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TELEPHONE MEN.

LIII.—ALFRED MAGNALL.

ALFRED MAGNALL was born at Birkenhead in 1865, and educated at private schools in Ashton-under-Lyne. Owing to the death of his father he had to turn out and earn his own livelihood very early in life, and realising later the need of better education he joined the night schools of the Liverpool School of Science and obtained certificates. His connection with telephony began when he entered the service of the Lancashire & Cheshire Telephone Exchange Company at Liverpool in 1883, and he took part in the erection of the first trunk route between Manchester and Liverpool, which was opened for use on Jan. 1, 1885. It may be of interest to note that these were single circuits on 24-inch and 32-inch arms. Each insulator had a galvanised iron guard surrounding it, the latter being carefully connected to earth by means of earth wires neatly stapled round each insulator bolt hole, and connected to the pole earth wires. A line earth wire which was run the entire length of the route (40 miles) on brown insulators was attached to the pole by means of a coach screw fitted below the arms. The cross-talk on these wires was such that when listening on one wire all that was going over any of the others could be heard, but in those days so long as A and B got into communication and understood each other, they took no notice of any noise and chatter going on at the same time, and they were perfectly satisfied with the service. In damp foggy weather or during a hoar frost, ringing was impossible over these circuits, yet when Manchester and Liverpool did get hold of each other speaking was really good.

Mr. Magnall remembers a certain engineer one morning telephoning to him when such conditions prevailed and instructing him to disconnect the main "line earth at Liverpool end." He did so, but no improvement in the insulation of the wires ensued and they had to struggle through until the sun came out to do the needful. Testing these circuits was a hopeless task for a stranger, as the only means of judging whether any actual faults existed was obtaining a constant from the whole, each day, and working from that.

The Company had for some years the maintenance of the block telegraph system on the Mersey Tunnel Railway, of which Mr. Magnall had charge for some time, and from which he gained useful experience of railway work generally. He was in attendance when the tunnel was opened on Jan. 20, 1886, by the late King (then Prince of Wales), accompanied by the present King and the late Duke of Clarence.

When in April, 1886, a fire occurred at the Liverpool Central Exchange, burning out the whole of the testroom of which Mr. Magnall was then in charge and part of the multiple board, he was on duty for four consecutive days and nights. He remained in charge of the testroom until he was appointed Assistant Engineer in July, 1890.

Previous to the construction of underground works in Liverpool the overhead plant suffered much through fires, and Mr. Magnall was called out so frequently that he was almost a member of the fire brigade. On one occasion there was a fire in Wood Street at a cotton warehouse on the roof of which the Company had a number of wires and gutta percha-covered cables, and to prevent further damage Mr. Magnall went on the roof and cut the cables so that they could be drawn away at each side. On trying to leave the premises he found all ordinary means of egress cut off, and was obliged to place foot-runs over a narrow street from the burning building to another, and cross on his hands and knees.

Under the supervision of Mr. Turney, of the Western Electric Company, Mr. Magnall jointed the first dry-core lead-covered cable to be laid in this country, through the Mersey Tunnel in 1891.

Owing to the great use which has been made of this class of cable, the experience gained has been of much service to him. The joints were "boiled out," a method which is being adopted to-day.

In 1892-3 Mr. Magnall was in charge of the line work in connection with the transfer of the Liverpool Central Exchange, when 4,560 wires had to be dealt with.

He was appointed Local Manager at Warrington in February, 1893, and in the following May was given the District Managership of South-West-Lancashire.

On Jan. 1, 1899, he was appointed Engineer for the Manchester district. Since being there he has conducted many important change-overs and carried out large works.

Mr. Magnall has always taken a great interest in the telephone societies. He was president of the Manchester Telephone Society on two occasions, and has read papers at Manchester, Liverpool, Bolton, Warrington, Hanley, Leicester and other towns. He has been an occasional contributor to the JOURNAL, and has attended every meeting of Head Officers and taken part in the discussions.

