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TELEPHONE MEN.

XLVIII.—ARTHUR MARTIN.

ARTHUR MARTIN was born on May 17, 1858, at Harrington, Cumberland. He is the youngest son of Samuel Martin, shipowner, and in his earliest days was attracted by the harbour and by the shipbuilding yard of Messrs. Williamson & Sons.

In 1866 the family removed to Liverpool, and the subject of this sketch, entering the Alverton House Academy, was awarded the First Boy's Medal at Midsummer, 1872, out of over 80 pupils, and subsequently finished at Wesley College, Sheffield, from which he brought away some of his water-colour paintings, upon which he still looks with pleasure.

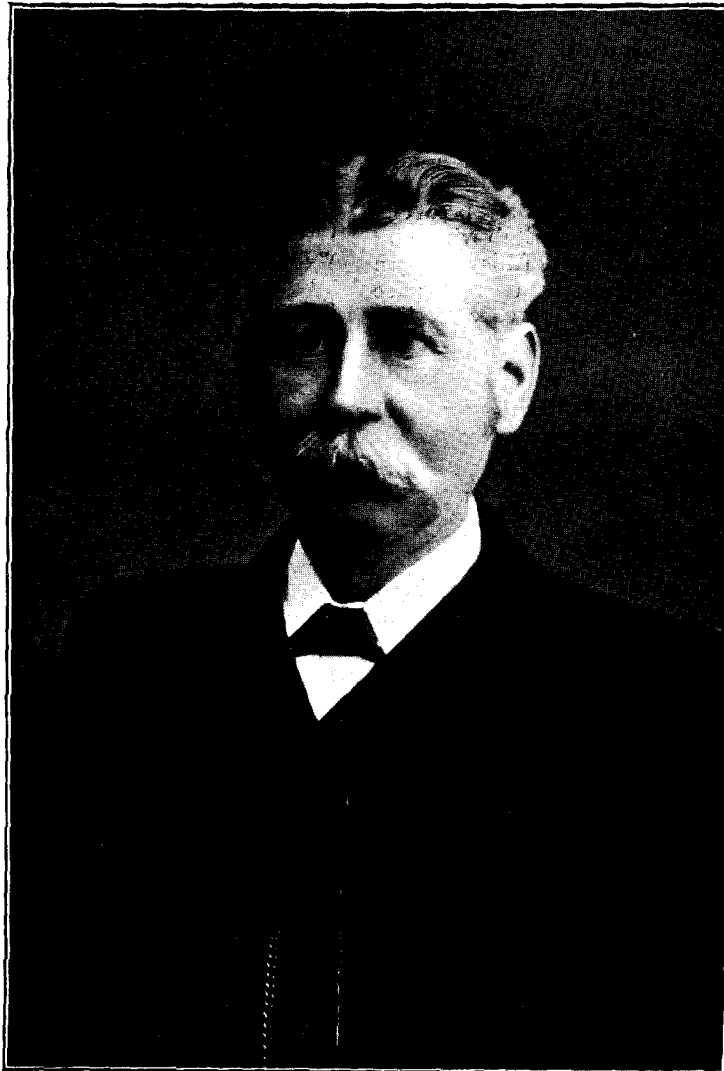
After spending some time with Hargrove, Ferguson, & Jackson, shipowners, during which time he got to know so well all the courses to be steered from the Rock Lighthouse at the entrance to the Mersey right away to below the Tuskur Lighthouse at the southern entrance to the Irish Sea, that on many occasions he has taken a turn at the tugboat's steering wheel. He put in nearly two years in the engineering business with his brother, when he had to give way to early hours and late nights so that he might be about at tide time to make a "pier head jump," as it was at that time a case of first come first served in the matter of securing the repairing work on tramp steamers.

On his introduction to Mr. Heywood Claxton, by Alderman J. B. Morgan's partner, Mr. Martin obtained an appointment in the Lancashire Telephonic Exchange. Being convinced that this young venture was destined to grow into a very big concern the offer was accepted, and Mr. Martin served under Mr. Claxton from April 7, 1881, to Dec. 31, 1899—for the first twelve years as Chief Clerk with the exception of a short period at the outset when he was dealing with an entirely new system of bookkeeping introduced by Mr. Pilling, of Manchester, the Company's accountant. The

remaining seven years were spent as District Manager at Liverpool, which then included the Wirral peninsula, subsequently made into a separate district. This period covers the days when not only had every nerve to be strained to place on solid foundations what was

to become a huge structure, and when like Ishmael's son the Company had practically every man's hand against it in the matter of wayleaves, but there was the determined onslaught made by the Mutual Telephone Company of Manchester. Mr. Martin being one of the best known men in Liverpool and having numerous friends in the Newsroom, Stock and Cotton Exchanges, and Corn and Fruit Markets (as well of course as in shipping and engineering circles), he was in and out of these various places during the day for several weeks until the attack was repulsed, and he thinks he is entitled to look back with some satisfaction to the part he took in the successful defence. On the outbreak of the South African War, when it was a matter of great importance to the whole empire that men and stores should be hurried to the front with the utmost despatch, Mr. Martin suggested to Mr. R. P. Houston, M.P., that he should have an instrument installed on his *S.S. Hyades*, and the latter connected with the Central Exchange. With his characteristic quickness in grasping possibilities Mr. Houston gave the order, and, also with his characteristic idea of having orders executed almost before they are given, Mr. Houston wanted the communication established by four o'clock (it was then noon). Of course this was impossible the steamer being two and a half to

three miles from the exchange, but Mr. Martin spoke through from the cabin of the *Hyades* before midnight to Mr. Houston's house, much to the surprise and delight of the latter. How it was done, says Mr. Martin, nobody knew except that splendid engineer "Tommy" Rowe



and his capable gangs. All Mr. Houston's and the bulk of the other transports which sailed from Liverpool were subsequently connected with the exchange system, and Mr. Houston stated at a large dinner at the Adelphi Hotel, where Mr. Martin was one of his principal guests, that the installation of the telephone on transports had enabled them to get the steamers to sea long before they would otherwise have been able to do. Some years previous to this Mr. Martin secured the order for installing a telephonic exchange on the Prince of Monaco's new yacht, which was fitted with such a splendid equipment of hydro-graphic apparatus by the builders Laird Bros., of Birkenhead. The mention of the latter town calls to mind the fact that Mr. Martin was one of the first men to walk under the Mersey from Liverpool to Birkenhead immediately after the completion of the "drainage heading" of the Mersey Tunnel.

During the time Mr. Martin was District Manager he never lost an opportunity of personally interviewing a subscriber or wayleave grantor, and, by his genial manner, nearly always succeeded where any trouble arose in smoothing matters over. His tact and his courteous way of treating people are still remembered, not only by those who were well acquainted with him but also by many whom he knew simply in connection with telephone business.

The same may be said of his manner with the Company's staff; he always met them in a friendly way, irrespective of their position, having a kind word for each.

After spending nineteen strenuous years in Liverpool Mr. Martin was appointed Assistant Superintendent of the Northern Province, on Jan. 1, 1900, where he is still situated.

Mr. Martin was for over twelve years cantor's bass in the Parish Church of St. Hilary Wallasey, Cheshire, and an honorary member of the Liverpool Cathedral Choir—served eight years in the 1st Cheshire Rifle Volunteers known as the "Robin Redbreasts," was for five years captain of the Egremont Cricket Club where he went by the sobriquet of "The Steady" on account of his stubborn defence in keeping his end up, and bowled at a great pace with much success year after year. He was also very fond of rowing.

Mr. Martin now spends most of his spare time in fine weather either in the country or in the garden in which he takes a great interest—and when indoors enjoys many hours at the piano.

AWARDS FOR INVENTIONS, SUGGESTIONS, ETC.

The following awards have lately been made by the Company on the recommendation of the education committee for inventions and suggestions:—

	£	s	d.
T. Pettigrew, Glasow, improvements to gas bolt heater stands ..	2	0	0
J. W. Harvey, London, stand for Angelini transmitters ..	2	0	0
W. K. Harding, Head Office, use of coloured paper for printing curves	2	0	0
J. Clappeson, Hull, stop valve for air testing	2	0	0
E. S. Byng, London, stiffening stay for D.C. brackets ..	2	0	0
H. J. Mobbs, Head Office, improvements to photograph printing machine	2	0	0
G. H. Bryant, London, metal pilot spacers for use with record cards	2	0	0
C. Campbell, Manchester, alteration to Account Form No. 1,249 ..	2	0	0
J. C. Fuller, London, grant for obtaining bronze medal	3	0	0

GRANTS TO LOCAL TELEPHONE SOCIETIES.

Swansea Telephone Society	4	17	0
Swansea Operators' Telephone Society	4	15	0
Glasgow Telephone Society	4	10	0
Isle of Man Telephone Society	4	10	0
Coventry Telephone Society	4	16	0
Exeter Telephone Society (1908-9)	5	0	0
Stirling Telephone Society	3	14	0
Glasgow Operators' Telephone Society	5	0	0
Plymouth Telephone Society	5	0	0
Torquay Telephone Society	4	8	0
Portsmouth Telephone Society	4	8	0
Bournemouth Telephone Society	4	19	0
Manchester Telephone Society	3	17	0
Bristol Telephone Society	4	18	0
Bristol Operators' Telephone Society	5	0	0

SERVICE INSTRUCTIONS AND DISCRETION.

BY EUSTACE HARE.

(Concluded from page 3.)

Would any man expect or desire to be judged solely on his adherence to the letter of instructions? If so, he is content to be a machine, and every machine depreciates with use or rusts in idleness.

A little expansion of thought is only necessary to see that every branch of work in the telephone service calls for the exercise of personal discretion and originality, forced or involuntary. The instrument fitter must consult the wishes of the subscriber as to the position of the apparatus, but to keep silence when experience tells him the choice is eminently unsuitable, is to court future trouble and expense.

The operator has a definite formula of words to be employed for various occasions, but it would be unwise to make these formulae so rigid that under no circumstances, in no exchange, irrespective of size and time and place, are they to be varied or added to. There is involuntary discretion in the very phrasing of the standard terms, and it is not easy always to discover the exact boundary line between the tone of business and the tone of curtness. An inexperienced subscriber might even so far deceive himself as to fancy he detected a note of sweetness which was merely intended for ordinary politeness. The happy medium is the hall-mark of an accomplished operator.

There is a patriarchal instruction, and a very necessary one, that no work must be done without a works order; but one can scarcely conceive any engineer, foreman or wireman abstaining from taking steps to avert or repair an accident by the most unofficial or unorthodox means that may occur to him. It is possible, however, to imagine a man so imbued with the letter of the law that, on being sent on an expensive journey on specific work, refrains from killing two birds with one stone because he has not been specially authorised to slay more than one. And yet it is this very discretion in economy which helps to make or mar the financial success of private enterprise.

I now turn to a point touching the civil laws which, I think you will agree on consideration, is somewhat remarkable. In spite of the legislative mill which is always grinding and which grinds pretty small in spite of the prodigious output in the course of history, has it ever occurred to you what an infinitesimal part of the whole population of this country ever finds itself brought, not merely into conflict with the law, but consciously within its purview! Does not this prove how very little these laws worry us; how very lightly they sit on our minds and our consciences? Excluding the natural laws, offences against which we and all right-minded persons shrink from instinctively, how many, if any, laws of the land apply equally to every individual in this room? Some of us have to pay income tax, and those of us who desire to keep a dog must pay for the privilege; but not one of us is, for example, exposed to the temptation of giving short weight, nor runs the risk of punishment for entertaining guests during prohibited hours. Probably not one of us knows by what laws he or she is individually surrounded, nor what are unconsciously obeyed or broken.

It is exactly the same with our Service Instructions. Consider the ramifications of the work, the numerous staff branches with their sub-divisions; the varying conditions under which they carry out their duties; eliminate such natural rules as punctuality, honesty, discipline, devotion to service and so forth, which apply equally throughout—not only to our business, but to every business under the sun, if it is to progress—and then let each one of us seek for himself or herself those hide-bound and tape-bound instructions which it has been suggested discourage our intentions and cramp our possibilities! I venture to say there will be difficulty in finding one.

But if one be found, the finder has not only his remedy but his reward. There is not a single official of the Company among those responsible for the issue of Service Instructions who deems himself infallible in his productions, and who is not only ready to consider creative or amending suggestions, but thankful to get them. There

is not a single idea or proposal for improvement that fails to get a patient hearing or is not carefully weighed before a decision is given, or which in proportion to its value in the wisdom of the education committee fails to obtain its reward.

It may be that in some quarters there is an impression that there exists a department whose special function it is to keep a perpetual look-out for gaps in the instruction hedge which surrounds our field of action; if so, the idea has no foundation in fact. I have had considerable experience in drafting and dealing with instructions, and I can tell you this, that so far as my particular sphere is concerned, the unwritten axiom has always been not to issue or alter a service instruction without absolute necessity—to leave a free hand wherever it can be left with safety. Personally, every printed instruction that it has been my lot to father, I have looked upon not so much with paternal pride as in the light of a thankless child that at any moment may display the serpent's tooth.

For in an instruction first and foremost there are the facts, then the marshalling and dovetailing of facts, their condensation, the avoidance of the Scylla of discursiveness and the Charybdis of incompleteness, the fear of misunderstood phrases, the correction of proofs, the reference to other departments into whose domain one may necessarily set foot, and then the launching forth. Finally, expectant criticisms, when, like a fugitive from justice who having closed fifty doors of detection finds himself suddenly confronted with a gaping fifty-first, to-morrow's post may bring to light a simple but obvious error or omission demanding a humiliating correction or supplement.

Another side of the picture reveals instructions misread—possibly, on occasions, not unforgetful of Nelson's blind eye—of which I can give you a concrete example. There exists a certain return which shows monthly the result of new orders obtained, etc.; but it was recently discovered that in one instance the return had, from its inception, been a record not of orders obtained, but of orders completed.

With this birds-eye view, can you not imagine that the inclination is to approach the issue of new instructions with reluctance rather than with alacrity?

But these objections to a too-ready rushing into departmental instructions are mere incidents and accidents to be reckoned with and overcome, and must not be construed into a shirking of or a desire to shift responsibility. There are other and far weightier reasons for care in the making of rules and in the foresight of their results.

There are three great underlying and pervading characteristics to be found in all laws and to be held in remembrance of all legislators the world over, and they are these: permanence, uniformity and universality. Sufficient, I think, to cause one to pause, lest undue haste spells the letting loose of an error.

For a business concern we, the staff of the Company, form a great body—a business community—and before making a single addition to our existing code of instructions, it is essential to decide whether the circumstances under which it is proposed to make it are likely to alter—whether it affects only a particular branch of the business or particular districts, or whether a common rule is to be established for general observance. Should it be found that the case to be met is of a temporary nature or affects a partial area only, something less formidable—such as a circular letter to cover the passing incident—than a general printed instruction will suffice.

To treat Service Instructions in a lighter way than this, to overlook the question of permanence would be to invite chaos and to produce waste paper, for every month would bring forth its bewildering crop of cancellations, amendments or supplements, involving continually new editions of whole sections, so that a harried and irritated staff would never know how far it was up to date in its methods.

Permanence therefore acts as a wholesome restraint on hasty, half-baked legislation; for it is no small matter to remember that an order issued to-night will have reached a thousand brains to-morrow morning and that without care and forethought it might be imperative to get it out of those brains after it had become firmly established there, in a month or two. But if you are prepared to acknowledge and accept some reason and prudence in those who issue our instructions, you should, with consistency receive them in the same spirit and treat them accordingly. Perhaps they merely

confirm your existing method, your pre-conceived notions; so much the better. And if not, give the author credit for a good and broad motive, and still remaining unconvinced, submit your matured alternative.

But do not forget uniformity, on which there is much to be said.

It would be of no use for me to attempt to disprove that, taken alone, uniformity is opposed to individuality; I admit the fact but at the same time dismiss it with the proposition that individuality outsteps uniformity. Uniformity soon exhausts itself while the phases and possibilities of individuality are practically limitless.

I have already referred to the even step of a regiment of soldiers. Now, to the casual observer this regularity may seem merely a question of discipline, or it may be the rhythm of many marching as one that appeals to the sense of order, in much the same way as does the scarlet coat: and the regularity of tread and clothing proclaims to him the soldier. But to the soldier himself the red coat and the discipline, unconsciously, mean much more: they mean unity of mind and of action in the field, they remind him of what is expected of him; and he rightly expects that every man clothed and trained as he is will act equally, side by side, at the word of command.

But the soldier also knows that the red coat cannot of itself turn a constitutional coward into a brave man and that no discipline will regulate his pulse or control his feelings. Nor will the soldier be likely to win distinction by always waiting for instructions.

The word of command given, the soldier is his own master. He may urge his horse or keep it in, as he thinks fit: he may coolly mark his man before he fires or he may leave each bullet to find its billet; he may prefer surrender to death. These are matters, not of uniformity but of judgment, discretion, initiative and temperament. At the same time, if he betakes himself to either extremes, he will not, probably escape the eye of his superior officer.

Our position as a commercial concern does not commonly lead us into ways of heroism or the reverse, but in point of direction and discretion my military metaphor holds good, and I need not labour the moral. In further regard to uniformity I have a few words to say on the technical side of our work as distinct from the financial; although you must not assume that engineering has no connection with finance. It has much, but the relationship is not part of my story.

Of engineering and electricity and their intricacies I know nothing, but in the little I have learnt of things in general I have gathered this, that the complete knowledge of all physical facts is only achieved by searching their theories. You may mechanically build a wall or a route of poles, anyone can see them when built, but without the study of their theory you do not know them. To the men who set up a pole, to the onlooker who sees them do it, it may seem all sufficient that the security of the pole is established by its being sunk a reasonable depth into the earth; and that the deeper it is sunk the greater is its stability. Assume for the moment that the officer in charge of the work knows nothing of its scientific principles. How does he gauge the required depth? By sheer experience? If so, how many years, how many poles of varying sizes has it cost the Company for him to ascertain to a nicety how many inches of each pole must be hidden in the earth? If he plants too deeply he is wasting money both in material and labour; if the depth is too shallow, he runs the risk of disaster.

No; he follows an instruction, a table. Not arrived at by tedious and doubtful experiments, but by knowledge of solid facts founded on proved theories. And the setting forth of these facts by master hands facilitates his labours and accelerates the work of the Company. Again, be it remarked, there is no desire here to restrain individuality, but the primary object is to promote uniformly good and safe work, the welfare of the business coming before all things.

It is quite easy to imagine that when the telephone was first introduced to this district of Gloucester the whole staff might have consisted of a manager; a foreman, with one or two wiremen and labourers; a fitter and instrument inspector, one operator and a clerk. That is to say one person may have had the entire work of a department on his or her shoulders. In such circumstances it is evident that the issue of printed instructions would be wasteful, expensive and out of place—for each person, assuming his competence, would be, practically, a law unto himself, and any doubts or difficulties would be referred to the manager, who, being responsible

for the whole, would deal with them as he thought fit. In this primitive state uniformity would find no place; it would not exist.

