calling for particular skill. It is not unskilled clerical work merely, for the complications of special instructions and the like place it in a category apart. It is the general opinion that it is better to use skilled telegraphists for the duty. Specialisation in telegraph offices is beset with special difficulties. At moments of pressure it is necessary to use staff gathered from various points, and in expectation of such moments of pressure it is generally argued that everyone who is employed in or about a telegraph office should be, at least, a Morse telegraphist. It is probable that the argument is pressed somewhat beyond its legitimate limits, certainly it is not the case either in America or on the Continent that "all round" abilities are demanded on such a level as in England. There can be no doubt, on the other hand, that the change in the nature of the work is of benefit and for this reason the rotation system, as between such work as addressing envelopes and telegraphy proper, is strongly supported. There is, proportionately, a small range of work in connexion with telegraphy which affords relief from the strain of Morse signalling, and for this reason the general English opinion is in favour of using telegraphists at the addressing table. The question cannot altogether be separated from the development of newer types of apparatus. If the type keyboard takes the place of the Morse key to a very large extent there will be less reason for using the addressing table as a relief.

In some cases of offices served by tube the telegrams are enveloped at the central office and transmitted by tube ready for delivery. In a few cases they are enveloped at the delivering point. The question is usually settled on a consideration of local circumstances, generally the question of accommodation at the head office. There are advantages from keeping the addressing tables together, and these advantages are all the greater where the staff used for addressing the envelopes is not telegraphically skilled, as there is then greater elasticity in cases of pressure. Small groups of addressing telegraphists at separated points are much more likely to be overwhelmed by sudden pressure than if they are within reach of assistance from other groups of addressing telegraphists. It is one of the curiosities of telegraphy that particularly heavy pressure does not come coincidentally at several points.

The remuneration of the messengers takes three distinct forms; it is either on a basis of fixed wages, or on a piece basis—called "docket"—with a guaranteed minimum, or the messenger may be employed merely as a casual messenger for the delivery of the particular telegram. The method of accounting varies. In some places tokens are given to the boys by means of which the number of delivered telegrams is recorded. In the United States these devices have been developed very far. The tendency in England is rather to prefer the fixed wages system and this has been emphasised by the more general employment of girls. In France and Germany there is rather more of the casual employment of boys than in England. The provision of bicycles is now on a wide scale, and is varied with a special payment for the use of the messenger's own cycle. Various methods of contracting for journeys in public vehicles, such as trams, &c., are adopted. This includes the Express Delivery Service which, in England, is part of the telegraph messenger arrangements. In the United States the Postal Telegraph Company

has its own messenger system, both for telegrams and for express letters, while the Western Union Company contracts with an Express Messenger Company for the delivery of its telegrams. There are instances in England where foreign cable companies deliver every telegram in duplicate, but the Post Office only delivers duplicates in the form of certified copies for which a charge is made. Similarly a brief reference may be made to the method in force in America and in England by certain cable companies of collecting telegrams free of charge. This does not apply to inland telegrams in England. Receipts are demanded from the public for express letters but not for telegrams.

The association of the telephone with the telegraph has been one of the remarkable features of recent development in all countries. It is curious that the uniform characteristic of this development is that the public is more ready to pass its telegrams by telephone than to accept them. In all countries something of the nature of a campaign has been necessary to show the advantages of the delivery by telephone of telegrams. The practice differs considerably. In England there has been an inclination to lay stress on registered telegraphic addresses as an essential, in order that telegrams for telephonic delivery may readily be discovered. In the United States and in Germany fully addressed telegrams have been picked out at the request of the addressee. More recent development in England tends in the direction of accepting instructions for the telephonic delivery of fully addressed telegrams. A characteristic of the British practice is the telephonic address, whereby telegrams are accepted addressed to a name, exchange and telephone number, and are delivered by telephone. The British system is more liberal than others in the delivery, by post, of confirmatory copies of all telegrams previously delivered by telephone. An attempt is made to save telegraph transmissions by telephonic delivery from points other than the terminal point, thus obtaining an advantage at the delivery stage from what already has been described as the "centralising" feature of the British system. The local telephone service lends itself by its junction system, connecting one area with another area, to such a development. It is possible that this will be carried even farther and that we are only at the beginning of the fusion of telegraphs and telephones. The remnant prejudice which regards with disfavour the work of writing down a telegram which is occasioned by telephoning will probably disappear just as the prejudice against the typist has disappeared.