Mr. Magnall is known as a strict disciplinarian, who will not tolerate poor work or overlook neglect to carry out instructions. The telephone is his recreation, and his work is his sport. Many of his cycle rides in the evening or at week-ends have been to supervise work in hand, to locate a subscriber's place, deal with a wayleave difficulty or similar work. During the last few years, however, he has taken to bowling, and has been chairman of the Withington Bowling Club for over five years.

INTER-DEPARTMENTAL AND INTER-DISTRICT AMENITIES.

BY EDGAR J. FRASER.

IT may not be amiss if a Scot calls attention to an unmistakably Scots failing, which in our Company has spread till it is no longer Scottish only but national in a peculiar sense, and which must affect adversely the efficiency for which we say we individually and collectively strive so much. I mean the habit, for it has become a habit, of dissembling our love. It is perfectly true that there is a certain sweetness to be extracted from one's own criticism or from one's own remembrance of a disregarded service instruction and the consequent adjustment of the erring department or district to the narrow way. But that sweetness should be extracted from one's self-commendation alone and not from the discomfiture of others.

In this connection many instances recur to the mind when, to put it bluntly, courtesy would have prevented soreness and retaliation and friction. To the proper type of man—and if we have not got him we should dispense with the usurper it is sufficient to point out his error. His regret will not be more poignant because you "rub it in"; "rubbing it in" will simply destroy much of the value of the experience to him. No department, no district, no individual even, has any right to communicate with another in terms of superiority or in tones calculated to induce acerbity and retaliation, and it is unwise to take obvious pleasure in correction. Just remember, you who "rub it in," that even Homer has been seen to nod, and a vindictively retentive memory will some day remind you of it.

This is not simple platitudinising. However funny or enjoyable a philosophical onlooker or participant may find a continual verbal wrestle on the catch-as-catch-can plan, the result is a loss of staff amity, the weakening of efficiency and harm to the Company's work, and everyone who reads these words will know cases where friendliness will effect its end much more quickly and profitably than even legitimate complaint. Yet I throw out the suggestion that those who wish friendliness should show it; otherwise—*Nemo me impune lacessit.*

NATIONAL TELEPHONE STAFF BENEVOLENT SOCIETY, LONDON.

THE following grants were made during August:—

Maintenance Department (three)	£15	2	6
Engineers Department (five)	18	0	0
Traffic Department (three)	11	0	0
Head Office (one)	3	0	0
	£47	2	6

Total grants made to date, 280; £846 16s. 10d.

Donations received, £13 11s. 1d. Number of members at Aug. 31, 2,969.

EDUCATION OF THE TECHNICAL STAFF.

BY P. T. W.

IT is less than a year since an article under the above title appeared in the JOURNAL, and a further paper on the same subject may appear uncalled for. The question of education is now such a burning one, however, that it may be relied on to arouse interest, and though I am going to deal with a subject whose study may not be thought a profitable one, yet all must agree that it is at any rate interesting. It has not yet found its way into the curriculum of the Post Office engineer.

In one of the early numbers of the NATIONAL TELEPHONE JOURNAL appeared an article by Mr. Hare, entitled "The Broader Value of the Clerk." In this article the somewhat startling statement is made that most engineers are good and most clerks are bad. This is afterwards explained somewhat on these lines, that whereas the clerk requires little special training, and but little daily use of judgment and initiative, he lacks in his daily work the opportunities of fitting himself for a position of trust or one requiring administrative abilities. On the other hand, the engineer dealing directly as he does with the actual world around him learns without any chance of shirking his lesson, the necessity for correct reasoning from sure data. Mr. Hare concludes by suggesting certain studies for the junior clerk, one of which—namely, logic—I have chosen as the subject of this paper. I propose to give a few examples illustrating the use of this science, and indicate in an amateurish sort of way how important an item it is in the education of all men, whether on the technical or the office staff.