But as the business grows in size and importance the conditions change; and to cope with them *additional staff has to be sought and has to be taught*. In time also the pupil becomes as wise or even wiser than his master, until a point is reached when it is necessary to decide upon the merits of new methods and superseding innovations. It is here that the old order changeth, and, supposing Gloucester to be the only telephoned town in the kingdom, it would fall upon the manager to arbitrate and to lay down definite rules to be generally followed; and the instant that you begin to create rules uniformity necessarily and imperatively follows.

One of the main objects of laws and instructions therefore is to promote uniformity, and the question of uniformity arises only when the number of persons concerned becomes too great to allow of individual counsel.

Gloucester is, however, but a unit, and not an isolated unit. It might be better described as a link in a vast chain, every link of equal importance and of the same pattern. Here we are brought to universality, a big word, a word for big minds, achievable only by the comprehensive mind, and by those whose work lies in the forging of the entire chain.

Unfortunately, in every progressive undertaking absolute universality of system and plant is unattainable; the perfect thing, if it ever comes at all, comes by evolution. We know this and regret it, and regretting it we must surely acknowledge that the next best thing is to get as near to it as possible. We can at least pull together, and without undue splashing, even if our boat is not of the most modern and approved type.

No one would deny that universality of system is good for the public—that the man from Glasgow or even from New York should feel at home when using a telephone in Gloucester. Nor is it difficult to see that the work of the management would be very much easier if every new exchange were but a replica of the last. The facts speak for themselves and need no demonstration, but I want to show in what way the staff benefits by universal practice and methods.

Suppose sufficient latitude were allowed to every engineer to use the class of material he thought best for his work with unfettered discretion in the manner of shaping it for the needs of the service; or that every chief clerk were given scope to alter the methods of bookkeeping when in his opinion it was advantageous to do so. In skilful hands, it might be that, in themselves, the results were perfectly satisfactory. But what of the men under those chiefs who have been taught otherwise, and who have to unlearn their own methods; what of the staff at Head Office who have to gather up the threads of a hundred centres and show results as a whole? And, above all, what of the unfortunate individual who, promoted from one district to another, finds himself a foreigner in a strange land, with the sequel that his subordinates find themselves choking with the dust raised by a new broom!

Service Instructions are expressly issued to prevent this. They bind us together; they teach us to sink our individualities where the common good is concerned; as a book of reference they help us when we are at a loss; they tell us, indirectly, what is in the mind of the management and, directly, that every new idea worthy of putting into practice, and from whatsoever quarter it emanates, is percolating through the entire system at one and the same time.

Wherein, then, lies our discretion, the exercise of our individual judgment and ingenuity? In the intelligent interpretation not merely of the letter, but also of the spirit of the laws laid down by our acknowledged governing body. If we do this, we are doing much; if, having accomplished this, we evolve an improvement in any particular direction, we are doing better, and our efforts do not escape recognition. But on our side we must recognise that laws are not made for the individual but for the community, and that the man of genius, the man who rises above the laws, is a rarity.

There are probably no two men whose views of their work and of the service generally are exactly alike, but we can, I think, divide the staff broadly into three orders: First, those of the conservative order—men of punctual habits both in the matter of arrival and departure, painstaking in the work allotted to them, men with hobbies, disliking change, and merely tolerant of any Service Instructions which spell innovation. But they master them loyally,

and resume the placid tenour of their way. Partly on account of their innate conservatism and partly from the fact that probably their interest in amateur pursuits is equal to or outweighs their official duties, the question of discretion or ingenuity in methods does not greatly appeal to them. The book of Service Instructions is their anchor sheet.

Then there is the order of the querulous—happily, I believe, a small one—men prone to opine that their merits do not always receive adequate recognition—possibly men of brilliant parts but of narrow vision, fretful under criticism, whose convictions are founded on inspiration or prejudice, rather than on the surer basis of tedious reasoning and study. These are the men to whom cold and uniform instructions are irksome and irritating, and to whom discretion and initiative mean an unfettered stage of operation, which is of course an impossibility where uniformity is paramount.

Lastly, there are those of the order enthusiastic, ever extending and not confined to any particular branch of the staff, whose chief aim is to advance in the knowledge of their work and thus help to vivify and advance the work itself. Service Instructions to men and women of this type produce neither fretfulness nor a slavish machine-like observance. They search for motives in order to enter into the spirit of the instruction and thus are able to carry out the letter intelligently. Discretion, ingenuity, originality exist equally for all of us, ready to be applied to the methods which uniformity, economy and permanence compel the administration to lay down. It is not necessary that these qualities should be freed from restraint to develop themselves, and, instructions or no instructions, no man need despair of stamping his work with his individuality, be it good or bad.

There is perhaps no man who has to rely on his individuality more than the actor, but his art lies not in improving on the words or the plots of Shakespeare, but in identifying himself with and conveying to his audience an accurate and living representation of Shakespeare's creations. Because, the mere copy and the closest imitation of the greatest facts or ideas, without appreciation of their true and inner meaning, will not carry us many stages along the road to success.

EXPERIMENTS ON DRAWING IN UNDERGROUND CABLE.

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THIS paper is based on the results of an investigation of the mechanical working of underground cables. The investigation covers most of the mechanical stresses set up in an underground cable, and terminates with the consideration of the stresses for the revision of the thickness and the choice of materials of the sheaths.

The co-efficients of friction between cable sheaths and various classes of ducts have been determined, and it is noticeable that the effect of duct lubricant varies with different ducts. Thus in the case of cast-iron pipes the co-efficient of friction is reduced to about 55 per cent. of its value by the use of lubricant. Similarly the co-efficient for a lubricated cement pipe is reduced to about 68 per cent. its value by the use of lubricant; but in the case of glazed earthenware ducts the co-efficient is only reduced to about 80 per cent. of its unlubricated value.

The force required to draw a cable into a duct, however, is not altogether accounted for by the weight of the cable and the co-efficient of friction only. The diameter of the cable affects the progress of the cable, inasmuch as a cable of a large diameter will retain the curvature, imparted to it while on the drum, more rigidly than a small cable. The effect of this and other curvature is to cause the cable to touch on the top of the inside of the pipe, and thus cause additional resistance to the motion of the cable.

A series of tests have, therefore, been carried out to measure the force required to draw a cable into a pipe, and to see how it varies with the length, diameter, weight, etc., of the cable.

The first problem was that of devising a means of measuring the tension in a running rope while drawing a cable into a duct; the tension in the rope being a measure of the force which is applied to the cable. The most obvious method of doing this is to

insert a spring balance in series with the hauling rope. This method, however, is not always practicable as it entails placing the winch at some distance from the manhole in order that the balance may be constantly in view during the passage of the cable through the duct.

The method chiefly employed for finding the tension in the hauling rope is shown in Fig. 1 embodying the principle of a transmission dynamometer.

The rope on its way from the duct to the winch is made to pass round the pulleys A, B and C. The pulleys A and B are fixed relatively to the earth and the pulley C is suspended in series with a spring balance from some support above, and it is easily seen that the reading of the balance is dependent upon the tension in the rope.

Thus suppose the pulleys be set so that the angle made by the rope passing over the pulley C is 120° , then the force acting down-

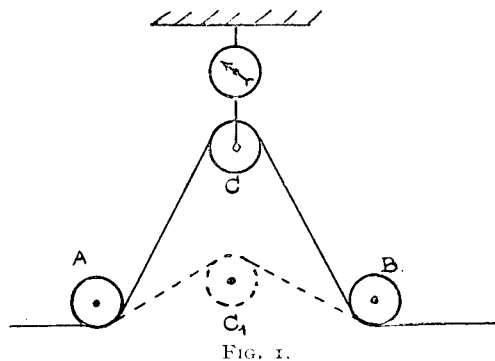


FIG. 1.

wards on C, which is the reading of the balance, is equal to the tension in the rope.

The chief feature of this arrangement is its flexibility of range of measurement, for it will be seen that with a balance of given limits, say, 2,000 lbs., it is possible to measure a rope tension of almost anything by setting the pulley C in some lower position, so that the rope tension is just double or three times the reading of the balance.

It is not advisable, however, to have the ratio of rope tension to balance reading too great, greater than, say, 1.5, as a slight error in measuring the position of C relative to A and B would then seriously alter the results.

A dynamometer on this principle was constructed in which a spring balance reading up to 200 lbs. was set to measure a rope tension of 2,000 lbs., so that the top of the pulley C was only slightly above the bottoms of the pulleys A and B. The

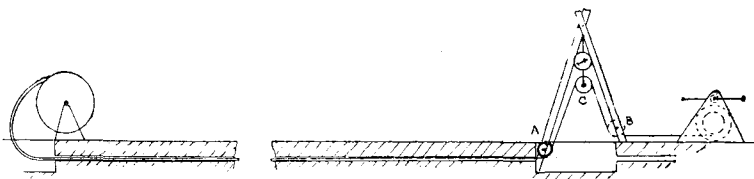


FIG. 2.

machine was not a success, owing to the stretching of the rope and the inability of the rope to immediately regain its normal diameter on reducing the tension.

A typical general arrangement as actually used is shown in Fig. 2. On the left-hand side is seen the cable drum containing the cable to be experimented with. The rope is shown threaded through the duct and round the three pulleys A, B and C to the winch. In this case a spring balance reading up to 2,000 lbs. was used, and the pulleys forming the transmission dynamometer fixed into a portable set of "shear legs." Owing to the more acute angle made by the rope over the pulley C the stretching of the rope does not affect the results appreciably.

In one case it was estimated that with the pulley C (Fig. 2) set as low as was consistent with accuracy, the downward force on C would be greater than the balance was designed to read, and was likely therefore to damage the balance.

The method of overcoming this difficulty was to modify the suspension of the balance as shown in Fig. 3. This arrangement consists of the pulley C for the hauling rope and two other pulleys with an endless rope passing round them as shown. In this case the downward force on C is equally sustained by the two ropes r_1 and r_2 so that the reading of the balance is just one-half of the total downward force on C thus enabling the balance to be used with safety.

The investigation on tension was terminated by the creation of a formula, which enables the tension to be calculated in a cable of any length, weight and diameter when drawn into various classes of 3-inch pipes, lubricated or not lubricated.

One of the next questions was to ascertain what assistance was given to the tensile strength of the sheath by the friction between the core and the sheath. This was found to vary with different cables and manufacturers, and experiment showed that in some cases it is necessary to elongate abnormally the sheath before the friction between these two parts becomes of any importance. Under the circumstances it has been decided to neglect this assistance as a working quantity and to include it in the tension factor of safety of the sheath.

The choice of material lay between pure lead and an alloy of 3 per cent. tin and 97 per cent. lead, and to make two sheaths of the same tensile strength it has been conclusively shown that it is

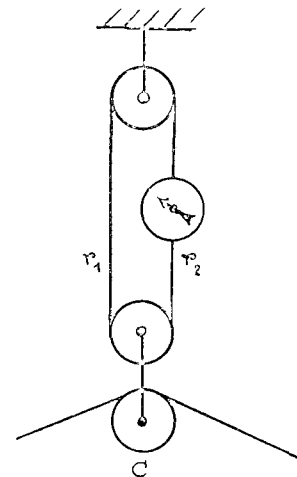


FIG. 3.

cheaper to use the 3 per cent. tin lead alloy, so long as the price of tin does not exceed a certain number of times the price of lead—a ratio which has not yet been reached.

One of the points generally raised against the use of the alloy is that the tensile strength cannot be relied upon owing to the difficulty in mixing the composite metals of the alloy properly.

In support of the use of the alloy it may be mentioned that all the tensile strength tests on cable sheaths were carried out in duplicate, and it was found that the average variation in the tensile strengths of two similar specimens of the same material was 2.1 per cent. in the case of the alloy and 2.5 per cent. in the case of the lead.

This shows conclusively that the mixture of the alloy does not vary from inch to inch in a specimen.

A comparison of the breaking stress of different-sized specimens shows a small uniform increase in the breaking stress as the cross-sectional area of the specimen decreases. This of course has nothing to do with the former point.

There are many other respects in which the two have been compared, pliability, hardness, ability to resist chemical corrosion, internal air pressure, etc.

It was, of course, a difficult matter to compare the advantage of one material over the other in one respect, with the advantage of the other over the one in some other respect. It was finally decided, having due regard to all these properties, that to construct a sheath for the requirements under consideration the alloy was the better material to employ.

The minimum tension factor of safety being decided on, the following table has been drawn up, indicating what length of 10-lb. conductor cable can be drawn into an otherwise empty 3-inch lubricated C.I. pipe on a straight route:—

Number of pairs.	Length which may be drawn into cast iron ducts.				Yards.
1					
2					
3					
5					
8					
10	350
15					
20					
25					
50					
75					
100	330
150	300
200	270
250	270
300	270
400	250
500	220
600	200

One suggestion for economy which was put forward and abandoned in consequence of manufacturing difficulties, is worth mentioning.

It will be understood that the tension in the sheath of a cable when being dragged through a pipe, is a maximum at its head and diminishes to zero at the tail of the cable. From the consideration of tension only, the thickness of the sheath could be made, therefore, to diminish to zero at the tail of the cable.



USING THE SPRING BALANCE IN SERIES WITH THE HAULING ROPE.

The suggested sheath consisted of a tapered sheath being thick enough at the thinnest point (the tail) to prevent punctures, etc., from other causes.

This sheath, known as the constant stress sheath, would insist on certain restrictions with regard to working. For example, the cable grip would always have to be fastened to the thick sheath end of the cable whether drawing in or out. Nevertheless, such a sheath would well be worth considering on the score of economy, if it could be made inexpensively.

FOOTBALL.—THE CLAY CHALLENGE CUP.

The final tie took place at Tottenham on April 9 between Head Office and London Southern District. After leading by three to nil at half-time, Head Office ultimately won the cup by four goals to two.

OPERATING AS A CAREER.

BY FLORENCE J. MINTER, *Metropolitan Examining Matron.*

(Concluded from page 10.)

I have heard some people say that references are of no use, and certainly it is only in one or two cases that we have received adverse letters of recommendation. People would naturally select as referees those who would have something good to say of them. Judging by the references, there never was such a staff of good honest, clever, intelligent and well-behaved people as those of the National Telephone traffic staff. Some people have strange ideas as to what constitutes suitable referees, and we receive the names of omnibus and tram drivers, policemen, postmen, waiters and cooks—honest, no doubt, but scarcely what the Company mean by "responsible person."

The quaintest letter of this nature I have received is the following:—"It affords Miss ——— much pleasure to sign herself as a reference to the character of Lillian ———. She readily expresses her approval of Miss ——— to any post she may obtain, and gladly sums up her experience of her whole life (Miss ——— has known her since babhood) in such hearty terms."

It sounds like the polite letter writer slightly transposed.

I do not know whether I am more sorry for the beginner, when she commences her career in the operating school, and is faced by the mass of seemingly intricate matter she has mentally to assimilate within four weeks, or when she makes her first step into an exchange, and has to bring into actual practice all she has been learning. I am afraid some of our senior staff, when they come to the school and see the apparatus and the plans and diagrams provided, and have an opportunity of hearing the patient manner in which the supervisors endeavour to instil their knowledge into the learners, are rather apt to expect too much of the operator on probation in the exchange, because the learner has so much provided which was not known in earlier days. They forget, however, that what they know themselves has been taken in gradually as the years have sped, and this and that rule or that method of working has come into force; but the learner of to-day has to take in the theory and practice of modern telephone operating and a mass of regulations and general knowledge rendered the more difficult because of multiplicity of the present rules, instead of the simplicity of the past, and I doubt very much whether these seniors would do very much better, if as well, as some of the juniors to-day. I must confess to a very soft spot in my heart for the newcomers.

The school life is happy enough, and I am sure hundreds look back to that period which contained happy days as well as hard days, and many lasting friendships are made at that time.

The individuality of the operators must always be reckoned with throughout their service, and certainly it is nowhere more apparent than in the operating school.

There is the brilliant girl to whom learning is child's play, and who seems to grasp the idea before one has the opportunity of showing her; the dense girl who is hopelessly so and the dense girl on whose intellect the light suddenly breaks in, and who afterwards makes rapid progress; the quick girl who never becomes careful and the slow girl who would not hurry in a fire, and the plodder who becomes the reliable operator; the bad-tempered girl who resents correction, and the girl who thinks she knows and equally resents being told; the girl with no sense of humour, and the girl who breaks the accustomed quiet of the school by an irrepressible laugh at the thought of the man in the call office who, possessed of a bent penny, cannot get his money in.

In the latter case I am, of course, referring to the monitors, one of whose duties it is to pretend to be subscribers, and are in turn all species of that terrible person. They carry out these duties so successfully that one girl was reduced to tears by the pretended cross subscriber, although she said afterwards, through her sobs, that she would not have minded if it had really been a man, but she could not bear to think the monitor was angry.

Possibly in the smaller schools in the provinces there is more opportunity for individual training; but although the different personalities must come in, they cannot be dealt with and moulded

singly in a Metropolitan school, nor can, in either case, indefinite time be given to a girl making unsatisfactory progress until she has gained what she lacks in energy or smartness, or lost those attributes which form stumbling blocks to her success; and although from time to time we have to dispense with such learners' services, I do not think we must always credit them as failures, or ourselves with too little insight into their characters. It is not every girl who is suitable for telephone operating.

So far I am afraid I have dealt at too great length with the operator in embryo, and at the very outset of her career, but as so much of a girl's success in an exchange must depend upon her personality, training and general suitability for the work, character study must come largely into the selection, and then, having learnt her work, and being on the staff, the "career," so far as each day's work is concerned, seems very much the same, as the years slip quickly by, till she becomes a senior operator and eligible for promotion.

Yet how important are those years between the date "made operator" and the date when the exchange manager recommends for promotion, or, on the other hand, has to say, though she may have been for some time at her maximum salary, that he "cannot recommend." Far more important, just because of those two possibilities, than I fancy many of the operators realise. Just as in everyday life a person is credited with a character for this or that, so surely do operators gain their character and build up reputations in telephone exchanges quite apart from the "service card," with its copious entries or its clean sheets, for it is but a poor exchange manager or clerk-in-charge who does not know what to expect from each individual on their staff.

With regard to the service card, the girl with a record of constant small irregularities is, to my mind, not nearly so excusable as the girl with one or two big faults which her clerk-in-charge may often be able to account for from her knowledge of the special circumstances, private or otherwise—being out of health or specially tried. I am, of course, not speaking of those who commit great breaches of the regulations, often through want of sense of honour, and who destroy the confidence of their superior officers and bring discredit on their colleagues. But the fact remains that the girl who is constantly going wrong in little points, but points all important to good service, cannot expect promotion to a more responsible position, any more than the operator with big entries against her. Both show lack of appreciation of discipline, or the good of the service, and a want of *esprit de corps*, and who can bring discipline to bear on others if they have not themselves first learned to be ruled and directed?