It is a curiosity of phonogram work generally that the in-flow and out-flow is not coincident. Speaking generally the flow of telegraph traffic from subscribers coincides with the ordinary telephone peak load. On this ground the tendency has been to equip what is practically a separate organism for the traffic incoming from subscribers to the Post Office, and to use the ordinary telephone organism for the outgoing traffic. This has its influence upon an old controversy whether there should or should not be a distributing switch to control the instruments where phonograms are dictated or written down. So far as can be seen at this moment this issue is clearing itself in this direction—telephone circuits upon which telegrams are spoken for delivery should be simple subscribers' circuits on the main exchange; telephone circuits from which telegrams are received from the public should be connected to a distributing switch, which, in turn, should be served by "junctions" available to the telephone operators who accept calls from the public; there should be an arrangement for overflow traffic in either direction so as to preserve elasticity. By this means the delivery of telegrams by telephone is absorbed in the local telephone work and plant is put to better use.

(To be continued).

EXTRACT FROM AIR RAID REPORT.

Wednesday, Aug. 22, 1917.

- 10.40 a.m. Air raid action issued to specials.
- 10.50 a.m. Outlooks posted. Distant gun pointing S.E. Clouds many, closely linked and drifting slowly at great height. Wind S.S.E.
- 10.55 a.m. Two home defence planes seen flying eastwards, disappeared behind the advancing clouds. No enemy aeroplanes sighted, but two separate flights of city pigeons or gulls observed at great heights (for them) [P.S., P.P.S., P.P.P.S.]. Gun shifted various times and directions from N.E. to S.S.E.
- 11.50 a.m. One returning aeroplane observed S.E. flying towards S. of London and clear signal given.

- P.S.—The feathered citizens of London are to be requested not to practice aeroplane squadron formation during enemy air raid warning period.
- P.P.S.—The high speed sprint of the specials on outlook duty to the N.W. Well [stairs proved each runner to be in good condition.
- P.P.P.S.—On reaching N.W. door a sight through glasses revealed the fact that the supposed squadron had flapping planes. The gulls were gulling us.
- P.P.P.P.S.—These feathered fliers christened "Bill's Birds."

DUDLEY AUTOMATIC EXCHANGE.

BY H. W. DIPPLE (*Birmingham*).

THE automatic switching system installed at Dudley is that developed by the Western Electric Company. Several novel features in automatic switching are included in this system, and an endeavour will be made to outline some of the fundamental principles of the Western Electric Company's system, which differs greatly from the Strowger Company's system.

The movements of brushes in the Strowger system are effected electrically by means of electro-magnets which lift the brushes vertically and step them with a horizontal rotary motion on to the correct contacts. The lifting and stepping magnets are controlled directly by the impulses from the subscriber's dial switch. In the Western Electric Company's system, the movements of the brush carriages are effected entirely by mechanical means, the mechanical power being applied to the brush carriages at the correct moment by electrical means. The brushes are not controlled directly from the subscriber's dial switch, but are controlled by a number of pieces of apparatus collectively known as the register, which receives the impulses from the subscriber's dial switch and transmits them to the brushes.

Operation of Automatic Switches and Contacts, Sketch A.

(1) The subscribers' lines are connected with contact pins which are embedded in insulating material. The pins are arranged in horizontal rows, a bank of contacts being arranged in the form of a semi circle or, as it is usually termed, a "contact arc."

(2) The brush carriages consist of an arrangement of metallic contact pieces known as brushes. The brushes are mounted on a vertical shaft which can be rotated from left to right only. The brush carriage is mounted near to a contact arc in such a manner that when rotated the brushes trail over the contact pins. Contact with any subscriber's line can thus be made by stopping the rotation of the brush carriage as soon as it reaches the contact pins of the required line.

(3) *Method of Rotating Brush Carriages.*—The contact arcs are mounted in groups on vertical racks. On each rack are vertical and horizontal driving shafts which are rotated by means of an electric motor. These shafts rotate continuously day and night. The drive is communicated to the brush carriage by means of an ingenious but very simple combination of electro-magnetic clutch and friction drive. On each horizontal driving shaft is affixed an iron disc which can be magnetised by means of an electro-magnet known as the power magnet. On each brush carriage is a similar iron disc fitted very close to and at right angles to the continuously rotating disc. When the power magnet is energised, the continuously rotating disc is magnetised and attracts the disc fitted to the brush carriages. The brush carriage disc is pulled down hard on to the rotating disc and is thus made to rotate.

It will be clear, therefore, that the brush carriage can be moved any required distance by energising the power magnet for the required length of time and de-energising as soon as the correct contact has been reached. A holding magnet is provided for each brush carriage and is energised the instant the power magnet is de-energised, the function being to prevent the momentum of the brush carriage carrying it past the selected contacts. A special means of centering the brushes squarely on to the contacts is provided and will be described later.