All reasoning is of two kinds; deductive or inductive. In the one case a conclusion is arrived at from certain premises which are taken for granted; in the other case a conclusion is arrived at, and premises obtained from experiments and observation of a number of particular cases. In the deductive method argument or enquiry proceeds from general principles to a particular case. With induction the reverse occurs, a general proposition being obtained from particular data. The difficulties in obtaining a correct conclusion are, in most cases, considerable, and the number of fallacies accepted as arguments in politics, religion, etc., show how universal is the indifference to logic.

Macaulay gives a typical example of the inductive method of reasoning in his essays. "I ate mince pies on Monday and Wednesday, and I was kept awake by indigestion all night. I did not eat any on Tuesday and Friday and I was quite well. I ate very sparingly of them on Sunday and was very slightly indisposed in the evening, but on Christmas day I almost dined on them and was so ill that I was in great danger. It cannot have been the brandy which I took with them for I have drunk brandy daily for years without being the worse for it." The inference is, of course, that mince pies have caused the trouble. It is obvious, however, that the case is not made out against mince pies, as it may have been the mixture of mince pies and brandy which did the mischief. A case where all the possible causes of some known effect were not adequately considered.

Modern scientific investigations in all subjects are almost invariably carried out on the following lines:—The investigator frames a hypothesis, and assuming it to be true, deduces conclusions from it. Then, by comparison of these conclusions with the data from which he started, verifies (or disproves) the truth of the hypothesis. An episode in the history of chemistry will illustrate this. There are certain substances, about 80 in number, that cannot (so far as is at present known) be split up into anything simpler. These are the chemical elements. The chemist cannot estimate the weight of an element, but he has determined their relative weights by countless experiments on elements in combination. A discovery of great importance was made by a Russian chemist when he noticed that in a table of the elements arranged in order of their atomic weight, those of similar properties were separated by regular intervals. That is to say, if any property common to all elements be considered, and a curve plotted showing in what degree each element exhibits that property, it will be found that the curve rises and falls at regular intervals. No matter what common characteristic we may be plotting, the line representing it undulates, more or less

uniformly. This led Mendeléeff to the greatest generalisation of modern chemistry—the formulation of the periodic law. A near analogy may be found in acoustics. Each musical note has its own rate of vibration, which bears a simple ratio to its octave. So also the gamut of the elements may be divided into groups strangely resembling octaves. Any element can be allotted a place in this series once its properties are known, and its atomic weight approximately estimated. Atomic weights that would not fit into the scheme have been recalculated and found incorrect, and the properties of new elements have been anticipated, solely on the information given by their atomic weight.

Still more startling is the fact that as a result of gaps appearing in the scale to which no elements could be assigned, Mendeléeff postulated elements for the spaces that demanded them, and proceeded to define their properties from a study of the "octaves." Some time after, these elements were discovered, having the properties exactly as foretold.

Finally, and as a direct result of the knowledge acquired by application of this law, it is now possible to form a theory on the ultimate constitution of matter. Just as each musical tone is related to all other tones, there appears to be some intimate relation between the various elements which is at present uncertain, but may in time be found due to waves in the medium of ether as musical notes are due to waves in the more tangible medium of air.

A better instance of induction and subsequent deduction could not well be quoted.

In the preceding example an affinity between the laws regulating the various harmonies and combinations of music and those of matter has been suggessed. This conception seems to me a useful one, and in this case without danger, but fallacies from false analogy are possibly the most common cause of misconception that a student has to contend with, and cases are of frequent occurrence in magazines and newspapers. Mr. Milnes in his article on the "Electron Theory" has pointed out how misleading analogy could be, instancing the popular idea of electricity as an imponderable fluid possessing the property of inertia, and I have heard the law of inertia being used as a proof that because it had not rained for three weeks it was not likely to rain on the following day. Argument by example is more widely applied, not only in the process of inference but as proof, than any other form of argument, and the danger of overlooking some hidden element in the facts and thereby generalising too freely is often neglected by the unwary. It is so much less trouble to see that two things bear a striking resemblance than to discriminate accurately how far the resemblance really goes, and wherein lies the difference. I suppose every reader can recall to mind instances of fallacy by false analogy, and the injustice of the "not a parallel case." Fallacies are most interesting and deserve an article to themselves. There are quite a number of them on the market, so to speak, but all have this point in common—they will successfully bring any argument to a wrong conclusion.