None of the Company's rules are impossible to keep, and all are framed to render that, so dear to everyone who has the best interests of the Company at heart, an efficient service.

Because the work of a telephone operator is very much the same year in and year out, there may be with many a tendency to get too much into a groove, and the natural consequence is that, when the opportunity for promotion comes, an operator may be excellent in the actual operating routine but sadly lacking in initiative and common knowledge, and may never have troubled to think why she does this or that, or *why* this or that is required in connection with her work.

To me it is astonishing how little some people know or trouble to learn of matters outside the immediate sphere of their work, and with these self-created limitations such people become, unconsciously, merely machines, and certainly mechanical in thought. This becomes very apparent in the qualifying tests for clerkships or supervisors' positions, where an actual inability is shown to express their ideas or views on paper, and it is obvious how little they have used their powers of observation.

These same papers also show how little some people keep up their education. The essays are meagre; answers to questions are ungrammatical, sometimes badly spelt; the articles and subordinate words are omitted, and few candidates can compose a business letter.

I would preach and ever preach to the operator throughout her career—ambition. Not the "vaulting ambition which overleaps itself," but the variety that is mother of the healthy efforts at self-improvement and the attempt to fit oneself for something higher, with the feeling that, though but mortal, if not able to "command success," to do better, "deserve it."

An operator should enter the exchange with the fixed determination not to remain an operator all her life, if there are more lucrative and responsible positions in the service to attain. We must all pass through the mill, and no permanent success is obtained without hard work, and certainly none is so sweet as that which is the outcome of sustained effort.

Many manage to squeeze through the entrance examination, and having obtained a position, and qualified as an operator, think that nothing more is required of them in life but to satisfy a certain number of subscribers daily, and if not too many entries appear against them on their record, they will obtain their periodical increases in salary. The examination may have discovered a very weak subject, although the total marks obtained constituted a "pass," and it may have been suggested, as I generally suggest to such girls, that they would be wise to recognise their weakness, and endeavour to overcome it. But there is a great temptation to procrastinate, and a real effort is required to devote regularly even a few hours weekly to self-education and improvement. But the effort pays in the long run.

Supposing an operator is asked by her exchange manager to undertake some special duty—to assist temporarily with the clerical work, or to take a special record—do not think her failure or success, as shown by the amount of education she appears to possess, is passed unnoticed. There may be, later on, a vacant clerkship in the exchange, with its privileges and responsibilities, and possibly higher pay, for which an operator has always the chance of being specially selected.

And if you mean to be supervisors some day, remember you must be able to do something more than operate to keep the position, if promoted. Believe me, if success comes at all, it will come because it is deserved, and not because merely sought after. Do not be discouraged with the difficulties to be faced. Remember:

"The wise and active conquer difficulties;
By daring to attempt them. Sloth and folly
Shiver and shrink at sight of will and hazard;
And *make* the impossibility they fear."

To those who do try their very utmost to succeed, and yet fail to rise, and to whom Nature has not given an abundance of those essentials for higher positions which it is impossible to cultivate, I would say, remember that "high failure overleaps the bounds of low successes," or, as George Macdonald puts it, "The failures of some will be found eternities beyond the successes of others."

Your aims, your efforts, your steady conscientiousness, must win the confidence of your exchange manager in you as an operator, and you had better be an excellent operator than a poor supervisor. But still, *aim high*—"Not failure, but low aim is crime."

Endeavours should be made by exchange managers to get every worrying and troublesome subscriber to visit the exchanges, when he would at least be convinced that operators do *not* read novels or do fancy work at the switchboard, or hold long and interesting conversations with their colleagues near at hand on the subject of a new hat. I think there is still a great deal to be done in the shape of educating the public as to what a busy and important official of the Company is the operator who is responsible for their telephone service.

The operator herself must never lose sight of the fact that she *is* important and responsible. Generally the only acquaintance a subscriber has with the Telephone Company is through the operator who answers his calls, and through the receipt of the annual rental notices. Do not forget that you represent the National Telephone Company to him—be jealous of the reputation you gain for it; uphold the prestige of the firm, and its gigantic staff, of which you are a member. Remember you are individually responsible.

Then again, although you may accuse me of sermonising, I would say that a girl should try to realise, when she enters the service, what she owes to her fellow-workers. It is due to them to do her share to maintain the tone of an exchange staff, and one's influence is so widespread that it may circle and widen for good or bad beyond all our expectations.

Two things should never be lost sight of—Not to make the fatal mistake in thinking your work does not matter; and—Not to look upon your work as a necessary evil. If you do, the effect will

soon be apparent. We should, I suppose, if we had our choice, select the path in life which contained no toil, but Kingsley says:

"Thank God every morning when you get up that you have something to do that day which must be done, whether you like it or not. Being forced to work, and forced to do your best, will breed in you temperance and self-control, diligence and strength of will, cheerfulness and content, and a hundred other virtues the idle will never know."

It is not an easy matter to keep sweet-tempered and cheerful, but it is worth while trying. I think it is the famous Mrs. Wiggs of the *Cabbage Patch* who said:

"When things first got to goin' wrong with me, I says: 'Oh, Lord, whatever comes, keep me from gettin' sour!' Since then I've made it a practice to put all my worries down in the bottom of my heart, then sit on the lid an' smile."

It is a very good practice to follow, but I expect a number of us have to "set" rather heavily on the lid occasionally to keep the worries from creeping out.

I do not know the system for promotion to supervisor's positions existing in provincial towns, but one cannot but appreciate the formidable task in London with a staff of nearly 2,000 girls cut up among 61 exchanges, and with the order of seniority to be taken into consideration.

I think the old idea of being promoted by seniority without taking merit into consideration is entirely exploded among the Metropolitan girls, and they know they must be meritorious and as suitable in character as in work to obtain their increases, and certainly to be promoted.

In London we have found it necessary to keep a separate record of all senior operators, and each six months the fifteen exchange managers present the traffic manager with a list, showing in order of merit all senior operators in their district in receipt of a salary of 19s. a week and over, giving their full remarks on the abilities, character and suitability of each—drawing a line between those recommended and those who cannot be recommended for promotion, and giving reasons for the latter. The traffic manager then considers for promotion during the current six months only those above the line, he, of course, having to work from a complete list compiled in my office from the fifteen other lists on a seniority basis, with the order of merit inserted against each operator.

If the first in order of seniority is first in order of merit in her exchange also, and her address enables her to fill the particular vacancy, she is naturally the first considered; but if not recommended her seniority rightly avails her nothing.

Each supervisor or monitor is promoted for three months on probation, during which time, by the traffic manager's instructions, she is coached in her particular duties, and has so many hours allotted for actual study of operating matters from the various service instructions, and so forth, and if her practical work recommends her, at the end of the probationary period she sits for a qualifying test, and, if she passes, her appointment is confirmed.

It must be understood that this test of efficiency has not been framed for the purpose of making promotion more difficult, but the past has shown the error of appointing to the responsible position of supervisor one who, on the surface, is giving satisfactory practical work, and yet in an emergency, or in course of time, shows but very superficial knowledge of the theory of her work, and but poor acquaintance with the rules.

The test deals entirely with subjects with which, in the ordinary course of her work, she may daily come in contact, and a person of average education, with some ability to express her thoughts on paper, should have no difficulty in passing.

It is a system which I believe I am right in thinking the London traffic manager has satisfied himself as having been amply justified by the results in the exchanges.

I often think of the supervising staff as like the non-commissioned officers, who are considered the backbone of the British Army; but every little nerve and tissue of the gigantic vertebræ required to form the support of exchange work must be strong—strong with a keen sense of responsibility; strong in the knowledge of what to do at the time; strong in the ability to transmit to others her own knowledge; strong in tact; strong in character; and strong in both wish and ability to help her juniors.

I can but deal shortly with the different class of work required

of supervisors who deal with the operators, and the monitors who deal directly with subscribers, one of the latter's principal qualifications being the ability to give the "soft answer that turneth away wrath." The operator who, during her career, has been capable of instilling the confidence into her subscribers that all possible is being done, and every attention is given to his individual service, will go far to make a successful monitor.

It has been suggested more than once that supervisors have more responsibility than monitors, but I am of opinion that each is equally important, although the monitor has perhaps the more trying position. Alertness and an absolute knowledge of rules is essential in both, but the monitor must have the bigger strain on the sweetness of her temper.

Representing the clerk-in-charge, she must give a subscriber the impression that that personage can always be relied on to settle his telephone trouble; but there are many subscribers possibly at the same moment who are clamouring equally, and not always politely, for attention to their particular complaint.

Some monitors give, as the result of a businesslike tone, the impression that there is no time to be wasted; there is not, but the subscriber must be answered pleasantly, and given the impression that all the time of the clerk-in-charge is at his disposal.

A monitor must also be firm, and, knowing she is right, keep to her word, and yet tactfully still "turn away wrath." She must also be accurate in recording complaints, and should be a good writer. In a large exchange "team work" is as essential among monitors as operators. With the excellent modern arrangement of team work, or divisions, one can but regard the supervisors as clerks-in-charge in the making. Each is responsible for the work and training of a certain number of individuals, and on taking up her duties a supervisor learns to look at operating not merely from the standpoint of her own little section, but, with a broader view, to realise the difficulties of maintaining a good service with the ever-varying human parts of the machinery to control and direct.

Hitherto she has had to control herself, and has been directed in the difficult points; now she has to bring into play all the tact of which she is capable suitably to control others, and all her operating knowledge and experience to assist and direct those of whom she is in charge, and for whose work she is responsible.

She has also, during her probationary period, to study and become closely acquainted with traffic subjects, which she has hitherto looked upon more or less in the abstract. To teach others we must have a very accurate knowledge ourselves; but as regards our personal influence, this depends not only on what we know, or even on what we do, but upon what we are.

Furthermore, a supervisor has to cultivate a due sense of her position, and yet avoid that aloofness from her team which is fatal to all feeling of comradeship between different grades of staff. This latter is a more difficult quality to attain when promoted to a higher position in the same exchange—a thing which is very seldom necessary in London, but which, I presume, has to be done in smaller districts.

In this position, no less than any other in an exchange, would I again preach the doctrine of ambition, for there remain still higher heights to climb. The same system of promoting on probation is followed with regard to making senior supervisors in an exchange, or senior supervisors in charge of smaller ones, the latter's classification being dependent on the number of subscribers and their positions, and being, to my mind, much more onerous and responsible, with all the clerical duties to perform, and responsibilities of being in charge, than the senior supervisor in a large exchange, with its clerical work performed by persons specially sanctioned for the purpose, and a clerk-in-charge and often an exchange manager to refer to in a difficulty.

The same system again is applied when the question of an operator's reaching the zenith of her career is being considered, but for so important a position, the test is naturally severe, and a somewhat fierce light must be brought to bear on a person's qualifications for the post. In fact, I approach the subject of that highly important official with the consciousness of my own temerity, but, at the same time, have my own opinion of what constitutes the ideal clerk-in-charge.

Her responsibilities are so manifold that she may materially make or mar an exchange from the service point of view, and

certainly she may affect the well-being and happiness of the army of girls under her rule. If one may use a simile, she is the hub of the wheel, the supervisors are the spokes, and the operators the rim, and the smooth running of the whole is dependent on the stability and excellence of the central portion. She may raise or lower the tone of an exchange; she may influence, for good or bad, the spirit in which its work is carried on. The position demands of its holder high attainments, high ideals, and the ability to distribute her knowledge—to give the benefit of her experience of human nature as well as of the work of operating—to possess such a personality that its influence may result in her own high ideals permeating the exchange rank and file.

Some persons have the gift of extracting, without apparent effort, the very best from others. Some, on the contrary, may urge, expostulate, persuade, and even drive, and the result will not be such a standard of excellence, and may bring about efforts made half-heartedly, begrudgingly, and even from fear of consequences.

The chief part of the day in the workaday world is spent in labour, and it is a sorry day for anybody when one's work becomes mere means to an end, and the scene of one's labours but represents the place in which so much money is gained for so much toil; and I am confident that the exchange, in spite of the monotony of calls, troublesome subscribers, and service tests, can become the place in which genuine *esprit de corps* gives healthy competition, and the happiness that comes in the knowledge of a day's work well done—of one's efforts being appreciated. But it may become a hopeless, horrible, ghastly reverse, to the newcomer especially, who has not become hardened, or developed a hard sort of philosophy as to the world in which an unkind fate has placed her. The clerk-in-charge should be a woman who will greet newcomers in a way which puts them at their ease, and certainly not with the stony British stare which slowly travels in a disconcerting way from feet to head, and which is not confined to the aristocracy of the Vere de Vere grade, I am sorry to say.

She should be a woman who, though sensible of the dignity of her position, should always be approachable to her staff, and ready to lend the friendly, sympathetic ear to a difficulty, pleasure or trouble.

I feel I am not exaggerating when I say that the personality of a clerk-in-charge can be responsible for making an exchange like either of the two pictures I have presented.

In reading the biographies of the "Telephone Woman" in the JOURNAL one cannot fail to be struck with the number of excellent disciplinarians the company possess. Discipline is an art, but before complete knowledge of your subject, wide sympathies and zealous attention to duty, its difficulties must vanish, and the small assertions of inferior natures are forced behind.

An enthusiastic love of work and the knowledge of the working of a mind as it struggles towards the light, will accomplish greater things than the most perfect methods or rigorous discipline.

Nature did well when she moulded us in different patterns, and life would be monotonous indeed if we all had the same characteristics and abilities; and although to work smoothly an exchange becomes like a well-oiled machine, the human components will never become wholly machines, and the individuality of the worker must become apparent, and has its own value, and the clerk-in-charge, to be successful, must be able to take into consideration the various personalities of her staff, and use them to the best advantage.

To mention beginners again, a clerk-in-charge should be able to deal tactfully with them, in order that they may feel they have someone to whom to apply in difficulties, and not a person ready to condemn what are sometimes justifiable errors in a beginner, in spite of all her tuition. I have heard of a learner fresh from the school being counted as having committed an irregularity when it has been proved the senior operator or the supervisor had not mastered a rule which the girl fresh from the school was studiously carrying out; but if errors are committed it is the work of the clerk-in-charge to see that the supervisor and senior operators of the teams in which the learners are placed recognise it is to their own advantage to help and guide, inasmuch as the success of the division is the sooner effected.

A clerk-in-charge must recognise that her duties are anything but confined to those set down in black and white, but rather, to a

far greater extent, composed of infinitesimal small things, all affecting the efficiency of the service, the tone of the exchange, the well-being and happiness of the operating staff, in which tact, discrimination and common sense are required, and yet which cannot be scheduled as actual duties.

Some people say that nothing is perfect in this world. Nothing will ever be, and it is therefore of no use expecting perfection of people; and so they are calmly willing to accept mediocrity as a sufficiently high standard, and excuse all occasions in which they fall short in somewhat similar sentiments. But I would say to all grades of the operating staff what I often try to impress upon some of our beginners: Aim high; set yourself a high standard. To be satisfied with oneself is to court certain failure. *Do your best; be your best in whatever you undertake.* You may not climb to the top of the ladder, but you will achieve more than the person who does not attempt to climb. Some of you may not even reach sufficiently high to supervise, but you can be some of the very best operators the "National" ever had to help on its success. We are all units in the mighty whole—little pieces of this huge mechanism—you and I—and each little bit is as necessary, I believe, as any other, and no machine ever yet worked smoothly of which each part was not working in unison with the rest, and with this end in view does it not devolve upon each individual to so co-operate—Metropolitan and provincial—that the mighty machine called the National Telephone Company, of which most of us are so justly proud, works without a hitch? To be jealous of its reputation until the day when its existence as a company ceases, and then to carry forward into the new era the attainment of the high standards to which we have set our hands.

HYDRO-ELECTRIC PHENOMENA.

THE *Post Office Electrical Engineers' Journal* gives an account of the electrostatic charging of telegraph wires by locomotives which occurred at Dell railway-crossing station on the Natal-Transvaal main line. The occurrence is described as exceptional, even in a country where extraordinary atmospheric effects are not unusual; but without going any further afield than Glasgow we are able to quote an account of similar phenomena (in connection with a stationary colliery engine and telephone wires) given by Mr. Gill eight years ago in a paper read before the Dublin section of the Institution of Electrical Engineers:

In June last (1902) one of the employees of the National Telephone Company was working on a pole supporting a number of wires (seventeen) running through a rural district near Glasgow. On touching the topmost wire the man received a severe electric shock. On reporting the matter to a member of the Engineer-in-Chief's staff, Mr. Watts, the matter was investigated, and it was found that during certain times sparks could be drawn from the wire in question. This wire was found to be an unused one and was of copper weighing 100 lbs. per mile, about 1,000 yards long, and insulated at both ends and over its whole length. It was carried at a height of 26 feet from the ground, and its capacity would be about .0087 mfd.

It was at first difficult to explain the reason for the charge as the wire seemed perfectly insulated from all other conductors. The only thing at all unusual about the line was found to be at a point where the exhaust steam from a colliery engine was blown from a distance of about 23 feet by the wind against the wires. The exhaust pipe extended vertically 18 feet and was 3 inches diameter at the top. It was found that the charge only occurred when the engine was working on load, and only when the wind blew the exhaust steam against the wire. Further investigation was made by Mr. Watts, who had a collector constructed of a long bamboo rod with an insulator at the top on which was fixed a number of short pieces of wire with a V.I.R. covered wire connected as a lead to the ground. When this collector was held in the steam near the mouth of the iron exhaust pipe a series of sparks was obtained from the covered lead, and the origin of the charge completely located. The weather during these experiments was exceptionally dry, and the charge could not be obtained on damp days.

Since that date Professor Magnus Maclean of Glasgow, having had his attention drawn to the phenomenon by Mr. Valentine, the Company's District Manager, has conducted some experiments by means of a portable electrometer. He found that when a similar collector to that already mentioned, but with the lead wire terminating above the ground, was inserted near the steam, continuous sparks of $\frac{1}{2}$ inch to $\frac{3}{4}$ inch long could be obtained between the end of the lead and a metal rod driven into the ground, the best results being obtained when the pressure of the escaping steam was highest. This length of spark would indicate a potential difference of about 40,000 volts. Professor Maclean also took sparks from the lead through his body and noticed that the physical pain experienced was much more severe than from a spark due to about 100,000 volts' pressure derived from a large 24-plate Wimshurst machine.

Professor Maclean also tested the potential of the air 6 feet above the ground and found when under the issuing steam and about 12 feet from it some

1,100 volts, and at a point 30 feet from the steam about 900 volts, when the engine was working. The electricity generated was positive in each case. Of course the hydro-electric effect of steam under pressure is well known and has been investigated by Faraday and by Armstrong, but it is very seldom that the effects are seen in the natural order of things.

The longest spark in the Natal instance had a value in kilovolts of 14.3. It will be seen that those referred to by Mr. Gill reached 40.