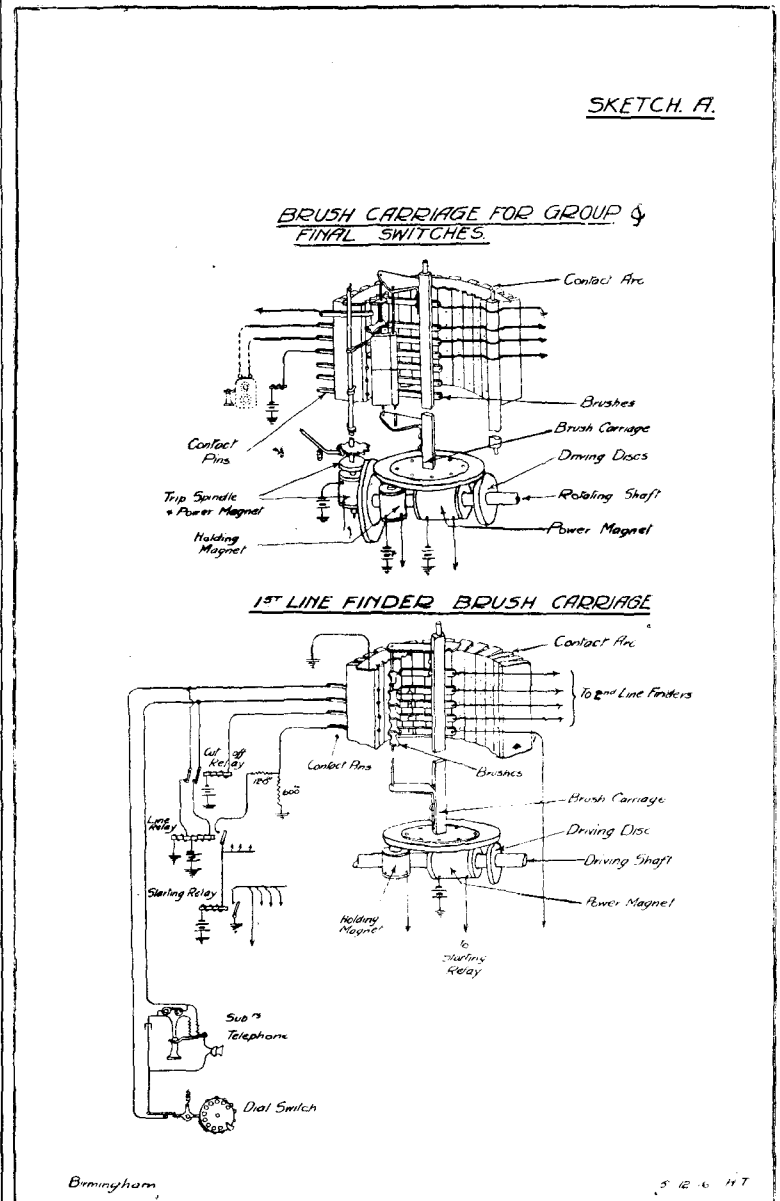
Similarity of Sequence of Operations at Manual and Automatic Exchanges.—As there is a great similarity between the sequence of operations necessary to establish a connexion at a C.B. manual and an automatic exchange, an interesting comparison can be made between the two systems. Such a comparison of the essential features of the two systems will be helpful in enabling the Western Electric automatic system to be more readily understood.

The following are the essential features of the manual system with the corresponding action in the automatic system :—

C.B. manual exchange.	W. E. Co.'s type of automatic exchange.
(a) Calling lamp and answering jack.	First line finder.
(b) The connexion cord circuits.	The connexion circuit and group switch.
(c) The operator.	The register.
(d) The multiple jack field.	The final switches.

The sequence of operations is as follows :—

(a) *Manual Exchange.*—The subscriber lifts telephone and causes the calling lamp to glow.



Automatic Exchange.—The subscriber lifts telephone and causes the first line finders to rotate in search of the calling line.

(b) *Manual Exchange.*—One of a pair of flexible cords is inserted by the operator in the answering jack corresponding with the lamp which has glowed.

Automatic Exchange.—The first line finders having rotated in search of the calling line, the first of the line finders to come into contact with the calling line stops at once and remains in contact with the line. This contact is equivalent to inserting the plug in the answering jack of the manual system.