They are therefore worth some study.

Instances of one or two of the more popular kinds will illustrate this. They all represent incorrect reasoning in some form or other.

The fallacy of equivocation consists in using the same term in two distinct senses. For instance—Nothing is better than wisdom: dry bread is better than nothing, therefore dry bread is better than wisdom. In this case the fallacy is obvious, but it is not always so apparent, as the premises are often placed at a considerable distance from each other in the course of a long argument.

Another logical fallacy is frequently found of which the following are examples. The reader can pass or reject as his powers of reasoning suggest:—

1. The circuit is open if the fuse has blown; but the fuse has not blown: therefore the circuit is not open.

2. If the circuit is open the fuse has blown; but the circuit is not open: therefore the fuse has not blown.

3. The fuse has blown if the circuit is open; but the fuse has blown: therefore the circuit is open.

4. If the fuse has blown the circuit is open; but the circuit is open; therefore the fuse has blown.

The only rule necessary for testing the validity of the above is this; that either the antecedent must be affirmed or the consequent denied. Accordingly No. 1 must be rejected because the antecedent is denied. Another class of conditional argument is the dilemma. Such an argument is usually fallacious because it is seldom possible to find instances where two alternatives exhaust all the possible cases. This form of dilemma is stated thus: If A is B, C is D, and if E is F, G is H, but either A is B, or E is F, therefore either C is D or G is H. A retort can often be made by producing as cogent a dilemma to the contrary effect, as instanced recently in a weekly magazine. "A pupil refused to pay his teacher of rhetoric on the following grounds:—'If you have taught me rhetoric I shall be able to persuade the judge that I ought not to pay: and if I cannot persuade the judge, then you have not taught me rhetoric, and therefore I ought not to pay.' To which the master replies: 'If you can persuade the judge then you have been taught rhetoric, and therefore ought to pay me; if you fail to persuade the judge then you will have to pay me.'"

Fallacies due to some important factor having been overlooked have already been referred to. Of a similar nature is the irrelevant conclusion, which consists in arguing to a wrong point, and may be likened to a traveller who has performed a journey but got to the wrong destination. This fallacy is the great resource of those who have to support a weak case, and is said to be not unknown in the legal profession, where a barrister's brief was endorsed "No case; abuse the plaintiff's counsel." Of such a kind, too, is the fallacy involved in the act of proving that there are weighty objections against a particular reform, when what is required to be proved is that there are more weighty objections against its adoption than against its rejection. Head Office must have experience of this. Sometimes the districts think *they* have.

Mathematics occasionally provides one with cases of fallacious reasoning. Of such a kind is the proof that $1 = 2$:

$$\text{Let } a = b. \quad \text{Then } ab = b^2$$
$$\text{and } ab - a^2 = b^2 - a^2$$
$$\therefore a(b - a) = (b - a)(b + a)$$
$$\therefore a = ba$$
$$\text{or } a = 2a$$
$$i.e., \ 1 = 2$$

"But what has all this to do with the education of the staff?" I am asked. Just this—that the final end of knowledge is practice, and the first requisite of knowledge is that it shall be true, and the difference between the scientific man and his unscientific fellow is simply that the former employs machinery to confirm his impressions or theories, and to discriminate between truth and falsehood, and between sufficient and insufficient evidence, while the latter takes things for granted. The necessary machinery is embraced in logic, which after all is uncommonly like trained common sense.

An inspector was recently sent to a subscriber who had complained of his transmitter being out of order. The E.T. was called up and tested line—"Current on loop." The instrument was a local battery magneto wall set. After a hunt round the pivot of the switch-hook was found loose. This was tightened, and a second test made with the same result. The springs of the switch-hook were then adjusted—something had to be done—and a call was made to the operator, who being busy probably, heard the inspector all right. "Clear" was given. "Switch-hook springs adjusted." Asked to explain how that had cleared the fault this inspector had to plead ignorance. The result of the next test was "current on loop." Further examination showed a broken wire on the switch-hook, which allowed the local primary circuit to be in bridge across the line. Fortunately this class of inspector is now practically extinct, and there is a very general keenness to understand intelligently the relations between cause and effect as instanced by the fault and the trouble caused.