TELEPHONE WOMEN.

LXVI.—MINNIE REILLY.

MISS MINNIE REILLY entered the service of the National Telephone Company in Manchester as an operator in May, 1892, and has therefore had eighteen years' varied experience of telephone work. She has had experience in magneto, call-wire, call-key ring through and central battery working.

After eight years as an operator Miss Reilly was promoted to the position of supervisor in 1900, and assistant clerk-in-charge at the Manchester Central Exchange in 1907. This was then the largest provincial exchange in the Company's system. On account of the excellent work she did while holding the position of assistant-clerk-in-charge she was, at the opening of the new City Exchange, which is a central battery equipment with 4,000 working lines, appointed to the responsible position of clerk-in-charge which position she still holds.



MINNIE REILLY.

Miss Reilly is before all things an enthusiastic telephone woman. She has taken and still takes a keen and intelligent interest in the progress of her exchange, and her ambition is to have a thoroughly efficient and contented staff. While holding the reins of discipline firmly she is very tactful in the manner in which she deals with her staff, and is therefore very popular.

In connection with the operators' social gatherings, Miss Reilly is a prominent figure, and does not hesitate to add to the pleasure of these gatherings by taking a personal part in the various entertainments. Although she does not confess to any special hobby she finds much of her recreation in whist and reading.

Miss Reilly may also be said to come of a telephone family, having several brothers and sisters earning their livelihood in this industry, one of her sisters being clerk-in-charge of the main exchange in Mexico City.

LXVII.—HARRIET STAMPER.

MISS HARRIET STAMPER entered the service of the Mutual Telephone Company in Manchester in July, 1893, and was transferred to the National Telephone Company's service in February, 1896.



HARRIET STAMPER.

In January, 1903, Miss Stamper was promoted to the position of chief operator at Rusholme, which is one of the principal sub-exchanges to the Manchester area. In March, 1908, owing to the growth of the Rusholme Exchange, Miss Stamper received the title of Clerk-in-Charge, and when the new central battery equipment superseded the old magneto equipment she was transferred to the new exchange in the same capacity.

During the time the work in connection with the new exchange was in progress, and in connection with the special training of her staff to prepare them for central battery operating, Miss Stamper spared no pains to make the transfer, as far as her department was concerned, a thorough success; she has imbued her staff with a very healthy *esprit de corps*, and she therefore gets thoroughly loyal service from her operators.

Miss Stamper is an elocutionist of more than average ability and some twelve months ago she was elected a member of the Manchester Association of Elocutionists. Recreations are, however, only secondary considerations with her; as she is thoroughly wrapt up in her work, which holds first place in her affections.

REVIEW.

Die Europäischen Fernsprechebührentarife (the European Telephone Rates). By Dr. Erwin Günther. Published by Gustav Fischer, Jena. 263 pp., 6 marks.—This book, which is a monumental compilation, contains very complete and useful tables of both local and trunk line tariffs for all European countries, from 1879 to the present time. The British tariffs are arranged in periods, 1879-92, 1892-99, 1899-1907, and since 1907. The various grades of measured and party line rates now in force are given in detail, and, considering the modifications which have been made in them, on the whole with great accuracy. It is a pity, however, that no mention is made of the private branch exchange tariff, which is such a feature of the measured rate system of this country. The only criticism we have to make respecting the British rates is that the author omits to mention that the Company introduced the £5 and £4 message rate in London at the same time as the Post Office, and does not make it clear that the Company's and the State tariffs for London are in all respects identical. A small point is that there is nothing to show that the old rate for members of Parliament was £2 per month, and was qualified by a minimum payment of £5. The flat rates for municipal systems are given at the bottom of page 152 as ranging from £5 to £10: as a matter of fact they varied from £5 at Swansea to £6 6s. at Hull.

The book also contains tables of the telephonic development year by year of all countries in Europe— in most cases since 1885, although the record of Great Britain begins at 1903. There are about 100 pages of prefatory matter dealing with the bearing of telephone development on national economics, the importance of the tariff question, and the technical, administrative, economic and financial principles underlying the building up of a tariff, in all of which the reader will find much that is interesting and instructive.

In discussing the question of private ownership Dr. Günther says: In Europe the activity of the State-licensed private companies without competition led mostly to the introduction of unreasonably high monopoly prices. This is very significantly shown in the development of the telephone system in England, where even the simultaneous establishment of State and private exchanges in the same places was unable to attack the monopoly prices of the National Telephone Company. The complaints of the bad service and unyielding attitude of the Company in England were not silenced until the State, looking forward to the taking over of the whole system at the end of 1911, undertook the energetic construction of local systems.

This is not a very accurate description of the events of 1898 and their outcome. Judging by his references, Dr. Günther has relied chiefly on German sources and on the publications of the Bureau International. He might have consulted with advantage Professor Meyer on *Public Ownership and the Telephone in Great Britain*, who states that if the Committee of 1898 had been governed by the evidence submitted to it and not been swayed by the bias of Mr. Hanbury it would have found a verdict not unfavourable to the Company. As regards the energetic extensions to which Dr. Günther refers, beyond the establishment of friendly competition in London at mutually agreed rates, the activities of the Post Office have been confined to exchanges in country places of the least commercial importance. Of the municipal systems called into existence by the new Government policy the two largest (Glasgow and Brighton) were sold to the Post Office, Tunbridge Wells and Swansea to the Company, while Hull and Portsmouth are still in existence; they were not all absorbed by the Government, as stated on page 155.

Of the advantages of State administration the author says that this alone is able to regulate tariffs satisfactorily according to general economic, social and political points of view, balancing the contrasting interests of the users from the higher standpoint of real national interests independently of powerful private interests.

Experience, however, has shown that complete independence of powerful interests is not found in practice to exist under State control. The new Austrian rates caused much dissatisfaction to the large user and were revised; but the considerable reductions which were made were confined to the higher-grade rates alone. The proposed new German rates, prepared in 1907, which were supported by the strongest recommendations of the Imperial Post Office, met with widespread opposition—also from the large user—and, as far as we are aware, are still far off adoption.

In Chapter III, Section 13 (development of a typical tariff

reform), is described how the flat rate was first adopted in America in the early telephone days and how it rapidly spread over Europe. Dr. Günther discusses its well-known disadvantages and inequalities, and also the drawbacks to the system of payment for the cost of installation (in vogue in France, Holland, Sweden, and elsewhere), which hinders the development of the telephone, as the heavy initial charge often frightens away small business men.

Dr. Timotheus Rothen, afterwards chief of the International Bureau of Berne, is credited with first advocating the justness of the system of payment per message. He had the satisfaction of seeing it adopted in 1890 by Switzerland, whose example was followed by the United States and Sweden in the early nineties. In some American cities, however, measured rates had been adopted long before 1890.

In the section "Right Lines for Tariff Construction" we are in hearty agreement with Dr. Günther when he says:

The flat rate . . . is still very widespread to-day. It was justifiable in the first decade of public telephone service when the subscribers were chiefly drawn from larger traders, and the number of their calls in each local system, excluding the capital, did not differ greatly. But even in the second decade, when smaller business men and householders were joined up, the difference in use began to be significant. In the new century the telephone is still more democratic, and is a welcome and often indispensable aid to small businesses and the difference in the use made of single stations amounts to hundreds and even thousands of calls. . . . In these conditions the flat rate must therefore be considered antiquated and should be discarded (pp. 81-82).

After discussing the various factors in the fixing of a tariff he sees the best solution of the question in the separate payment of an annual charge and a charge per call. The book, which has evidently cost much labour and research, is an invaluable one for every telephone administrative department and every student of telephone economics.

THE SPREAD OF THE TELEPHONE.

UNDER this heading a paragraph appears in *Engineering* to the following effect:—

According to statistics just published, there are in the whole world 9,600,000 telephones, and the lines have an aggregate length of about 20,000,000 kilometres. There are 1,800,000 telephones in Europe, 56,000 in Asia, 9,000 in Africa, 7,700,000 in America (of which 7,590,000 are in the United States), and 53,000 in Australia. Denmark is the European country with the largest number of telephones per number of inhabitants—viz., 33.2 per 1,000 inhabitants; and Denmark has now ousted Sweden from that position, the figure for Sweden being 31.8 per 1,000 inhabitants.

The source of the "published statistics" is not given, but we should imagine that it was American from the liberal estimate allowed to that country. Europe is surely far enough behind without its 2,400,000 telephones being diminished to 1,800,000. The obtaining of complete telephone statistics for the whole world is notoriously difficult, and, in fact, practically impossible. America, especially with its innumerable small independent companies, affords a favourable field for magnificently generous estimates; but we think the intelligent estimator of the above statistics might have extended some of his generosity to the old world.

In the Viennese *Electrotechnik und Maschinenbau* Herr von Hellrigl recently published an article on the telephone statistics of the world. He deals in round figures and, outside of Europe, has had, of course, to supplement accurate information with estimates—as was done in the articles published in the July-November numbers of the *JOURNAL*. It may be of interest to compare the three sets of statistics:—

	<i>Engineering</i> (Thousands.)	<i>Von Hellrigl</i> (Thousands.)	<i>National Telephone Journal</i> (Thousands.)
Europe	1,800	2,500	2,381
Asia	56	100	100
Africa	9	7	25
America	7,700	6,900	7,097
of which U.S.A.	7,590	6,600	6,870
Australia	53	70	79
World	9,600	9,500	9,682

The first set of figures are absurdly out as regards Asia, where Japan is known to have, officially, over 70,000 telephones. Von Hellrigl does not do justice to Africa, where in Egypt alone the Telephone Company of Egypt has more than 7,000 stations, without taking into account Algeria and the whole of South Africa. His figures, and those given in the *JOURNAL* apply to Jan. 1, 1909. The number of telephones now in work is certainly considerably over 10,000,000.

The National Telephone Journal.

"BY THE STAFF FOR THE STAFF."

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VOL. V.]

MAY, 1910.

[No. 50.]

BUDGETS AND TELEPHONES.

It is far from our intention to awaken in our reader's minds by the first of the above words memories of the political tumults of the last twelve months, or to exacerbate the feelings of Liberal or Conservative by referring to matters so far outside our province. Nevertheless the word budget has its meaning for telephone men, and in the future will have a special significance for the telephone-using community and all friends of telephonic progress. Already in the principal countries of Europe the financing of telephone development rests with the State, and as the postal budget in each year is liberal or the reverse so is the progress of the telephone in that State foreshadowed.

But, as we have often remarked before, Government Departments have their own ideas as to the amount of capital which should be allotted each year to telephone development, and these ideas are based upon a curious sense of economy. Money must be freely spent on the telephone system because it cannot stand still; nor, from a national standpoint, ought it to stand still, especially as the capital expended upon it is productive. The high development of America is a standing triumph for unrestricted, unhampered private enterprise. Even in the countries so frequently held up to our admiration in Europe, Sweden and Denmark, a company owns the majority of the telephones in Stockholm, and in Copenhagen the Copenhagen Telephone Company holds the field. On the other hand, populous France has no city possessing 10,000 telephones outside Paris, and, as will be seen from an article we publish in another column, even Germany, the country having the largest number of telephones in the world except America, has reduced its budget this year from 45 millions of marks to 25 millions. Well may a Berlin official journal wonder whether it is right to be parsimonious with regard to money-earning plant which pays for itself.

Even if a good reason for open-handedness, viz., that capital which the State expends on the telephone is productive, did not

exist, it would still be in the interests of the community to further the rapid development of the quickest means of communication, to place no hindrances in the way of its expansion, but rather to facilitate the means for placing it within everyone's reach. The necessity, the indispensability of the telephone in business is now absolute; for national economic reasons sufficient money for its fullest and most adequate development ought not to be grudged, and having in view the revenue-earning capabilities of the telephone is there any reason for parsimony?

In this country, although its development is almost entirely due to private enterprise, that enterprise has not been free from governmental restrictions. Royalties, frequent changes of government policy, and, above all, limited tenure, have acted as brakes on all efforts to get up speed or to overtake rival countries. Some few years since the telephone stations of this country were increasing at the rate of 50,000 and 60,000 a year; but for the last two years the increase has been about 35,000.

London, with its 6,000,000 inhabitants, possesses some 180,000 telephone stations, or about one-quarter as many as it should possess in comparison with New York, or one-half in comparison with Berlin. Its net increase for the last three years has been between 16,000 and 17,000, and the percentage of increase has fallen from 13 to 10. When the Post Office commenced operations in London (supplementing the efforts of the Company, whilst at the same time restricting the area of the latter's activities) the rate of increase was 25 per cent. and over. The reasons which have relaxed the Company's efforts are well known; but the Post Office rate of increase for the last three years has also fallen to 20, 13 and 14 per cent. respectively.

Great Britain has some leeway to make up in telephone development, and the present therefore is not the time to progress at half-speed. Private enterprise will soon have ceased to provide capital for further expansion of the telephone, and then that industry will have to look each year to the Budget. It is our sincere hope that the future may develop in the Treasury an appreciation of Great Britain's telephonic needs, and with that appreciation a greater open-handedness, and that, adopting an attitude at once broad-minded and businesslike, they will furnish the means of developing this great economic necessity with no niggardly hand.

THE GERMAN TELEPHONE BUDGET.

FROM *Blätter für Post und Telegraphie* we learn that the supplementary German budget for telephone purposes amounts to 25,000,000 marks, or about a million and a quarter pounds, which will be raised by means of loans and applied to plant of lasting value and ensuring satisfactory returns. The loans will be redeemed, as usual, out of the receipts of the Post and Telegraph Department. The following figures and an abridgment of our contemporary's comments on them will be of special interest at the present time:—

The amount of the supplementary budget is substantially less than in previous years (1907, 44·8 million marks; 1908, 60 millions (inclusive of half a million for the Emden-Borkum cable); 1909, 45 millions). These amounts are allotted as follows:—

	1907.	1908.	1909.	1910.
Million of marks (roundly).				
1. Changing aerial telephone lines to underground, building ducts, laying cables, etc.	12·4	70	73	60
2. Laying telephone cables for the extension of existing telephone systems				

	1907.	1908.	1909.	1910.
Million of marks (roundly).				
3. Introduction and change over of multiple working in the larger exchanges	5.9	5.0	4.2	3.8
4. Erection of junction (trunk) wires	21.5	26.5	14.0	1.7
5. Introduction of metallic circuit working	5.0	5.5	3.5	0.5

It will be observed, says the *Blätter für Post und Telegraphie*, that the expenditure on the introduction and transformation of multiple working in the larger exchanges decreases slowly but steadily. It is most noticeable that the outlay for the laying of telephone cables and for extending the system is three millions less than last year, and that for the erection of trunk wires only 1.7 millions are required. The increases of stations in the years 1899 to 1908 were 22,987, 52,009, 44,159, 45,420, 49,474, 58,225, 65,877, 76,436, 78,651, 72,676. It will be seen that the yearly increase, with the exception of the year 1908, has continuously grown. It will require the greatest economy to supply all the required new connections with the specified sum of only thirteen millions. We hope it will be sufficient.

The amount for the erection of new trunk wires, that is for the improvement of the long distance traffic, was only 7.9 per cent. of the expenditure for the year 1907, 6.4 per cent. of the expenditure for 1908, 12.2 per cent. for 1909. When one considers that the number of trunk messages in 1906 was 207,192,710, in 1907 230,268,164, in 1908 231,347,000, that they therefore increased in 1907 by roundly 23 millions as against one million in 1908, it might appear only natural for this sum to be noticeably decreased; but it must be remembered that there is now every prospect of a great further increase, and that in many places the number of trunk lines gives very scanty accommodation. In any case this accommodation would be too strained to satisfy the needs of the increasing traffic with so small a sum and to avoid a set-back to the progress of telephone work. Whether it is just and "commercial" to be parsimonious with money-earning plant which pays for itself so well appears questionable. In this connexion an excessive economy would appear to be harmful for the postal and imperial finances. It appears to us to be pressingly necessary on various grounds to provide satisfactorily the means for telephone purposes. It cannot be denied that the Postal Administration has not only been able to fill the requirements of the telephone traffic, but that its introduction and development is due to its initiative. The history of the development of the telephone up to and including the new tariff law will be ascribed without doubt to the credit side of Postal Administration, even if to-day the new tariff scheme is one of the favourite points of attack and is gladly used as an example of the backwardness and hostility to commerce of the Postal Administration. . . . Lately some of the numerous critics of the Administration have reproached the Department with extravagance. We can, on the contrary, only express the hope that the Administration is not driven to false economy. Our neighbour France is a classic example of how not to economise. By reason of the small means which Parliament allows for telephone purposes, France is now faced with the question, which cannot be postponed, of renewing an altogether backward and antiquated system at double cost. In ten years they will hardly be in a position to make up for lost time. . . . As regards our trunk lines, their condition has become needful of improvement—this could not be otherwise with the rapid growth of the traffic—but the Administration have always had the necessary means to erect new lines at the right time. Therefore the figure of 1.7 million marks for new trunk lines, and the figure of 25 millions in all, is calculated to remove the fears of the telephone subscriber and of the Postal official concerned for the honour of his Department; and the Administration will not have decided on its modest demand without the fullest consideration. . . . It must always be remembered that the Postal Administration is a traffic concern, that a State Department in the interests of the State handles non-paying business, but in the extension of paying branches of its work must act as a business man, *i.e.*, it must put money into the business which will not pay for some years, but then yield good interest. Therefore the earning capital of the Postal Administration ought not to be cut down. We hope that next year's supplementary budget will again contain more liberal provisions.

HIC ET UBIQUE.

MR. F. GILL, the Company's Engineer-in-Chief, was in Portugal at Easter, when he inspected the telephone systems of Lisbon and Oporto.

A RECENT visitor at Head Office was Mr. Risuke Wakameda electrical engineer, Department of Communications, Tokyo. He is now visiting five or six of the principal provincial exchanges.

THE Liège Association of Electrical Engineers asks us to give prominence to the triennial prize of the *Fondation George Montefiore* for the best original work for the scientific advancement of the technical application of electricity. The prize is 20,000 francs, and the jury is formed of five Belgians and five foreigners. The work may be in English or French, and should be addressed to M. le Secrétaire-Archiviste de la Fondation George Montefiore, rue St. Gilles 31, Liège, before March 31, 1911.

WE have often quoted very personal paragraphs from rural American journals in which the local telephone operator played the leading part. Here is an English example from the *Derbyshire Advertiser* referring to a small Derbyshire market town:—

It is very refreshing to find here one place at least unimpaired by the incapacity, apathy, and dilatoriness which are corroding the very life of the town. This happy spot is the public telephone office where, thanks to the businesslike promptitude and determination of the clever little operator, one is placed *en rapport* with one's correspondent in a remarkably short space of time.

A GLOUCESTER correspondent sends us as a sign of the times an advertisement of a "Young Business Gentleman" who, in enquiring for a bedroom and sitting-room, wants to know whether the telephone is fixed.