(c) *Manual Exchange.*—The operator connects her telephone

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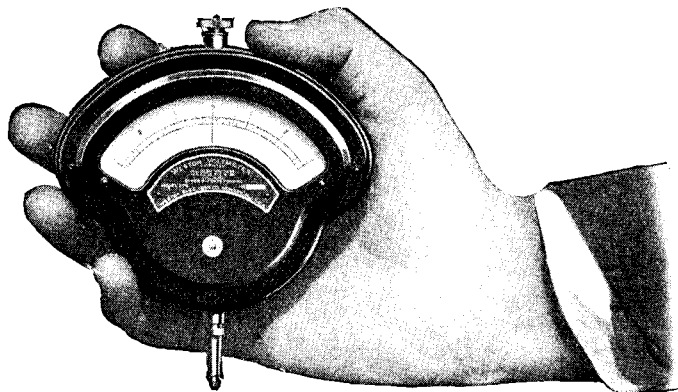
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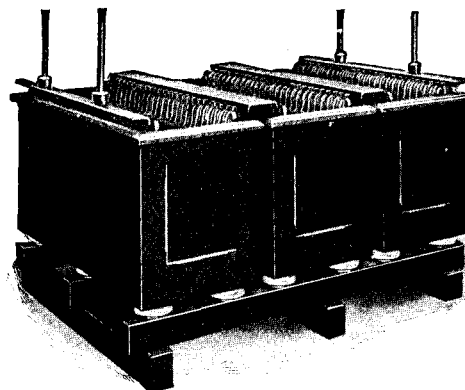
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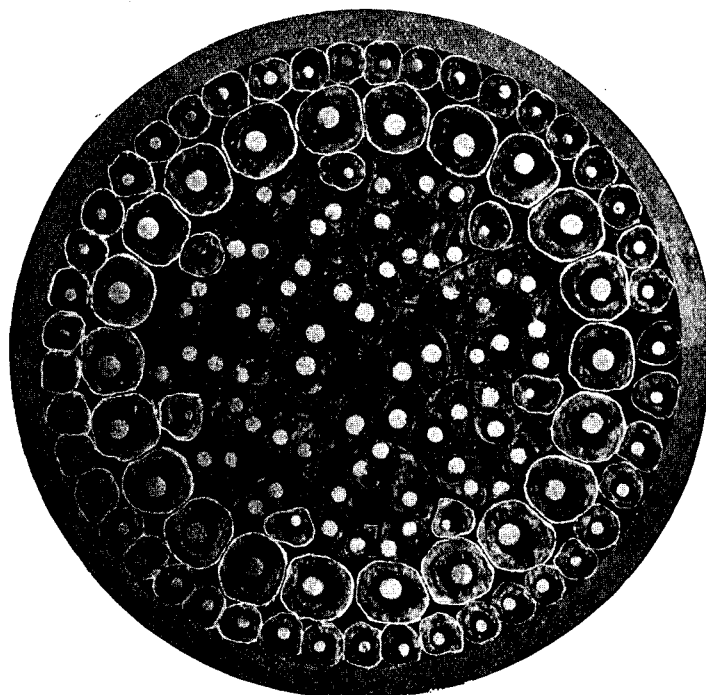
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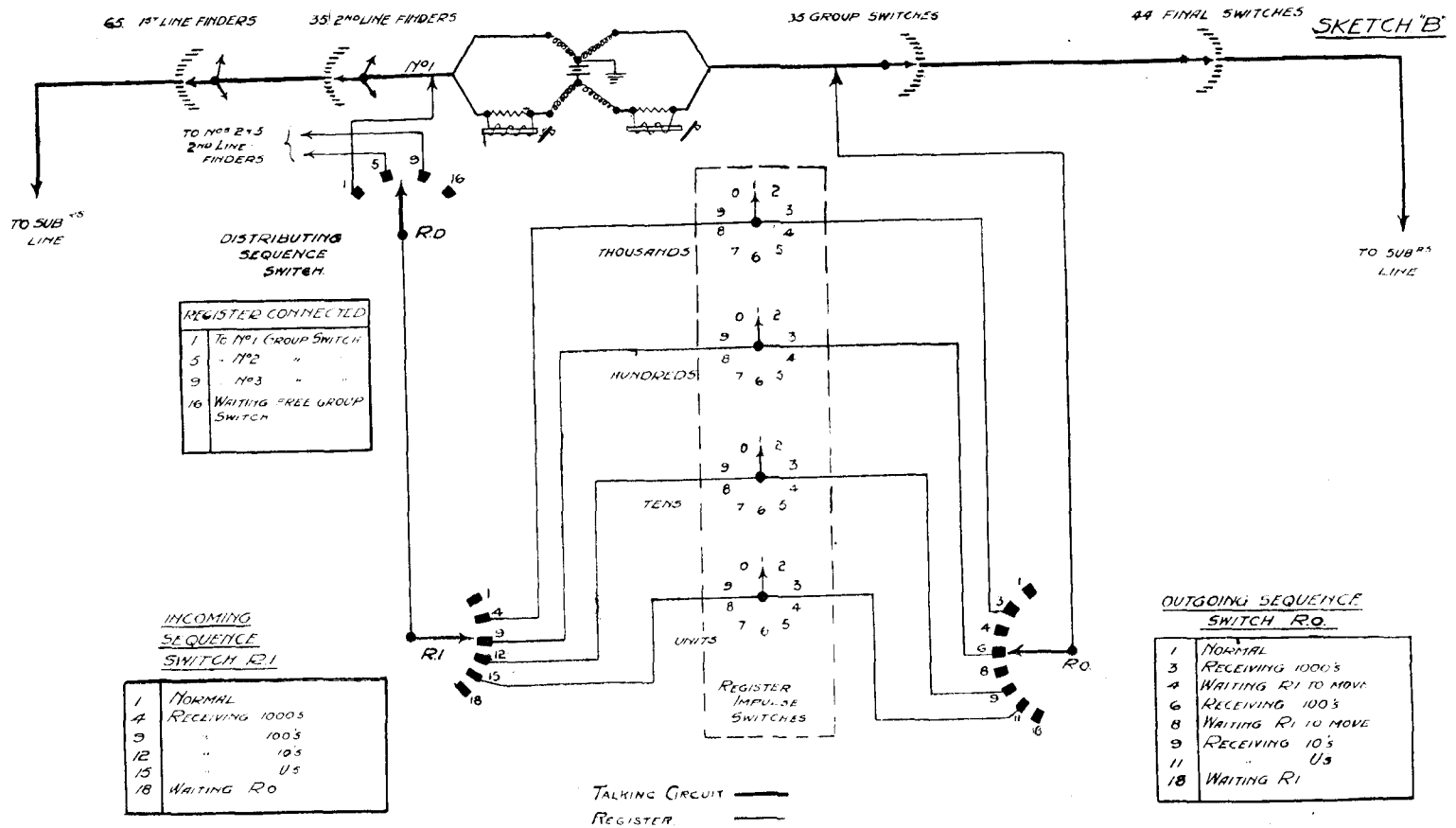
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with the circuit by means of the speaking key and says "Number, please."