THE ATTACKS ON MR. ANNS.

WE congratulate Mr. Albert Anns, the Secretary of the Company, upon the successful result of the legal proceedings in which he has recently been engaged, and all the readers of the JOURNAL who have read the report of the case will, we are sure, join in our satisfaction. For a long time Mr. Anns has been the subject of attacks upon his business reputation which must have been peculiarly objectionable to him, but so long as those charges were circulated only amongst those with whom he was in close business relationship, and who knew how groundless they were, he could afford to disregard them. When, however, a wider publicity was given to the libels Mr. Anns had no alternative but to invoke the procedure of the law, and as the result of a verdict and judgment given in the King's Bench Division, and confirmed by the Court of Appeal, he has been entirely justified and the attacks made upon him have proved to be baseless.

In the trial before Mr. Justice Grantham and a special jury, a verdict and judgment in favour of Mr. Anns were given without the necessity of calling upon him to give or produce any evidence on his own behalf, and an appeal by the defendant for a new trial was dismissed by the Court of Appeal without calling upon Mr. Anns' counsel to reply. Mr. Anns made it clear that he had no vindictive feeling in the matter by asking only for nominal damages, although he has been put to great expense and trouble in relation to these proceedings, and it is to be hoped that he will not experience any further annoyance.

NATIONAL TELEPHONE CHESS CLUB (LONDON).

THE second season of the above club has just been brought to a close, and although not much success has been met with in the matches, the club is in a much better position financially than last year.

Ten matches have been played, all in the Civil Service and Municipal Chess League, but owing to the fact that in several of the matches some of the best players were not available only one was won, some others, however, yielding very close finishes.

The secretary states that a proposal to form a draughts section is being brought up at the next general meeting, which will be held on May 9, and he will be pleased to receive any suggestions as to likely support in this direction, as early as possible.

Communications should be addressed to Mr. R. P. Lowe, 17, West India Dock Road, E.

LONDON AND ITS ORGANISATION.

ELECTRICAL.

By J. STIRLING, Metropolitan Chief Accountant, and G. F. GREENHAM, Metropolitan Electrician.

(Concluded from page 9.)

One difficulty in the Maintenance, as in all other technical Departments, is the training of men thoroughly, so that results may be efficient and economical. It never pays to have an inefficient man, but it has to be borne in mind that inefficiency may spring either from lack of capacity or lack of opportunity to learn. No up-to-date administration can afford not to make provision for the latter. The policy of the Company is to give every member of the staff as much knowledge relative to his work as possible, and in such a manner as to be readily assimilated. Attendance at Technical Classes is encouraged, and the results carefully noted by the Chief Officers.

The oversight of expenditure is less formidable now than a year or two ago. At one time each Exchange Electrician had to send in careful details of the money he wanted, and having got his grant, spent an inordinate amount of time checking every penny expended, so as to avoid "rows" at the end of the month. Now, our check is no less keen and effective, but much less cumbrous and wasteful. On general maintenance, the wages spent naturally depend on the number of staff employed. By estimating that number six months in advance, we can fix at the beginning of each half-year the amounts required, and these are notified to the Divisional Officers. If for any unforeseen reason a variation is necessary, the matter is specially dealt with. As regards materials, experience has shown that in any half-year there is a definite ratio of materials to wages; any departure from that will mean abnormal expenditure, the cause of which will be known to the local officers, and must be sanctioned. This arrangement is simple, works well, and involves a minimum of clerical work at the technical end. Statements of costs in the various Exchange Electricians' areas are sent out from the Chief Accountant's office each six months; these are divided, for comparative purposes, into groups within which the

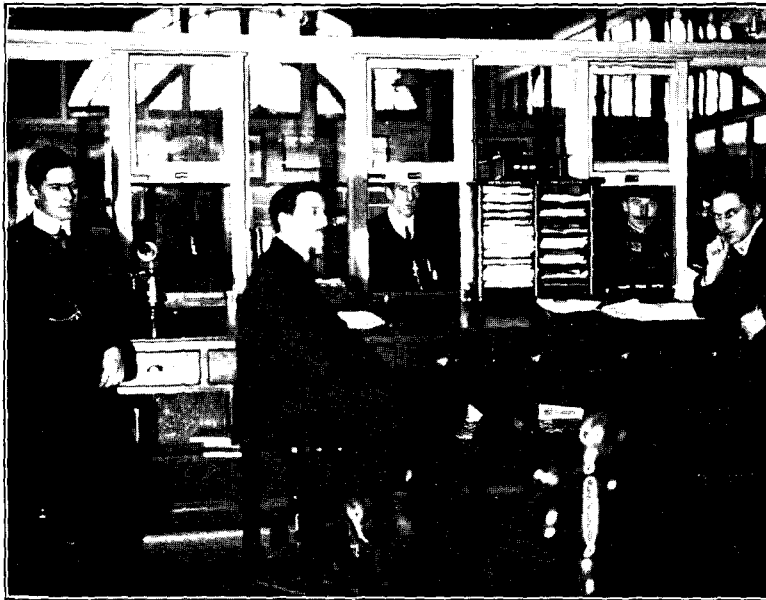


FIG. 3.—"FITTING" OFFICE, GERRARD.

type of plant, conditions of transit, etc., are similar. The healthy rivalry thus engendered is not likely to lead to economy being fostered at the expense of efficiency, as the periodic reports on the percentage of faults, time taken to clear, and inspections carried out would, apart from the active supervision exercised, soon show up the weak spots. As a matter of fact, good results and cheap results are not rare companions.

Outside faultsmen are, for obvious reasons, on the Electrician's staff; only special faults involving renewals, cable changes, overhauling, etc., being given to the Engineers. An essential for the rapid clearing of the latter class of trouble is a close and friendly relationship between the local officers; given this, the best results to both Company and subscriber are assured. In London at the present time there is happily little to be desired in this respect. A



FIG. 4.—TEST AND FAULT CLERKS' TABLES, GERRARD.

town faultsmen's lot is not always a happy one; to him city roofs are less risky than busy streets, and a giddily-perched pole as safe as the top of an omnibus; but the irate householder is not always easily appeased, nor the elements a cause of blessing when the rain descends, or the enveloping fog casts its dark mantle over housetop and street.

Although we have placed Maintenance work first, it is not from any feeling that it has prior claims over the Construction Department. Between two branches of work so bound up with and dependent upon each other there can be no possible rivalry. Emulation as to results there may be, and that is worthy of encouragement, for it is an unflinching sign of interest. That good fitting means inexpensive maintenance, and good maintenance means credit to the fitting staff for well-executed work, goes without saying.

The "Construction" organisation is on similar lines to the "Maintenance," but necessarily modified in some particulars. There are four Divisional Constructional Electricians, each having under him a Divisional Fitter, the latter officer controlling the Fitters, arranging their work, deciding questions that arise, giving advice, and generally seeing that his Works Orders are cleared with regularity and expedition. Fitting Inspectors, whose duty it is to examine and report upon all new fitting work, are also provided.

At one time a considerable amount of switchboard work was done by the Construction staff. So far as the Company's exchanges are concerned, very little is now executed, except at small places. It has been found that large switchboards and extensions to them can with advantage be entrusted to outside contractors; this policy has been adopted at all large common battery exchanges. The local staff have by no means been deprived, however, of all opportunities for showing their skill, as some of the switchboards operated on subscribers' premises are by no means small or easily fitted. One or two of the largest are:—

	Exchange Lines.	Extensions.
Army and Navy Stores	24	298
Savoy Hotel	16	233
London County Council	15	184
Whiteley's	28	137
Selfridge's	20	163
Queen Ann's Mansions	14	837

With the inevitable extension of a message rate, this class of work will certainly tend to increase. Assuredly no subscriber who has once experienced the advantages of a modern system in a large business would desire to return to the old out-of-date arrangements under which the few instruments provided were always engaged, and clients therefore took their business elsewhere. In connection with subscribers' switchboards, it is of interest to record that one firm on Holborn Exchange have a blind operator. His work is all done by means of his acute sense of touch, and the result is an excellent service.

The total *personnel* of the Construction Department is 158. They fit an average of 320 Stations per week, recover 140 and carry out other jobs, such as removals, sales, fitting extension bells, jacks, etc., to the extent of 430 per week. Power circuits for subscribers' use are constantly increasing, and on Gerrard Exchange alone the number now exceeds 500.

Works Order routine at the Fitting Offices has been gradually evolved from various methods in vogue from time to time. Slight alterations in procedure are occasionally made, but no change of any moment has been needed in the general principle since its adoption a few years ago. When a new line works order is issued by the Chief Accountant's office the blue slip is sent direct to the divisional fitter, who places it in the "Waiting for Engineers" compartment of his works order distributor. The slips are in alphabetical order, so that they can be easily extracted and transferred to the "Work to be given out" distributor immediately the pink slip signifying that the outside work is completed arrives from the engineer. All three slips of any works order on which outside work is obviously not required are sent by the Chief Accountant to the Fitting Office; these are immediately on receipt placed in the "Work to be given out" distributor. The latter has divisions for the various classes of work, and the works orders are arranged in date order so that those most recently received will be at the bottom of the group. Removals and new lines are usually treated as more urgent than other classes of work, but obviously there must now and again be exceptions both to this salutary rule and to the one prescribing that orders must be executed in regular date sequence, so that undue preference will not be given to an importunate subscriber.

A works card, on which are entered the works order number, subscriber's name and address, particulars of work, and some other essential particulars, is used for each fitter. As soon as a job is given out these details are entered, the blue slip handed to the fitter, and the pink slip with the card attached placed in the distributor under the fitter's number. As the cards become filled they are filed away, and from them particulars are forthcoming should any question afterwards arise on any fitter's work. The time sheet used for the allocation of wages is made up by the Divisional Fitter's clerk from the cards. It has horizontal headings for "New," "Ceased," "Removals," etc.; the vertical columns are used for recording the works order number and hours worked on each job. One sheet contains space for twenty names. The fitter's clerical work is thus confined to the particulars required on the back of his works order form. A bald description can only give an imperfect idea of the system. That it is complete and sure is evidenced by the rapidity with which orders can be dealt out to a large staff, and further instructions given as the men telephone from their various jobs throughout the day.

Fitters, like inspectors, meet with odd experiences, and hear all sorts of innocent observations made by people whose knowledge of the telephone is about as extensive as their acquaintance with the Mountains of the Moon. One fitter tells that, having connected an "A" to "B" line on a switchboard just moved into new premises for a firm of stockbrokers, he tried the line from the distant end to the switchboard, but no response could be obtained. On returning to the switchboard to ascertain the cause, the fitter was greeted by the builder's man with: "Was that you ringing? I thought it was you, and shouted down the hole you had been working on, but couldn't hear anything, so gave it up." He had been spending his energy shouting into the jack; another variation of the speaking-tube notion. Clearly the ideas of the man in the street on electricity and its uses are woefully vague and undefined. There is a tradition in London that a fitter was once locked in by an irate subscriber, who then telephoned to headquarters and declared that he would not release the man until the Company changed the instrument.

Enterprise and originality always appeal to one; we confess, therefore, to a sneaking sympathy with the subscriber.

An interesting point of view was that of the lady whose husband was repeating to her the instruction just given him for operating a switchboard. To his innocent observation, "This is the answering plug of the telephone," she replied, "Very objectionable if it has to be placed in everybody's ear." Mouthpieces apparently are not the only parts of our apparatus which occasion hygienic outbursts.

Another illustration of a little knowledge making a man say amusingly foolish things is the case where a new subscriber called attention to some old wiring, and on the fitter tracing it to the water pipe, remarked, "Oh! the old tenant evidently had a telephone to the water company"; a new form of *à posteriori* argument.

The installation at Buckingham Palace will doubtless be of general interest, not because of any particularly unique features, but owing to that feeling of loyalty to His Majesty which makes everything connected with his *entourage* possess a peculiar attraction for his subjects. A 60-line floorboard is installed in the Post Room; this is operated by the Company during the day. At night, by means of a special change-over switch, all connections are transferred to a duplicate board in the Equerry's room, and it is worked by the Palace officials.

Special installations to large halls and buildings where shows and exhibitions are held are not uncommon. At Olympia, the immense spaciousness of which is known to most London visitors, the Company has a permanent cable to Kensington Exchange, so that stands and call offices can be connected with great rapidity. In connection with the recent great Motor Show, which attracted visitors from all over Europe, nearly 80 telephones were installed for exhibitors, and several public Call Boxes were also available.

Although the troubles attendant upon the change-over to central battery working of the London exchanges at which that system was first adopted are fast disappearing into the limbo of forgotten things, the outlines of some of them are still green in the memories of the staff who played leading parts. We have become inured, or rather accustomed, to such changes now, and look upon them as quite ordinary events in the course of business. Things were otherwise at the beginning.

Difficult and complex as the task may well have seemed to the staff responsible for smooth working at the exchange, the real and most inscrutable problem of a change to common battery working was the subscriber. What patience and tactfulness were exercised in dealing with him and bringing him to reason! What argumentative and persuasive powers were revealed in and developed by the canvassers to whom the duty was entrusted! What sudden affection was shown for the old instrument, the shortcomings of which had been so apparent until we proposed to take it away and substitute a type as yet unknown! Now that the struggle is over, the amusing side is uppermost; at the time, the humour was not so apparent to either party in the controversy.

The principal objection to the new instrument was the loss of the hand micro-telephone, with its speaking key. Then subscribers prone to becoming impatient did not like losing their generators; it was a relief to the feelings to "grind the machine" at such times. Some did not want a fixed transmitter; others objected to the bell-box; while another section made a strong point of the instrument's non-adaptability to height. Time and experience have proved the wisdom of the change, and to-day, reading through a report from the officer in charge of the work, one wonders at the tempest of opposition which had to be encountered. One gentleman listened very quietly to the description of the new apparatus; he then called in a stenographer, stood with his back to the door, and dictated to the Company's General Manager a letter dealing very "faithfully" with "the young man who is going to take away the instruments I have had for years." Only when the letter had been signed and despatched to the post was "the young man" allowed to go.

After the conversion, the number of subscribers wanting the old instruments back was legion. It was generally found that those who had been too impatient or busy to listen to our representative's description were those who grumbled loudest. One City subscriber went so far as to offer £50 for the return of his hand micro-telephone set: whether, had the proposal been accepted, settling

day would have shown it to be genuine is doubtful. With very delightful *naïveté* the Company's officer in his general report remarks: "Where subscribers objected to the arrangement of the instruments after conversion, their objections were patiently listened to, and treated as if they were quite novel and fresh, and as if it was most unusual for a subscriber not to like the common battery instrument." Such admirable self-suppression and diplomatic silence reminds one of Alice's reply to the Mock Turtle's remark: "Perhaps you were never even introduced to a lobster"; Alice began to say, "I once tasted," but checked herself hastily and said, "No, never."

The number of central battery exchanges in London is now 21, representing 76 per cent. of the total Exchange Lines. The power supply for one year costs over £1,700, and the extensive power plant entailed in the exchange buildings has added considerably to the responsibilities of the Maintenance staff. One gratifying result of the establishment of so many new exchanges, with their spick and span modern equipment, has been a general smartening up—or, rather, toning up—of the staff to their changed surroundings. There is a much keener interest in the work, attributed, not without cause, to the pride which the men naturally feel in the handsomely fitted apparatus entrusted to their care, and their desire that neither its reputation nor theirs should be tarnished if they can prevent it. It is an admirable spirit, and should be encouraged. It also proves an old thesis of all reformers that environment has an important part to play in the results a man achieves.

Without men who can carry out faithfully, sensibly and successfully the orders given to them, no enterprise can show abiding prosperity. Organisation, system, discipline, forethought—all can do much, but officers in positions of authority know that these qualities must be supplemented by an intelligent and able staff if success is to result. It is a deserved tribute to the rank and file of both branches in the Electrical Department that their work as a whole is a credit to themselves and an appreciated asset to the Company.

ACCUMULATORS AS APPLIED TO C.B. TELEPHONY.

By J. R. MILNES, *Engineer-in-Chief's Department.*

It is not widely enough recognised that the accumulator used in C.B. telephone work has duties to perform which are very dissimilar to the work for which the majority of large batteries have been designed.

Even under the best conditions two factors arise which are, as we shall see, mutually opposed. The object of these notes is to discuss briefly the two opposing functions with a view to reconciling the antagonistic demands made on the accumulator and arriving at some idea as to the most suitable type of plate.

A central battery has two functions to perform:

- (1) To supply current to the exchange.
- (2) To act as an insurance against breakdown (*i.e.*, failure of mains, supply, etc.).

At first sight the conflicting element in these two functions is not evident. To keep a battery in good condition the majority of makers state it is necessary to keep it as far as possible in constant work, that is to charge fully and *discharge fully* at frequent intervals, with an occasional overcharge as a tonic. The makers further state that continual overcharging is as deleterious as insufficient charging, rendering the positive plates soft, and liable to buckle and disintegrate.

This is not all; unless the battery is completely discharged at periodical intervals, what is known as "internal sulphating" takes place in that portion of the active material of the plate which is out of general use, and is really the stand-by of the exchange in case of emergency. This internal sulphating would result in about a year in the *entire loss of spare capacity in the battery* if no steps were taken to prevent this. Fortunately it is possible to a great extent to combat this by fortnightly overcharges—in nearly all cases at the sacrifice of part of the life of the positive plate.

Here we find a dilemma. In a telephone exchange it is the practice always to retain sufficient capacity in the battery to enable

the exchange to be run for at least twelve hours beyond the usual time for recharging as a precaution, or insurance, against emergency or breakdown. This applies more particularly to exchanges where duplicate charging machines are provided; where only one charging machine with a spare armature is installed it is customary to provide an even greater margin of spare capacity on account of the greater risk.

Let us summarise our deductions briefly at this point. We have found:

- (a) That continual overcharging shortens the life of the battery.
- (b) That complete discharges are necessary to keep the unused or emergency capacity of plate exercised *unless these are overcharged.*
- (c) That if we do not face one or the other of the two previous deductions we lose in about one year's time that spare capacity on which the whole exchange relies in case of emergency.

If we cannot get a plate which will not suffer from internal sulphating, or failing that, which can *stand* continual overcharging to avoid internal sulphating, we have to decide whether the life of the battery or the breakdown factor of the telephone service is to suffer.

We can at once dismiss the course of discharging the battery completely at even quarterly intervals, as it is without doubt the correct policy to take every precaution against the possibility of an interruption in the telephone service.

We then have only two choices—*viz.*, either to prolong the life of the battery and lose our spare capacity by avoiding overcharging, or to overcharge regularly and decrease the life of the positive plate. Perforce accepting the latter alternative, the whole question resolves itself into a search for the best plate for telephone conditions.