Automatic Exchange. The register, which may be likened to a mechanical operator, connects the "dialling tone" with the calling line. This is equivalent to the "Number, please" of the manual system.

(c2) *Manual Exchange.*—Subscriber asks operator for required number.

Automatic Exchange.—The subscriber dials the number required.

(d) *Manual Exchange.*—The operator tests the required number to ascertain whether it is free or engaged. If free, the plug is inserted and the subscriber called by means of the ringing key.

Automatic Exchange.—The final switch tests the required number. If free, the connexion is automatically established and the subscriber's bell is automatically rung. When the conversations are completed the telephones are replaced, and—

(1) *Manual Exchange.*—The supervisory lamps glow and the operator withdraws the plugs from the jacks.

(2) *Automatic Exchange.*—The automatic switches are released and return to their normal positions.

Having indicated the broad principles of the system, a more detailed description can now be given.

First Line Finders.

The subscribers' lines are arranged in groups of 60 on the first line finders. Eight brush carriages are allotted to each group of 60 lines. When a subscriber lifts the receiver, the eight line finders associated with the particular group of 60 lines in which the calling subscriber is situated are made to rotate by the method just described. As the finders rotate, the brushes trail over the contacts. The first brush carriage to make contact with the calling line stops instantly. The calling line is made busy by the actuation of the test relay, the actuation of this relay also de-

energising the power magnet and energising the holding magnet. Once the line has been picked up by a line finder and made busy, other line finders that make contact with the line in the course of their rotation do not stop on the calling line. One line finder now being in use, seven are left to rotate when the next call occurs in that group. One line finder is thus eliminated at a time from a group until all the eight are in use. As soon as a conversation is completed and the receiver restored, the line finder is free to take up another call. The number of calls on each group of 60 lines is so proportioned by means of a system of distributing the busy and slack subscribers' lines, that not more than eight calls are received at one time during the busiest period of the day.

The Registers (Sketch B).

The register is the means by which the signals are received from the subscriber's dial and transmitted to the group and final switches. The register is automatically switched into circuit to receive the call and is automatically switched out as soon as the call has been set up on the machine switches. One register is definitely allocated to three group switches; thus No. 1 register serves Nos. 1, 2 and 3 groups switches, and No. 10 serves Nos. 28, 29 and 30 switches; No. 12 register serves only two group switches at present, viz., Nos. 34 and 35.

The register is switched to each of the three group switches in turn by means of a distributing sequence switch known as the R.D. switch. When all three group switches are busy, the associated R.D. switch goes to a waiting position until a group switch becomes free, the register in the meantime being, of course, out of use. When a group switch becomes free, the register is automatically switched on to the free group switch.

Each register consists of (a) four short sequence switches, which may be termed the "impulse switches" as they receive and transmit the 1,000's, 100's, 10's and units impulses from the subscriber's dial, and (b) two long sequence switches known as the R.I. and R.O. or

incoming and outgoing switches. The function of the two latter is to switch the "impulse switches" in and out of circuit at the correct moment to receive and forward the impulses.

The impulses from the subscriber's dial are stored up in the "impulse switches," and are only taken out when the group or final switches are ready to accept them. In the case of Dudley, the 1,000's impulses are not used for automatic to automatic calls at present. The 100's impulses control the trip spindle of the group switch and select the correct level. The 10's impulses control the trip spindle of the final switches and select the correct level. The units impulses control the brush carriage of the final switch, and step the brushes over the correct number of contacts until the required number is reached.