Two side issues suggest themselves here which we can deal with at once. I used the words "prolong the life of battery and lose spare capacity" just now. To understand this rather anomalous statement we must bear in mind that during the normal *growth* of current consumption the internal unused position of the plate, which we will imagine has sulphated, gradually and automatically re-forms as required as the charge increases with the number of subscribers. Thus, although we have no emergency spare capacity, we have a potential material which is gradually being converted to active material for the normal growth of the exchange.

Secondly, we have not taken into account as yet the fact that a battery is designed with plates for some years ahead of actual requirements at the time of installation.

Now, assuming a normal steady growth of subscribers, and consequent increase in current consumption, the battery is at a still greater disadvantage during the first half of this period than would at first seem the case on account of the larger portion of the spare active material liable to internal sulphating. I will refer to this later.

To revert we must now see if the demand for such a type of plate as we want for telephone conditions has been met.

All commercial storage batteries embody some adaptation of the Faure principle, in which the active material is in the form of paste applied to a retaining grid, or the Plante principle, in which the plate constitutes the active material. The Faure plates have a high capacity in proportion to their weight, and are most suitable, therefore, for purposes where weight is a consideration—portable batteries for example—but they cannot be charged at high rates without damage to the active material, and, however carefully they are treated, Faure plates as positives are very deficient in durability.

Plante plates consist of either solid lead slabs grooved or worked in some manner to increase the surface area, or may be made up of lead strips joined to conducting frames. In the solid type there is want of porosity, and the two sides of the plates may therefore be subjected to unequal action, which is liable to cause buckling. In the strip type there is ample porosity, but the strips usually rot away at the junction with the frame. The main drawback to the use for telephone work of Plante plates as at present made is that the conducting frame is drawn upon to replenish the active

material, and consequently during the life of the plates the conducting area gradually decreases, thus adversely affecting the internal resistance, already high in the solid Plante plate through lack of porosity.

It will, I think, be sufficient merely to consider positive plates of the Plante-formed type similar to those now specified in C.B. exchanges. Negative plates are now made of the pasted type (and I include the "box" negative in this category), without exception by all manufacturers, and in all cases outlast the positive plates—so that the determining factor becomes the life and properties of the positive plate.

If one were to consider in detail the enormous number of plates placed on the market with their many ingenious methods of holding the active material tightly in the grid, one might spend hours; but fortunately time and experience have done this work for us, and out of the many plates that have been placed on the market two types only may be taken as having survived the test of experience in practice.

The first of these main types include all plates of the pure lead type—the makes of which vary little in mechanical structure. The second type we will consider by itself later. I think we may safely avoid any detailed account of the different mechanical forms adopted by the various makers with these two exceptions.

What really concerns us is to find a plate which will (1) suffer least from the continual overcharging necessary to prevent sulphating, and at the same time (2) be able without losing capacity from internal sulphating to dispense with ever being fully discharged.

On the first point we shall shortly find we have theoretically to dismiss all plates except the second type referred to above. On the second point we shall also find that the very feature which makes the second type plate to approximate to the ideal, so far as overcharging is concerned, also does away with the necessity for complete discharge.

Before going further, however, let us consider the effect of overcharging on the positive plate. Lead peroxide occupies a considerably greater bulk than the lead from which it is formed in the Plante type of plate or the litharge from which it is formed in a "pasted" type. This means that during initial formation, or during charging, the active material expands and presses with greater force against the containing grid. This pressure, if not overdone, has its advantages, and is utilised to obtain intimate contact between the active material and the grid during manufacture; but if this is continued beyond the safe limit, as often happens in overcharging in the first type of plate, the lead of the grid itself begins to form, the pressure increases, and something has got to give way.

What generally happens is that the grid buckles or the active material is loosened and falls out. In the latter case, in order to maintain the capacity of the battery, part of the lead constituting the grid has to be formed again after discharge to compensate for what has dropped out during the overcharge. The grid—the strength factor of the plate—is thus being gradually and imperceptibly weakened, active material is depositing rapidly at the bottom of the cell, the cross-section of lead in the grid (on which to a certain extent depends the internal resistance of the plate) is being reduced, and in due course the plate buckles badly, disintegration proceeds more rapidly, and the useful life of the plate is at an end and it has to be replaced.

To overcome this as far as possible, particularly where weight and bulk are of negligible importance, the positive plate has to be made very much heavier than would otherwise be required.

Now it is obvious from the foregoing remarks why the makers are so insistent in their depreciation of continual overcharging to compensate for internal sulphation, and to enable the plate to be at all times capable of giving the full capacity they have to, as far as policy will allow them, clamour for periodical complete discharges.

We may now consider the second type of plate for it is the one plate to which the foregoing does not apply, or rather applies least. The whole point lies in the fact that the active material is contained in a grid consisting of antimonial lead, that is to say lead to which a certain percentage of antimony has been added. This grid possesses the important property of not being attacked by the acid, is therefore incapable of being formed, and has only to suffer sooner or later,

from overcharging forcing part of the active material out of the receptacles with consequent loss of capacity. I do not mean it to be inferred that buckling will not take place under exceptional circumstances, but as the strength of the grid is (a) many times that of the same grid made of lead, (b) is not capable of being formed, and therefore does not lose strength it is obvious that for C.B. telephone conditions it is theoretically far and away ahead of the pure lead plates.

This plate differs from the pure lead plate, the active part of which generally consists of a large number of "formed" thin slats in that the antimonial lead of the grid is completely pierced with a series of circular holes bevelled on each side. Into these holes are inserted corrugated ribbons of pure lead rolled up into spirals. The corrugations are so arranged that the acid has free circulation right through the plate from side to side, an important feature. The ribbon when unformed fits tightly at the centre only. When formed the pressure due to the conversion of the lead into peroxide causes the corrugated ribbon to swell until it completely fills the bevelled holes making intimate contact with the antimonial grid.

Now this plate, I am definitely informed by the chief engineer of the manufacturers, does not require complete discharges, and will yet retain its spare capacity provided fortnightly overcharges are given to combat the tendency to internal sulphating in the unused interior portion of the plate. Our own experience confirms this, and the American Bell Telephone Company in all probability specify this type of cell only for this reason in all their exchanges.

A point has been raised in objection to the plate that the antimonial plate being more electro-positive to the active material than pure lead results in increased local action, and the formation of a thin film of sulphate between the pallet of active material and the grid. This, although I mention it for the purpose of reference, has proved to be somewhat of a bogey; the additional P.D. is so small as to appear to be negligible, and there is in telephone work no rapid increase of internal resistance, which would be the case if this local sulphating were to happen. It is of interest to note, however, that in some batteries to which I have recently had my attention drawn where there are long slow rates of discharge and trouble from sulphating, that the negative plates "gas" first when charging. Usually the reverse is the case, the positive plate "gassing" first. Now this gassing of the positive plate first is held to be due to the negative plate having become discharged first owing to local action, probably caused by portions of positive active material floating in the electrolyte and falling on the plate after charge. When the positive plate discharges first (*i.e.* "gasses" last) it is pertinent to ask the question: Is this due to the antimonial grid increasing local action?

In practice we have recently put in central batteries with pure lead positives. I believe the deposit is greater than with similar antimonial plates, but other figures are not available, owing to the short period of installation.

Comparing the antimonial with the pure lead type batteries in magneto exchanges which use moderate-sized batteries for signalling, it has been found that the life of the antimonial positive plate is on an average longer than the pure lead plate. Insufficient data and different duties render definite figures unsafe for any proper comparison, however.

I will conclude with some remarks of the manufacturers. The makers of the antimonial positive plate from their own experience state a fair average life for a chloride positive properly treated is from ten to twelve years. They advise periodical overcharges of 10 to 20 per cent. once a fortnight, and, under these circumstances, say no complete discharge is required to keep the plates thoroughly healthy and the reserve capacity unimpaired.

The makers of the pure lead positive plate are more modest, and claim an average life for a Plante positive of six years, although they say they have known plates well treated and kept "in harness" to last nine years. They also advise that the battery should never be allowed to stand discharged or partly discharged; but at the same time say little overcharging, if any, is required, whilst an occasional complete discharge is necessary, if not essential, to keep the plate in good condition under telephone conditions.

Both makers concur in their statement that the main cause of sulphating in telephone batteries is due to standing with a low discharge rate when battery is partly charged. This leads to

sulphating and consequent growth of positive active material, and the forcing of this out of the grid. The lead ribbon or slat becomes sulphated first of all behind the active material, and on this sulphate being reconverted on charge, not to lead again, but to lead peroxide, it expands one-sixth in bulk and forces the active material to swell outwards.

LONDON NOTES.

At the London Telephone Society meeting on April 4 the successful papers in the annual competition were read, and the prizes presented. The recipients and subjects were:

Mr. F. Morley Ward, "Notes on Secondary Batteries."

Mr. C. E. Street, "Experiments in connection with Dry Core Cables."

Mr. H. G. Bishop, "Capital and Revenue."

All the papers showed considerable ability.

The officers of the society for the ensuing year were appointed. Mr. Hare, Assistant General Superintendent, was unanimously elected president, with Messrs. Taylor, France and Greenham as vice-presidents. There is also a strong committee, so that great things may be expected next session.

FOLLOWING on the transfer of Lee Green Exchange to central battery working, the traffic staff there held an "at home" to give their relatives and friends an opportunity of seeing the new premises and equipment. Much interest was evinced by the visitors in all that was shown to them, and they appreciated heartily the services of the New Cross Exchange Manager and those members of the maintenance staff who assisted him in showing the guests round.

Mr. C. G. SLEIGH, who was recently transferred from the City to North as Local Engineer, was entertained by his colleagues at a farewell dinner, and presented with a case of pipes. Mr. Bascombe, City Divisional Engineer, made the presentation and conveyed to Mr. Sleigh the good wishes of the subscribers.

At the last meeting of the Western Telephone Society, Mr. Greenham, Metropolitan Electrician, read a paper on "Modern Maintenance Methods." Not only was a very full description given of existing organisation and duties of various maintenance officers, but some questions affecting future methods were suggested to the meeting. There were many interesting slides and a good discussion ensued.

THE Eastern district operators had their annual social in Limehouse Town Hall on April 8. In addition to an excellent musical programme, dancing and games occupied the evening. Various prizes were awarded to those who had shown greatest proficiency in the games. Mr. Tattersall made an excellent chairman, and did much to make the gathering a success.

THE last meeting of Telephone Society's Traffic Branch was held on April 18. The prize papers in the competition were read, and the prizes presented to the successful members. The following is the list:—

Junior Operators.—Miss L. Grammer, Paddington, "Early Impressions of the Telephone Operator."

Senior Operators.—Miss M. Clayton, London Wall, "An Explanation of the Working of an Exchange, Suitable for a Visiting Subscriber."

Supervisors and Female Clerical Staff.—Miss K. Howard, Paddington, "Local Observations."

Exchange Managers, Clerks-in-Charge, and Male Staff.—Mr. L. E. Cohen, Observation Office, "Observation, its Achievements and its Possibilities."

During the evening Mr. Deane replied to various criticisms passed on his paper at the previous meeting. To Miss Minter was extended a cordial vote of thanks for her services in the chair during the evening.

THE annual meeting of the Metropolitan members of the Staff Transfer Association took place at Salisbury House on April 1. The officers were elected and a new committee appointed for the year. The most noticeable change is the substitution of Mr. R. H. Carter for Mr. A. R. McParlane as secretary. The latter could not, unfortunately, see his way to continue in office. His successor is an able worker, and can be trusted to fill the post with credit both to himself and the association. A resolution of confidence in the central committee was unanimously adopted by the meeting. In proposing and seconding it, excellent speeches were made by Messrs. Greening and Dowlall.

OUR Brighton confrères are desirous of trying conclusions with us at cricket on a Saturday in June. Nothing definite has been settled, but, given good weather, a trip to the sea ought to be an attractive fixture in the early summer. Our cricketers would, no doubt, be ready to give a good account of themselves.

GLASGOW NOTES.

THE closing meeting of the telephone society was held in the Hillhead Exchange on the evening of Wednesday, March 23, when 95 members were present. Tea was served from 6 p.m. to 7 p.m., and thereafter Mr. Thomas Pettigrew delivered a short paper explaining the principles and advantages of the C.B. system. Officers of the Electrical and Traffic Departments then conducted groups of the members through the testroom and switchroom and explained the various pieces of apparatus. The visit of inspection aroused considerable interest and was much enjoyed.

THE following office bearers have been appointed to carry through the work of the telephone society for session 1910-11:—President, Mr. J. R. Thyne; vice-president, Mr. T. Pettigrew; secretary, Mr. J. K. Murray; treasurer, Mr. G. Dewar; librarian, Mr. A. C. Thomson. A strong committee has also been appointed representative of the various departments and of the out-centres. It was arranged that the society meet once a month for six months. Intimation was received that the splendid accommodation provided for the society at the Technical College during the past session was likely to be still further improved upon next session, a specially equipped lecture hall with adjacent committee room in the new part of the building having been placed at the disposal of scientific societies by the college authorities.

THE third meeting of the Operators' Society and Club was brought to a close on the evening of March 29, when prize essay competition papers were submitted by the members. The papers contributed by Misses Dickson and MacConnochie were awarded first and second prizes respectively, and consolation prizes were awarded to Messrs. Kelly and Petrie and to Miss Murray. Misses Dickson and MacConnochie read their papers to the meeting and were awarded a hearty vote of thanks. The sixth meeting of the "Club" took the form of a "Song tea," the winners in the competition being Misses J. Drennan, B. Reid and I. Brunton. In addition to this a sketch, a musical programme and dancing contributed to what proved a very pleasant evening.

THE Whist Club brought the season to a close with a whist drive, held on Friday, April 1, when a most enjoyable evening was spent. Miss Jamieson, Fees Clerk, and Mr. B. D. Heberton, Rental Register Department, were the prize winners. The manner in which the season's arrangements have been carried out reflects great credit on Mr. A. C. Thomson, the energetic secretary.

THE annual business meeting of the National Telephone Bowling Club was held in the engineers' office on the evening of April 6, when the office bearers were appointed for the ensuing season.

THE Golf Club's March Medal Competition resulted in a victory for Mr. H. Thomson. As he had already qualified, however, Mr. J. P. Hamilton was returned the winner. The spring meeting of the club has been fixed for April 23 when play will take place under medal conditions for three prizes. Negotiations for a golf match between the East and West of Scotland districts are being entered into. As yet nothing has been definitely arranged but the match will probably take place in June or July, and Hamilton has been proposed as the place of meeting.

WITH the advent of spring the members of the Office Swimming Club have resumed practice. The small pond in the Woodside Baths has been reserved, and, judging from the enthusiasm displayed at the first meeting, the season promises to be a successful one.

ARRANGEMENTS have been made to hold the annual picnic on Victoria Day, Thursday, May 19, and Callander will be the venue. The committee are to be congratulated on their choice of destination which is the centre of the most beautiful mountain and lake scenery in Scotland. Granted good weather, the excursion should be one of the most enjoyable ever held.

AMONG their multifarious duties, telephone men are not infrequently called upon to act as self-constituted officers of the Criminal Investigation Department, and an interesting case of this type occurred last month. A factor's clerk, engaged in the collection of rents, had his suspicions aroused by the actions of a man on the roof of a building in Summerfield Street, and as this man was using a Company's ladder the clerk communicated by telephone with our Bridgeton testroom. Faultsmen Macfee and Kelly took the matter in hand, and on arrival found that the suspect had left the ladder in a grocer's shop, with the intimation that he would call again in an hour. When he put in an appearance, however, he was grieved to find his return awaited with more than the usual interest, and immediately bolted. Our two heroes gave chase, and after doing 1,760 yards in their best style they succeeded in running their quarry to earth. At the police court on the following day the charge of stealing lead from the roof of the building was found "Not proven," but the prisoner was sentenced to 30 days for the theft of the ladder, which had been officially reported to the police a fortnight previously. The two principals now rejoice in the sobriquets of "Derek Clyde" and "Sexton Blake" respectively, and we congratulate them on their prowess.

WE regret to record the death of two members of the Glasgow staff during the past month. Stores Labourer Harry Brown, who had seven and a half years' service, died on March 10 as the result of heart trouble; he was quiet and obliging in manner, and in him we have lost a faithful and diligent worker. The Company has generously made a payment of £50 to Mrs. Brown. Contract Officer Miller died on March 20. He was transferred from the Post Office when the Company undertook the canvassing for both administrations over the whole area on March 1, but had not been well for some time. The sympathy of the staff is with those who now mourn their loss.

IT may interest our readers to know that the obituary notice relating to Fisher, Night Operator, at Kemp Town, Brighton, which appeared in last month's issue, has resulted in the receipt of a very kind letter from a lady in Belfast offering to do her best to obtain admission into a home for the children. Arrangements are, however, nearly complete for admitting the two youngest into Dr. Barnardo's Home, and it is hoped that it will not be necessary to accept the lady's kind offer. Thanks, however, are due to her for so promptly tendering her assistance.

CORRESPONDENCE.

EARTHING OF TELEPHONE BATTERIES.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL

WITH reference to Mr. Garner's letter re the earthing of the positive pole of main batteries, it has been found that when the positive is sent out to line the latter has a greater tendency to break down in insulation, and the conductor to corrode and waste away.

In fact, the action of the electrolytic cell is reproduced to some extent, i.e., the line being positive represents the anode or wasting pole, the moist atmosphere the electrolyte, and the earth or common return being the cathode.

By joining negative to line the opposite effect takes place, i.e., the wasting is confined to the common or earth connection, where it is not of much consequence.

I once came across a telephone exchange where the negative was earthed, and, being an automatic call system having the lines normally alive with 24 volts, the effect was disastrous.

Lines wasted away to needle points at the D.P. connections, and the subscriber's bell coils were continually becoming disconnected.

After reversing the polarity, all this trouble disappeared.

With regard to railway systems, Mr. Garner will thus see that the opposite of telephone practice is preferable (i.e., making the line or supply rail positive), as it is more economical to renew and maintain than the running rails or permanent way.

Mr. Garner may have noticed that the supply rail is nearly always corroded and rusted, whereas the running rails remain quite bright.

Liverpool, April 4.

J. G. WHITTLE.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

REGARDING the letter from Mr. Garner in the April number of the JOURNAL. Perhaps the following paragraphs taken from page 257 of *Telegraphy* (Preece & Sivewright) may be of use.

"If an underground wire becomes earthy, owing to the insulating covering being partly removed, and the conductor being thus laid bare, it should be worked from the copper current from the battery. When the copper pole of the battery is joined to the wires, a salt of the metal forming the conductor is formed by the current at the point of leakage, and this being a non-conductor, the insulation of the wires is improved. This, however, can only be done for a time, for the metal is gradually transformed into its salt, and communication is eventually broken down entirely.

"The action of the zinc current is the reverse of this: by depositing metallic copper its effect is to clean the wire, and thus to increase the leakage. For this reason the zinc currents should invariably be used in testing covered wires, for leakages will be brought to light by it which, with the copper current, would in all likelihood escape notice."

Nelson, April 13.

TOM HARGREAVES, Inspector.