The impulses sent in from the subscriber's dial switch consists of a number of short breaks of the circuit followed by one long break; thus, if "9" is dialled, eight short breaks of one-fiftieth of a second duration occur, followed by one long break of one-tenth of a second duration. The long break allows a slow acting relay to operate, the operation of which shifts the "incoming" sequence switch to the next position. Thus when the 1,000's impulses have been received on the impulse switch, the long break shifts the incoming sequence switch to the next position wherein the 100's "impulse switch" is brought into circuit to receive the next set of impulses. Simultaneously with the receiving of the impulses, the transmission or "counting out" of the impulses to the group and final switches takes place.

While the 100's impulses are being received, the 1,000's impulses are being transmitted, and while the 10's impulses are being received the 100's impulses are transmitted to the group switch.

Group Switch and Second Line Finder.

The group switches correspond to a certain extent to the cord circuits of the manual exchange and are distributed to the first line finders by means of the second line finders, which are

interposed between the first line finders and the group switches, as will be seen from the diagram B.

In a manual exchange, it is not necessary to provide a cord circuit for each subscriber's line, so in an automatic exchange it is not necessary to provide a group switch for each first line finder.

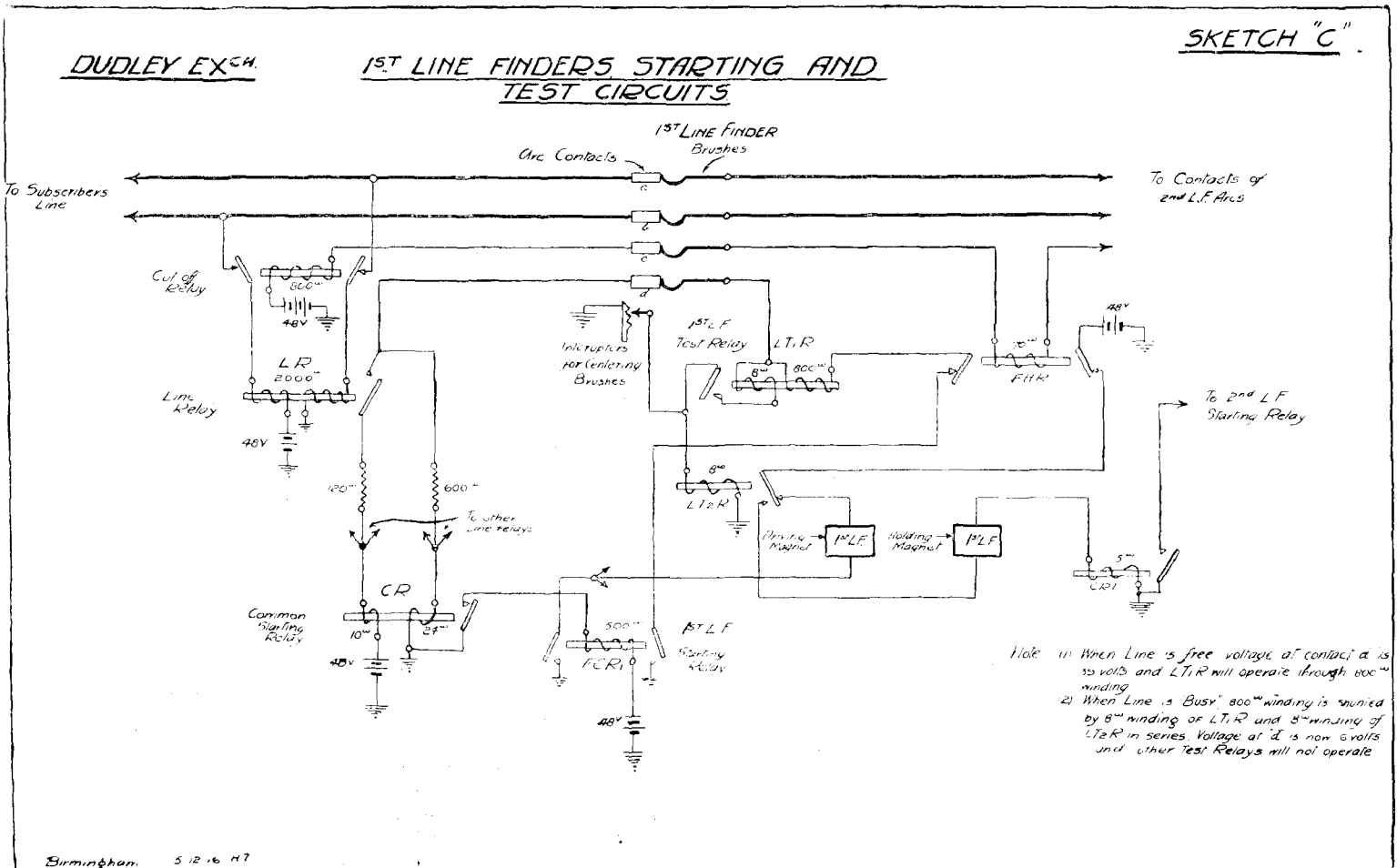
In the manual exchange an operator selects a free cord circuit to handle the call with, while in the automatic system, a free group switch automatically selects the first line finder in order to handle the call.

This is accomplished by connecting all the brushes of the first line finders with the contact arcs of the second line finders, and causing the second line finders to rotate in search of the first line finder which has taken up the calling subscriber. Thirty-five group switches and second line finders are provided at Dudley, that being the number required to handle the maximum number of simultaneous calls occurring during the busy hour.

The principal function of the group switch is to select a free junction and extend the calling line to the final switches, or to the manual switchboard for the special services as the case may be. To do this, it is necessary for the contacts of the group switch arcs to be joined up to the brushes of the final switches or to the lamps and answering jacks on the manual switchboard.

Each group switch contact arc consists of 220 sets of contacts arranged in 10 rows or levels of 22 each.

The brush carriage consists of ten sets of brushes, or one set for each level. Normally these brushes do not make contact with the contact pins. In order that the brushes shall make contact, it is necessary that they shall be "tripped" or "unlatched." The brushes are tripped by means of the trip spindle, the movements of which are controlled by the 100's impulses from the subscriber's dial. The trip spindle which is fitted near to the brush carriage, consists of a vertical spindle fitted with ten projecting teeth mounted spirally around the spindle, and is driven from the shafting by the same type of drive as is used for the brush carriages. The trip spindle is rotated a number of steps according



to the "hundreds" digit of the number dialled, and one of the projecting springs is interposed in the path of the brush carriage, so that when the brush carriage moves from its home position the correct set of brushes are unlatched.

The brush carriage is automatically started as soon as the trip spindle is set in the correct position, and rotates in search of a free junction. If all junctions are engaged, the brush carriage rotates continuously until a junction becomes free or the calling subscriber hangs up the receiver. A brush carriage makes one

dependent upon the traffic, 17 switches per 200 lines being provided here, with provision for increasing the number to 22 switches.

The contact pins are arranged in ten horizontal rows of ten each, the bottom row representing subscribers' lines 11 to 20 in the particular group of subscribers connected to that switch. The ninth row would represent lines 91 to 100, and the tenth row line 1 to 10 and so on.

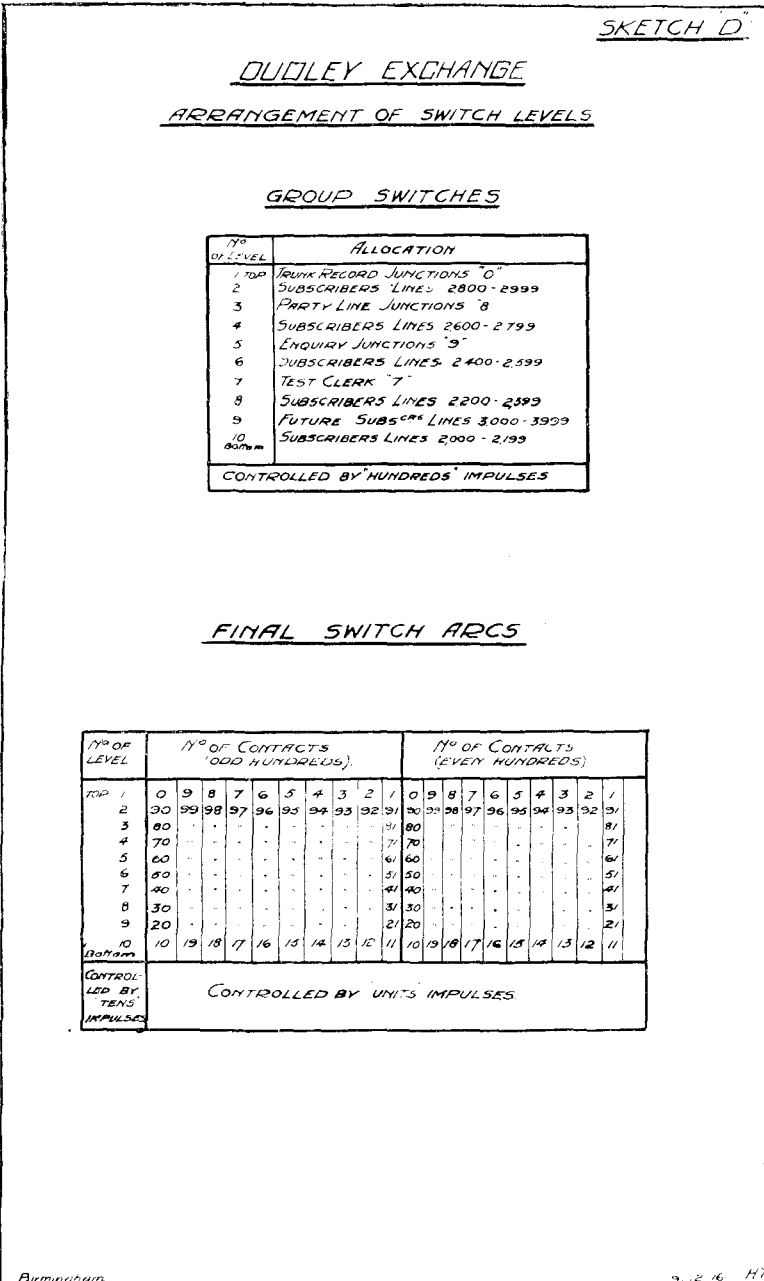
The final switch is controlled by the tens and units impulses: thus if No. 2468 is dialled, the six impulses operate the trip spindle to trip the brushes at the correct level, and the eight impulses step the brush carriage to the correct set of contacts.