Re CAPITAL AND REVENUE.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

WITH reference to Mr. E. Parkinson's letter in the March issue of the JOURNAL, headed "Capital and Revenue," without the context it is impossible to know the exact sense in which the authorities he quotes contend that labour is or is not "capital," and, very likely, in no case would there be any analogy with the Company's views or methods on the subject of the allocation of expenditure. Perhaps, however, the following illustration may assist Mr. Parkinson to form an opinion. Supposing he, being possessed of £2,000 (his capital), proposes to convert his cash into a house and to receive rent instead of dividends, clearly the value of the house when built still represents his capital, and the value of the house can only be arrived at by the cost of building it, and the cost of building it necessarily includes labour as well as material.

London, April 5.

"EQUITABLE."

DEVELOPMENT STUDY.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

MR. E. L. PRESTON, in the Correspondence columns of the April number of the JOURNAL, invites suggestions for improvements or additions of value to the system which he describes for recording the number of working circuits at distributing poles in Bristol. The subject is an important one, and it would be interesting and no doubt serviceable to have the views and experiences of engineers and others concerned with such records.

It is difficult to criticise such a system as Mr. Preston describes without a knowledge of the circumstances and organisation under which it works, and I venture to think Mr. Preston has lost sight of this fact and also that Mr. Taylor, obviously with intent, does not deal fully with the engineers' side of the question when he condemns the London contract card from an engineer's point of view. Quite contrary to Mr. Preston's statement that to his mind the London card does not meet requirements from a contract manager's point of view, Mr. Taylor on enquiry informs me most emphatically that the card fulfils all his requirements.

It is stated that the Bristol card has proved indispensable, and that the system has not been found wanting. Six separate entries for every alteration to the number of working circuits on a D.P. and a similar number in some cases where no such alteration occurs seem particularly useless and costly, and, to refer to Mr. Taylor's misquotation of Sam Weller, seem also to savour of "the taste and fancy of the doer." Items Nos. 1 and 2 mentioned in the fifth paragraph of Mr. Preston's letter are quite unnecessary, but item 3 is obviously indispensable. The information given on the Bristol card, with the single exception of that provided for in the last column, seems quite valueless, both from a contract and an engineering standpoint. From an economical point of view the system appears to be decidedly wanting.

When something more is required than the development record already provided for on testroom record card No. 2 (Schedule No. 1,340), which the Bristol system seems to ignore, the card here reproduced may be recommended.

The card provides for monthly entries of the number of working circuits for a period of four years. The necessary monthly or other periodic revision may be conveniently made by reference to the testroom record cards. At the

Exchange				
D.P. No.		D.P. Address		
No. of Pairs in Cable				
No. of Pairs connected to Cord				
No. of Pairs faulty				
Remarks				
Entries to be made as at the 1 st of each Month				
No. of Working Circuits				
Month	1908	1909	1910	1911
1				
2				
3				
4				
5				

top are given details of the D.P. with columns for alteration, if the capacity of the cable is affected, and an ample space for remarks. The back of the card might be squared for a graphical representation of the development, or decrease in available spares if desirable. The number of available circuits, the figure required by the Contract Department, may be obtained by subtracting the total working circuits from the number of pairs connected to exchange, due allowance being of course made for faulty circuits and circuits which must be reserved for service and other purposes, particulars of which should be entered in the remarks columns.

Salisbury House, April 15.

F. G. C. BALDWIN.

STANDARD EXPRESSIONS.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

MISS VAN RIEL's letter in the April issue on the above subject raises some interesting points. In the main I quite agree with the writer, but take exception to some of the suggested alterations.

"Sorry called you in error," and suggested expression "I am sorry it is a mistake." The first mentioned is a standard expression, as in "T.2," but is not "Mistake, I am sorry you have been troubled" more suitable?

"Sorry, I don't know: there is no one on your line now." Miss Van Riel seems to think that it is not always applicable. It has been found that in the majority of cases this expression has proved satisfactory. As to the suggested expression, "I will enquire": if the operator says this and makes the necessary enquiries among the other operators it considerably delays the work and burdens the operators unnecessarily; for it is seldom that an operator remembers, especially at a sub-exchange worked by order wire, where this expression is mostly in use. It is therefore almost impossible to find out.

"If I want you I will ring again." This sounds somewhat flippant, and almost implies that the operator knows that she has been ringing them unnecessarily. The writer appears to think it unnecessary to tell a subscriber that there is no one on his line, for if there were he would speak to them. I disagree and would instance the following example:—"Trunk" makes a call to a sub-exchange, where trunks are received on a ringing junction, and keeps the called number waiting five or ten minutes, which is a common occurrence. The called subscriber will then ring and the operator on answering is challenged with "Are you wanting me, Central?" She then replies "Yes, trunk are wanting you."

The writer also states that the reply is not always suitable and gives this example: "A subscriber rings up, and says: "Well! what do you want?" It is absurd to reply "I am sorry, I don't know, there is no one on your line now." An operator seldom realises that the subscriber is making the remarks to her, and she will invariably answer the call with "Number please," which is often met with the reply, "Is anybody wanting me, for you have just been ringing?"

The expression "Have you got them?" certainly requires modifying, would not "Have they answered?" meet the case better. "Have they replied?" is

somewhat difficult to say, and "Have you had them?" implies "Have you finished?"

There is another expression in "T.2" which might be commented upon, "What exchange, please?" (when a subscriber omits to give in the name of the exchange when asking for a number) this is not so suitable as "Which exchange, please?" "What" can be pronounced in a variety of ways, some of which are of a very bad form and undesirable for a telephone expression, but for "which" there is only one pronunciation. But apart from this "which" is the better word for a telephone expression. I should like some further comments on the suggestions made.

A few suggestions on the repeating of numbers:

As we are all aware, numbers repeated over the telephone are separated, with few exceptions, into units. These exceptions are the even hundreds and thousands and numbers in which the same figures occur twice or more in succession. This practice has no doubt in many instances resulted in the elimination of errors. It is nevertheless doubtful how the even hundreds after 900 should be repeated; for instance, 1900 is an even hundred. Should it be repeated "One, nine hundred?" Would not "One, nine, double oh" be more clearly understood? for unless an operator is very distinct in repeating the "one" the subscriber hears "nine hundred" only which causes him to repeat the number again and in some cases to ring, thinking the operator is connecting him to nine hundred instead of one, nine hundred.

Sheffield, April 18.

"TRAFFIC."

NEWS OF THE STAFF.

Mr. A. R. LAMB has been appointed District Manager to the new West of Scotland district (combining the old Greenock and Dumbarton districts) with headquarters at Greenock.

Mr. W. MITCHELSON, District Manager at Dumbarton, has been appointed Contract Manager for the combined district.

Mr. E. E. STOCKENS, District Manager, Aberdeen, was presented by the staff with a silver tea and coffee service to signalise the completion of 25 years' service. The presentation was made by the Contract Manager (Mr. T. Mackenzie). Mr. Archibald Clow presided at the gathering, and Mr. Douglas Watson paid tribute to Mr. Stockens' work in the district.

Mr. W. A. TAYLOR, Local Office Clerk, Cheltenham, was, on his transfer to Bristol district office, presented by the Gloucester and Cheltenham staffs with a leather trunk and a Gladstone bag. On March 18 a farewell whist drive and social gathering were held at Cheltenham.

Mr. D'AUTHREAU, Local Engineer, North, was presented with a *tantalus* as a token of esteem by the staff of the North-West district on his being transferred to a similar position at London Wall. The presentation was made by Mr. J. A. Hunt, Divisional Engineer, and took place at the North Local Office.

Mr. LEONARD PRICE, Engineer, Leicester, has been transferred to the Engineer-in-Chief's staff.

Mr. T. ELLIOT, Chief Clerk Galashiels, Border district, has been made the recipient of a handsome gold watch and albert from friends and members of the Gala Rugby Football Club in recognition of his valuable services on the football field. Mr. Elliot has played more than once for Scotland—the summit of a footballer's ambition.

Miss MARY LOYN, Operator, Cardiff, has been promoted to fill the additional position of Supervisor authorised on the opening of the new exchange.

Miss GRACE PATERSON, Operator, Argyle Exchange, Glasgow, left for Canada on March 24 and was presented with a gold bangle by the Argyle staff.

Miss MARY BRACKENRIDGE on being transferred from Crosshill to Argyle Exchange, Glasgow, was presented by the Crosshill operators with an ebony-backed hair brush and comb bearing her initials in silver.

Instrument Fitter DUNCAN PROUDFOOT was transferred to Scarborough from Glasgow and presented by his friends with a kit bag and a case of brushes in token of their esteem.

Switchboard Fitter THOMAS CANNING left for South Africa on April 14 and Test Clerk WILLIAM MAXEY left for Canada on April 28. Both these members of the Glasgow staff carry with them the best of good wishes for their future success.

Cable Jointer A. BUTLER, of York, has left the Company's service and is going out to America. He was presented with a kit bag by the York staff on his departure.

Mr. D. PILKINGTON, Sub-Engineer, Dundee, has been transferred to Ayr as Inspector-in-Charge.

Mr. W. H. NEWCOMBE, District Office Clerk, Exeter, was transferred to Neath on April 4. Before his departure Mr. Reid, the District Manager, on behalf of the Exeter staff, presented him with a fountain pen and shaving set with razors.

Mr. A. CARWITHEN, Learner, Plymouth, resigned on March 31 to go to Canada. Before leaving he was presented with a Gladstone bag by the staff with their best wishes for his future.

Mr. H. MASON, of the Portsmouth district office staff, was presented with a cabin trunk, on March 19, on the occasion of his leaving the Company's service to take up a position at Las Palmas. He was liked by all who knew him, and was a zealous worker, taking great interest in his duties. He carried with him all good wishes for his future welfare. Mr. S. J. Smith, District Manager, made the presentation.

Mr. H. C. HAMILTON, of the Portsmouth district office, was on April 8 presented with a travelling bag and pipe, on the occasion of his transfer to the General Superintendent's staff, as a token of appreciation by the staff. The presentation was made by Mr. F. E. Collins, Chief Clerk.

Mr. DONALD REID, Inspector, Banff, has been appointed to Buckie, vice Mr. W. C. Stuart, resigned.

Mr. JONAH ROGERS, Learner, Elgin, has been appointed Inspector at Banff, vice Inspector Reid transferred to Buckie.

Mr. ROBERT GAULD, Aberdeen (Apprentice), has been transferred as Inspector at Plymouth. Before leaving Aberdeen Mr. Gauld was presented with a travelling bag and set of razors by the Aberdeen staff.

Mr. PERCY G. DREW, Night Operator, Chatham, has been transferred to the position of Inspector.

Mr. ALBERT ERNEST RYLAND, has been appointed Exchange Manager, Cardiff, in succession to Mr. W. J. Marsh recently promoted to Traffic Manager for the Cardiff district. He joined the Company's service at Cheltenham as an apprentice in September, 1899, was transferred to Stroud as Inspector, and was finally transferred to Cardiff as Exchange Manager-in-training in April, 1909.

Mr. ADAM WATT, recently transferred from Edinburgh to Belfast, was entertained at a smoker on March 25 by the Edinburgh staff. During the evening Mr. John Robertson, Electrician, presented him on their behalf with a marble clock.

Mr. ALEXANDER F. DUNN, Cost Clerk at Edinburgh, has been presented with a set of Scott's novels and a Waterman fountain pen by the Edinburgh Telephone Thrift Club, of which he is treasurer. Miss A. St. Clair Johnson made the presentation.

Mr. STEPHEN R. MCKENNA, Foreman Jointer at Edinburgh, has been transferred to be Instrument Inspector at Belfast. The staff at Edinburgh presented him with a gold watch. The Engineer made the presentation.

Miss AGNES M. LOUDEN, lately Operator at Edinburgh Central, has been presented with a silver-backed brush and comb and a vanity bag.

Metropolitan Staff Changes.

The following promotions and transfers have been made:—

Mr. F. BURROUGHS, Divisional Fitter, North-East, to be Fitting Inspector, City.

Mr. D. MALTBY, Fault Clerk, Croydon, to be Instrument Inspector, Bromley.

Mr. S. HARVEY, Inspector, West, to be Fault Clerk, Croydon.

Mr. A. W. BRISTOW, Chief Clerk, Divisional Engineer's Office, West, to similar position South.

Mr. A. AMBROSE, Chief Clerk, Divisional Engineer's Office, South-East, to similar position West.

Mr. L. J. COOPER, Chief Clerk, Divisional Engineer's Office, South, to similar position South-East.

Mr. J. C. CREE, Clerk, Divisional Engineer's Office, North-West, to be Local Engineer's Clerk, Streatham.

Mr. P. H. POOLEY, Local Engineer's Clerk, Streatham, to be Local Engineer's Clerk, Lee Green.

Mr. W. HOOD, Local Engineer's Clerk, Lee Green, to be Local Engineer's Clerk, Redhill.

Mr. W. HALL, Local Engineer's Clerk, Redhill, to be Clerk, Statistical Office, Salisbury House.

Mr. J. B. SCOTT, Clerk, Statistical Office, Salisbury House, to be Clerk, Divisional Engineer's Office, North-West.

Mr. E. WELCH, Assistant Storekeeper, Gerrard, to be Storekeeper, East Ham.

Mr. A. S. R. MACFARLANE, Divisional Construction Electrician, North-East, to be Local Engineer, Walthamstow.

Mr. E. A. GILBERT, Divisional Construction Electrician's Clerk, Gerrard, to be Divisional Engineer's Clerk, South-East.

Mr. C. F. BENNETT, Inspector, London Wall, to be Test Clerk, Gerrard.

Mr. T. MITCHELL, Inspector, Avenue, to be Assistant Engineer, Streatham.

Mr. G. H. COLE, Divisional Maintenance Electrician's Clerk, South-East, to be Clerk in Metropolitan Electrician's Office.

Mr. F. C. MUIR, Clerk in Metropolitan Electrician's Office, to be Divisional Maintenance Electrician's Clerk, South-East.

Mr. H. R. PAYNE, Call Office Collector, Cashier's Department, to be Contract Officer, North-East.

Mr. N. J. FRENCH, Clerk in Statistical Office, to be Clerk in Construction Department, Gerrard.

Mr. E. GRAY, Clerk, Divisional Engineer's Office, Gerrard, transferred to Paddington.

London Traffic Department.

Miss CAROLINE WEST, Senior Supervisor-in-Charge, Walthamstow, transferred to a similar position at Ilford.

Miss ELVIRA COWLEY, Supervisor, Avenue, promoted to be Supervisor-in-Charge, Walthamstow.

Miss MABEL SHEARING, Operator, East, promoted to be Supervisor, Avenue.

Miss MAUDE CLAYTON, Operator, London Wall; Miss FLORENCE WRIGHT, Operator, Paddington; Miss VERA RIX, Operator, Westminster; and Miss AGNES HASELTON, Operator, Kensington, promoted to be Supervisors at Gerrard Exchange.

Miss JEAN MITCHELL, Supervisor, Holborn; Miss THERESA CASEY, Supervisor, Avenue; Miss FLORENCE DINGLE, Supervisor, Kensington; and Miss ETHEL BRAND, Supervisor, Bank, transferred to similar positions at London Wall.

Miss CHARLOTTE JEFFERIES, Operator, Gerrard, promoted to be Supervisor, Avenue.

Miss EVA MELDRUM, Operator, Avenue, promoted to be Supervisor, Bank.

Miss BERTHA BROTHERWOOD, Operator, East, promoted to be Supervisor, Holborn.

Miss JESSIE MOORE, on her transfer from Bank to be Senior Supervisor-in-Charge at Stratford, was presented with a "week-end" bag as a token of esteem from her colleagues.

MARRIAGES.

Miss MAUD B. GLADMAN, who had been in the Company's service in Brighton for fourteen years, and latterly had been Clerk-in-Charge of the Kemp Town Exchange, was married at St. Luke's, Brighton, on Easter Day. A number of the staff were present at the ceremony, including Miss Trott (Clerk-in-Charge, Brighton Exchange), and Messrs. L. Parsons (Chief Clerk and Churchwarden), J. H. Watkins (of the Engineer-in-Chief's Department), and H. Hine; a goodly number of operators from the various exchanges also being present. The presents were numerous and included a dinner service and Chippendale flower stand from the Brighton staff.

Miss CHARLOTTE PALMER, Operator, Cardiff, left the Company's service on March 24 in view of her approaching marriage. The operating staff presented her with an electro-plated dinner cruet as a mark of respect, and with best wishes for her future welfare.

Mr. A. SKEVINGTON, Faultsman, Watford, who was married to Miss D. LEWIS, Operator at the Rickmansworth Exchange, on April 9, was presented with a marble clock.

Mr. CYRIL BUFTON, who was in the Company's service at Folkestone for about two years, and left to take up similar employment in Winnipeg, Canada, was married there on March 21. Those of the staff who were acquainted with Mr. Bufton extend him their good wishes for his happiness.

Mr. A. V. HIGGINSON, Cabinet Maker, was presented by the Cabinet Department, Nottingham Factory, with a handsome set of fish carvers and a dinner service on the occasion of his marriage at Easter.

Mr. W. BENNETT, Nottingham Factory, was the recipient of a handsome curb from members of the Cabinet Department on the occasion of his wedding.

OBITUARY.

We regret to record the death of Mr. THOMAS WOODHOUSE, Assistant Engineer, Blackburn, which took place on Tuesday, April 12. His end was painfully sudden as he worked as usual on Saturday, April 9. On the evening of the same day, however, he became very ill, and as the symptoms were serious he was removed to the East Lancashire Infirmary, Blackburn, on Monday, but died on Tuesday, after an operation. The funeral took place on Saturday, April 16, and, despite most deplorable weather conditions, rain falling in torrents, all the time, was attended by nearly 50 members of the staff, amongst whom were the Engineer, Chief Electrician, Contract Manager, and Chief Clerk. The outside and inside staffs each sent wreaths, while one was also sent by the Burnley staff. Mr. Woodhouse entered the service in 1883 as firepot boy and won his way to Assistant Engineer by sheer merit. He was a quiet, unassuming man, and was much respected by all the staff, who keenly feel his loss.

We regret also to record the death at the early age of 27 years of Miss KATHLEEN KELLY, which occurred on March 13. She entered the service on March 13, 1906, as the Electrician's Typist, Manchester, but owing to ill-health she was unable to follow her employment from April, 1909. As a token of esteem a floral tribute was subscribed for and sent by the members of the various staffs.

On March 4 died of double pneumonia Mr. EDWARD CHARLES WATTS, of the Stationery Department, Head Office, which he entered in October, 1901. He had been absent from the office since Jan. 8, and died in the Lady Margaret Hospital, Bromley, on the day stated. His colleagues expressed their regard by a wreath.

LOCAL TELEPHONE SOCIETIES.