The general movements of the final switch are controlled by a sequence switch as in the case of the group switch. If the called line is busy, the sequence switch automatically connects the busy tone with the calling line. If the line is free, the ringing current is applied to the called line, and ringing is continued until the called subscriber answers, or until the calling subscriber replaces the telephone.

The circuit arrangements for the Western Electric Company's system are extremely complex, and it is not proposed to attempt any general description of these here, except in the case of the first line finder starting circuit. Diagram C shows this arrangement, the operation being as follows:—

The subscriber removes receiver and operates line relay L.R. The operation of this relay completes the circuit for the starting relays C.R. and F.C.R. and also connects battery to the (d) contact ready to operate the test relay L.T. 1R. The power magnets of the line finders are now operated, battery being applied through the contacts of F.H.R., L.T. 2R power magnet, contacts of F.C.R. to earth, line finders will now rotate in search of calling line.

When a set of brushes makes contact with the calling line, the test relay L.T. 1R will be operated, the circuit being from battery, windings of C.R. 120 ohm resistance, contact and brush d, 800 ohm winding of L.T. 1R contacts of F.H.R. and F.C.R. to earth. L.T. 1R in operating joins up its 8 ohm winding through its own contacts, 8 ohm winding of L.T. 2R to earth. L.T. 2R is now operated and disconnects battery from power magnet and applies it to the holding magnet also to the starting relay for the second line finders. The calling line has now been made busy to other line finders. This has been accomplished by shunting the 800 ohm winding of the test relay with its low resistance winding and the winding of L.T. 2R in series, which reduced the voltage at the (d) contact to about 6 volts. Other test relays which make contact with the busy line will not operate through their 800 ohm winding with only 6 volts. This method of making calling or called lines busy is also used on the group and final switches. Brush carriages are centred by means of the toothed plate and brush shown on the diagram. When the brush carriage is in a position between two contact pins, the special brush makes contact with the toothed plate and short circuits the L.T. 2R relay by connecting earth to the circuit. L.T. 2R, being short circuited, does not operate, consequently the power magnet is still operated and the brush carriage moves a little further until the brushes are standing on the contacts of the calling line. The short circuit is now removed from the L.T. 2R relay which operates, and releases the power magnet and operates the holding magnet.



complete rotation in approximately three seconds; therefore each junction is tested once every three seconds.

The movements of each group switch are controlled by a sequence switch which switches in and out of circuit at the correct moment the power magnets, holding magnets, tests relays, &c.

Final Switches.

The final switches are similar to the group switches as regards trip spindle and brush carriage. The contact pins are arranged in two groups of 100 each, thus each final switch gives access to 200 subscribers' lines. The number of final switches provided are

HOP EXCHANGE SOLDIERS' COMFORTS FUND.

On the evening of July 23 a most enjoyable concert was given by the members of Miss Dorothea Douglas's Concert Party at the Hatcham Liberal Club, the proceeds of which have been given to the Hop Exchange Soldiers' Comforts Funds. The arrangements of the hall and programmes were under the direction of Misses Alice Bowley and Ethel Sellen, and they must have felt amply rewarded for their labours, quite a large sum being realised for the fund. Every seat was occupied, and standing room almost unobtainable. The artists included Misses Mabel De Boughy, Gladys Dyer, Dorothea Hubbard, Agnes Melnotte, Mabel Patrick, Hilda Watson, Dorothea Douglas and Master Charles Edwards. During the evening Miss Dorothea Douglas was presented with a bouquet by the girls of the Hop Exchange.