Birmingham—The last meeting of the present session was held on April 5, when a paper was read by Mr. R. Dolman of the Electrician's Department, entitled "C.B. Working, Subscribers' Equipment, Modified and Otherwise." A large number of slides were shown and a good discussion followed.

Blackburn—The last meeting of the session was held on April 8, when the following six ten-minutes' competitive papers were read by junior members of the Blackburn district staff:—Airey, T., Inspector Blackburn, "Maintenance in Relation to Traffic." H. Jinks, C.O. Attendant, Burnley, "Method of Recording Faults." G. E. Mitchell, Inspector, "Operating." F. Parkinson, Firepot-Boy, Blackburn, "Duties of a Firepot-Boy." E. A. Riley, Clerk, Blackburn, "Primary and Secondary Cells." J. H. Taylor, Inspector, Burnley, "Education of the Subscriber." Three prizes were offered and as a result of the voting of members as to which were the best and most useful papers, the first prize was won by F. Parkinson, H. Jinks winning the second and T. Airey the third. It was unanimously agreed that the subjects selected by these younger members of the society were of high class and intelligently treated. Mr. R. Shepherd, past president of the society, who very generously provided the prize money, was present and opened the proceedings with a few very appropriate and encouraging remarks.

Bolton—On March 17, Mr. W. Boccock, Inspector, Bolton, read a paper intended for competition, entitled "Power Plant, Notes on Economy in Installation and Maintenance." The design of power leads and use of retardation coils in prevention of overheating were some of the points raised and discussed.

Brighton—A meeting was held on March 31, when an extremely interesting paper on "Detail—its Use and Abuse" was read by Mr. D. Wallace (Contract Manager). Besides being most useful in its suggestions, the paper was also a notable literary production and provoked a lengthy discussion after delivery. Mr. C. F. Moorhouse (District Manager) presided over a large attendance.

At a meeting held on April 11, a highly interesting lecture on "Maintenance" was given by Mr. H. Hatton (Chief Inspector). Practically all branches of maintenance were touched upon, and the lecture was illustrated by diagrams. There was a good attendance, and the chair was taken by Mr. F. W. Roberts, Local Manager. After the lecture, a protracted discussion on the various points raised took place.

Cheltenham—The ninth and last meeting of the session was held on March 30, the president (Mr. C. Elliott) being in the chair. Mr. R. A. Dalzell, Provincial Superintendent, was present together with fifteen members and two

guests. Miss F. H. Davenport gave a very interesting and instructive paper dealing with "Operating Expressions," and "Traffic," illustrated by a number of original curves.

Cork—A meeting was held on March 10 when Mr. J. Roy, Chief Inspector, read a most interesting and instructive paper entitled "Construction and Maintenance of Battery Calling System," and illustrated it by diagrams. The subject was very ably dealt with. A discussion followed and was taken part in by the District Manager (Mr. Kidd), Mr. A. Lynn, president, and Mr. H. Hayes.

Another interesting paper, entitled "Ticket Recording," was read by Miss Fitzpatrick, Travelling Supervisor, on March 31, Mr. Lynn in the chair. The speaker showed a thorough knowledge of the subject, and after a friendly discussion, taken part in by the manager, the chairman, and Miss Gallagher, the proceedings came to a close.

Dublin—On March 16 a paper on "Routine Testing" was read by Mr. G. Kirkwood, Exchange Inspector. The subject was most ably treated, the methods of making the various tests being discussed. A general discussion followed.

Mr. G. Sutcliffe, Sub-Engineer, gave a very interesting paper, entitled "Transmission," at the eighth meeting of the session held on April 6. The various transmission formulae were lucidly explained and evoked considerable discussion.

Dundee—The April meeting was held on April 12, Mr. W. Brown presided. A paper lent by Mr. J. Forrester, Glasgow, "Transmission of Power," was read.

East Kent—This society's sixth meeting for the session was held in the district offices, Dover, on March 22, when two papers were read—(1) by Mr. H. J. Corke (Local Manager, Folkestone), on "Some Operating Points"; (2) by Mr. J. Allen (Foreman, Folkestone), on "Overhead and Underground Construction." There was a good attendance of members, and discussion was freely indulged in.

Exeter—The final meeting of the session was held on March 23, Mr. H. Reid, District Manager in the chair. A paper was read by the president of the society, Mr. R. A. Dalzell on "Traffic and the Value of the Telephone Call as varied by the Degree of Efficiency of each Individual Member of the District Staff." There was a good attendance; the paper was most instructive, and an animated discussion followed.

Torquay—The last meeting of the session was held on April 4, when Mr. G. F. Brough read a paper, "Among the Wires at Home and Abroad." The different methods of carrying out work in America, Canada and Great Britain were described. A description also was given of the erection of a 600-mile telegraph line from Oakland to Oregon, U.S.A. A good discussion followed.

Gloucester—The seventh and final meeting of the session was held on April 7. The chair was occupied by Mr. C. Elliott, District Manager. A very excellent and most interesting paper was given by Mr. A. Berry, Inspector-in-Charge, Lydney, entitled "Methods of and Material Used in Construction," illustrated by lantern slides, manipulated by H. G. Henderson (electrical staff). A profitable discussion was indulged in by Messrs. A. D. Pike (Local Manager, Cheltenham), F. W. Sceats, J. L. de Medewe and G. A. Greenland. This being the final meeting of the session, a vote of thanks was recorded to Mr. C. Elliott, District Manager, for the kind interest he has taken in the society, and valuable information afforded at each of the meetings for the welfare of the members of the staff.

Hull—The sixth meeting of the East Yorkshire Telephone Society was held on March 31, when papers were read by Mr. T. P. Steel, "Reproduction of Sound," and Mr. A. C. Mayman, "Storage Batteries," who secured the first and second prizes respectively in the local competition recently held. The papers were much appreciated by the members of the society.

Leeds—Four papers occupied the attention of the meeting held on March 30. "Progress of Telephony," by Mr. P. S. Neiman; "Traffic Improvement from a Cost Point of View," by Mr. F. S. McGraw; "Notes on Building Materials," by Mr. W. E. Walker; "Training of a Telephone Man," by Mr. H. Mortimer.

Leicester—The last meeting of the session, held on April 15, was taken up by Mr. John Ashton, who read an interesting and highly instructive paper on "Simple Methods of Gaining Knowledge," which was much appreciated by the members present, of whom 47 per cent. attended. The president (Mr. M. Marsden) occupied the chair.

Liverpool and Birkenhead Operators—The fourth meeting was held on March 8. Miss E. M. Jones was in the chair. Papers were read by Miss Melville, of the Central Exchange, and Miss Hufton, Anfield Exchange, the subject chosen being "Automatic Boxes." Following these Miss Dreaper and Miss Burns each gave a paper on "Private Branch Exchanges," and being themselves private branch exchange operators, the points raised were interesting and brought forth a good discussion. The discussion with regard to automatic box working was also well maintained. During the latter portion of the evening several musical items were rendered.

The fifth and final meeting was held on April 12, Miss E. M. Jones presiding. The evening was set apart for the competition papers to be read. Prizes were offered for the two best papers, which it was required should be sent in under *noms de plume*. The prize winners were Miss F. Kerridge, Bank Exchange, the subject of whose paper was "Supervision," and Miss Annie Walker, Central Exchange, who selected "Some Causes for Slow Allotment" for her paper. A short musical programme terminated the proceedings, which were thoroughly enjoyed by all present.

Luton—At the meeting held on April 11 Mr. R. B. Lester gave a paper on "Magnets in Telephony," An interesting discussion followed.

Manchester—At a general meeting on March 18 the following were elected as officers for the session 1910-11:—Past presidents: R. H. Claxton, A. Magnall, G. S. Wallace; hon. presidents, R. Shepherd, F. W. Taylor; president, W. Cleary; vice-president, G. F. Staite; hon. secretary, E. Sawyer; hon. treasurer, J. Hayward.

Newcastle—The seventh and last meeting was held on April 5, Mr. J.

Gwyther, president, being in the chair. The annual general meeting was the first business, and following the minutes of last meeting, secretary and treasurer's reports were read, the election of officers were dealt with, and the officers for next session are as follows:—Hon. president, A. L. E. Drummund; president, J. P. Urwin; vice-presidents, R. W. Jackson, E. T. Payne, J. Gwyther; hon. secretary and treasurer, F. W. Gaskins. The first paper was given by Mr. F. W. Gaskins on "Telephone Engineering." Considerable interest was taken in the samples of apparatus which were passed round after being described. Amongst the apparatus of particular interest was a piece of D.C. cable which is believed to be the first laid in England, and also a piece of 8-wire 40-lb. conductor G.P. cable laid in C.I. split pipe by Post Office for telegraph switching system in Newcastle before telephones were in use. A second paper was to have been given by Mr. J. Gwyther but time did not permit.

Nottingham.—The seventh meeting was held on March 18. The subject of the paper read by Mr. A. C. Morris, Electrician and Traffic Manager, was "Traffic," which was illustrated by various slides showing magneto and C.B. switchboards and curves of junction and local traffic statistics. The paper produced a discussion in which thirteen members took part.

On April 11, Mr. P. R. Cockrem, Cost Clerk, read his paper on "Telephone Administration: How it is Organised." A number of slides were shown which illustrated among other things the staffs of each department in the district, staff diagram, diagram showing routine of measured rate works order in operation, and so forth.

A discussion took place at the close of the paper, during which nine members and visitors took part.

Nottingham Factory.—The last meeting of the session was held on April 11, when Mr. J. W. Hambleton of the Engineer-in-Chief's Department, Nottingham Factory, gave a paper on "The Solid Back Transmitter and the Transmission Testing of Telephone Apparatus," illustrated by slides and demonstrated by the actual working apparatus. Discussion followed, in which the necessity for the elimination of the human element in testing was recognised, and the design of the apparatus subjected to criticism.

Northampton.—A meeting was held in the inspector's room at the Northampton Exchange on April 5, with Mr. W. Dickinson in the chair. The following papers were given and a discussion of a general character followed each paper. "Operating," by Miss H. Crombie; "Faults," by Mr. C. Robinson.

North-East (London).—The monthly meeting of this society was held on March 31 in engineer's general office, Dalston Exchange, Kingsland Green, N.E. Mr. D. Morley-Ward (the president) was in the chair. A paper entitled "Outside Work" read by Mr. M. B. Stephens, Assistant Engineer, Dalston, was very interesting to the members who were present and was followed by a keen discussion.

Oldham.—A very interesting paper was given by Mr. Croasdale, of the Ashton-under-Lyne staff, on Feb. 24 last. Mr. Croasdale took for his subject "Leaves from an Inspector's Notebook," and the various matters dealt with were of much interest to the staff present.

Paisley.—The seventh and concluding meeting of the session was held in Hutton's Restaurant on April 8, Mr. R. Audsley, president, presiding. This was the annual business meeting, when the reports of the past session were reviewed. The treasurer's reports showed a deficit balance of 9s. 9½d. The present committee were re-elected *en bloc*. This, the first session of the society has been very successful, and it is to be hoped that next year's may be more so. The evening was given to a social gathering, which took the form of a whist drive. The game was enjoyed by everyone present, and when the scores were counted it was found that the prizes were won by the Misses Thomson and Messrs. Thomson and Stewart.

Plymouth.—On March 16 Mr. S. R. Harris gave a paper entitled "Line Faults." The subject gave plenty of scope for discussion, in which many of those present took part; 67 per cent. of the members were present.

On April 6 a meeting was held when two papers were read, the first by Miss M. C. Jinkin, Travelling Supervisor, entitled "Supervising Sub-Exchanges." The second paper was by Mr. S. G. Tregillus, Stores' Clerk, on "Stores." Both subjects were ably dealt with and a lively discussion was carried on; 40 per cent. of the members were present.

Portsmouth.—The telephone society brought a very successful session to a close at the general meeting held on March 31, when prizes were awarded to the following for papers read at the society's meetings:—First prize, Mr. S. Wainscot, "Atmospheric Electricity and Wireless Telegraphy;" second prize, Mr. T. Collins, "Electrical Units;" third prize, Mr. S. J. Pharo, "Electrophone Transmission."

Sheffield Operators.—The second meeting of the above was held on April 8, when a very interesting and instructive paper entitled "Order Wire Working," was read by Miss Ridal before a fair number of the operating staff. The reading was followed by considerable discussion.

Sheffield.—On April 8 the annual business meeting in connection with the above was held. There was a good attendance. This meeting was for the purpose of electing officers for the ensuing session, the following being elected:—Hon. presidents, Messrs. G. Franklin, A. Coleman and R. C. Bennett; president, Mr. W. Thyne; vice-presidents, Messrs. F. Barr, E. J. Johnson, and A. Broomhead; hon. secretary, Mr. D. Thomson; hon. treasurer, Mr. H. Stokes.

Sunderland and Shields.—The sixth monthly meeting of this society was held on April 1 at Sunderland; Mr. E. Spink presided. A paper on "Cable Testing" was given by Mr. Allen Livingstone. Discussion was followed by Messrs. E. Spink, J. G. Dixon, R. Scott and J. Martin.

Tunbridge Wells.—The fourth meeting of the session was held on Feb. 22, when Mr. R. Aitken lectured on "Aerial Lead-Covered Cables." With the aid of lantern slides, Mr. Aitken explained the methods of arriving at the comparative costs of aerial and underground cables, and also showed the various phases of the actual erection and the methods to be employed.

The fifth meeting of the 1909-10 session was held at the Dudley Institute on April 6, when Mr. Whibley lectured on "Coils." With the aid of diagrams

Mr. Whibley explained the various kinds of coils as applied to the Company's apparatus. Interesting experiments were also shown with a 10-inch sparking coil and vacuum tubes.

Western (Metropolitan).—The monthly meeting of this society was held on March 31, on which occasion Mr. G. F. Greenham (Metropolitan Electrician) read a paper entitled "Some Modern Maintenance Methods." There was a large attendance to hear what proved to be a very interesting lecture. Lantern slides were shown giving various circuits and statistics.

Wolverhampton.—The postponed March meeting took place on April 1 at the Midland Café, under the chairmanship of Mr. E. J. Jarrett, Local Manager. An interesting paper was read by Mr. R. S. Grosvenor, late Local Manager of Walsall on "Wayleaves," illustrated by curves and sketches. There was a good attendance, numbering 55 members, and numerous questions were asked at the close and satisfactorily answered.

STAFF GATHERINGS AND SPORTS.

Aberdeen.—Under the auspices of the cricket club the annual concert and dance was held in St. Margaret's Hall, Gallowgate, on April 6. In the absence of Mr. Stockens, District Manager, Mr. Thomas Mackenzie, Contract Manager, occupied the chair. An excellent musical programme was gone through and Miss Arthur played the accompaniments admirably. After the singing of "Auld Lang Syne" the hall was cleared and dancing was engaged in till twelve o'clock.

Birmingham.—On March 19 another football match took place, this time between the Engineer's and Electrician's Departments. Miss Hart, Supervisor, Midland Exchange, kicked off. The Electricians scored the only goal before half-time. On resuming the Engineers registered three goals in quick succession, and although the Electricians made strenuous efforts to recover the lost ground they could only reduce the lead by one goal, which was scored just before the call of time, the Engineers winning a very creditable game by three goals to two. There was a good attendance of the staff.

Bristol.—The annual football match, Office v. Instrument Staff, under Association rules, took place on Durdham Downs on April 9. The game was closely contested and resulted in a draw, one goal being scored for each side. Unfortunately F. J. Head, left back for the Office Staff, sustained an injury to his thigh before the conclusion of the match, so that the match terminated as a consequence a few minutes before time.

Edinburgh.—*Amateur Golf Club.*—The special spring competition was played off on Gorebridge on April 9. Owing to the inclement weather only fourteen members of the club took part. The match was a hole-and-hole against bogey for two prizes presented to the club and two presented by the club. The winners were: First, Mr. William P. Knox, Electrical Staff; second, Mr. R. B. Rae, Assistant Engineer; third, Mr. Arch. Pagan, Jernar; fourth, Messrs. William Fraser, General Office, and Alfred Robson, Electrical Staff.

London.—The third annual soiree was held by the Kensington Exchange staff at the Fulham Town Hall on April 9, and was attended by upwards of 150. The proceedings, organised by Miss Neller the Clerk-in-Charge, were of a highly enjoyable character. Miss Neller was admirably supported by Mr. H. C. Parker as M.C., Messrs. C. W. Naughtin, C. Knapman and J. Bool proving able stewards. Amongst those present were Mr. L. Harvey Lowe and the Exchange Manager. The entertainment consisted of dancing (music being supplied by Heinrich Hucks' band), songs and instrumental music by Misses E. Beverley, E. Barnard, E. Hayden, A.R.C.M., and Mr. Wm. Lott. A sketch entitled "Confession" was splendidly executed by Miss Lilian Exton and Mr. Collier Ground. A most enjoyable evening was spent by all present.

Oldham.—A football match was played under Association rules on March 19 between the Oldham and Ashton-under-Lyne staffs at Ashton-under-Lyne. The game resulted in a fine victory for the Oldham men by four goals to one, and was keen throughout. After the match an adjournment was made to the Stamford Café, where the visiting team were entertained to a substantial tea. This was followed by a smoker and a musical evening, the party dissolving at about 10.30 p.m. after having had a most enjoyable and entertaining time.

Portsmouth.—The Portsmouth staff held their first whist drive and social evening of the season on April 1 at the Masonic Hall, Lake Road. The gathering was a great success, quite 200 being present. Winners of prizes for the whist drive were: Ladies: first, Miss Cairns; second, Mrs. Harding. Gentlemen: first, Mr. P. Copeland; second, Mr. J. Gifford. After the presentation of the prizes the remainder of the evening was devoted to an enjoyable dance programme, interpolated with songs, music and a recitation. The duties of M.C. were ably carried out by Mr. Bennett, and he and Mr. S. J. Smith were responsible for the general organisation of the gathering. The prizes were presented by Mrs. S. J. Smith.

Stirling.—A social meeting in connection with the local telephone society was held in the Waverley Hotel on the evening of April 1. Mr. Edmond, District Manager and president of the society, occupied the chair, and there was a large turn-out of the members and their friends. During the evening a most enjoyable programme of songs and other music was gone through, and prizes were presented to the lady members of the society who had read papers during the session. The gathering which was the first of the kind held in the district, was thoroughly enjoyed by all present.

Swansea.—A smoking concert was held at the Adelphi Hotel on April 15 in connection with the local telephone society. The chair was occupied by Mr. W. E. Gauntlett (District Manager), supported by the heads of the departments. An excellent musical programme was gone through which was greatly appreciated. During the evening prizes were awarded Messrs. R. A. Skinner, A. Thompson, sen., D. E. Wilson, W. Caine and W. Davies, for papers read at meetings during the session. The staff and friends present numbered about 50, the company including Mr. W. Pennington, Post Office Sectional Engineer. The arrangements were satisfactorily carried out by Messrs. J. Radford, H. G. McArthur and C. A. Bevan.