Sufficient has been said, I think, to show the uses of logic as a mental training. Its range is far wider than can be covered within the scope of a short article, and in any complete course of the subject such items as degrees of probability, chance and its elimination, hypothesis, observation and experiment, etc., would be included.

Western Electric Company.—Mr. J. E. Kingsbury, formerly General Manager in London of the Western Electric Company, has joined the Board of Directors of Western Electric Company, Limited.

ELECTRIC CLOCKS.

BY J. H. STEWART, *Gerrard Street.*

(*Concluded from page* 128.)

Fig. 4 shows the dial mechanism: the ordinary "works" are dispensed with, the only wheels retained being the "motion" wheels which give to the minute and hour hands the proper ratio of 12 to 1 as they turn: the motion wheels can be seen in the figure behind the large driving wheel; the latter contains 120 teeth corresponding with the number of half-minutes in an hour: the hour hand is fixed to the same spindle as the driving wheel, and therefore moves by half-minute steps each time the click E pushes the wheel one tooth forward. The click E normally holds the wheel in the position shown in the figure. When the electro-magnet B is energised, the armature C pulls up and the click E is drawn back. On the current ceasing, the flat blade spring F pushes the click, and the wheel is moved one tooth forward. The spring blade is made to do the driving because it exerts a constant force on the driving click: had the electro-magnet been arranged to do the driving, a very variable force would be transmitted to the wheels, as the strength of the battery varied. The backward movement of the click is limited by the stop I, which performs a double function. It is clear from the figure that the notch in the arm D engages with the stop whenever the armature C is drawn up, when the back-stop lever G cannot rise; thus the wheel is locked during the time that the click E is drawn back and momentarily unable to perform the locking function. The means taken to prevent "tripping," or the passage of more than one tooth at a time under the click E, are worth close attention. The click engages with the minute wheel at such a point that the click rises as it drives, until it locks under the adjusting screw H, which is set so that locking occurs when the wheel has moved forward the space of one tooth. An inspection of the figure will make it plain that, however violently the driving click urged the wheel forward, it would be impossible for more than one tooth to pass under the click with each impulse. It may be noted in passing that the same locking device occurs in our subscribers' registers to prevent more than one call being recorded for each depression of the operator's

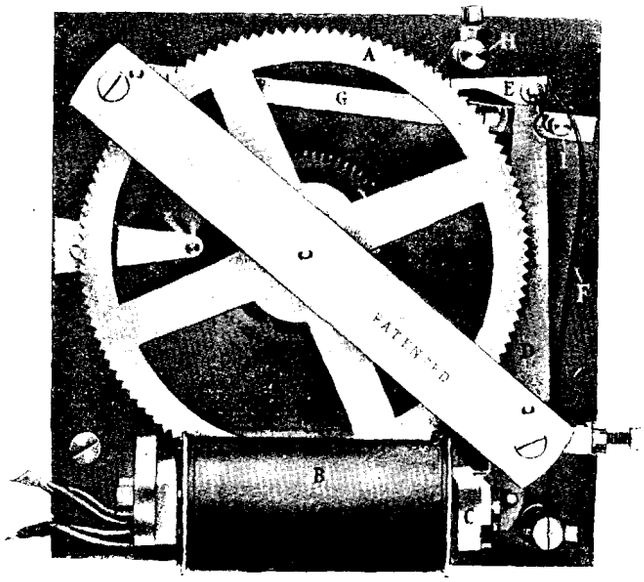


FIG. 4.

register key, and it is well known how satisfactory this mechanism has proved to be.

Any number of dials may work in series with one master clock; all that is necessary is to increase the battery E.M.F. as the dials are increased in number and the resistance of the circuit thereby increased so as to maintain the same current as before. In large installations, worked from the central storage battery, it is usual to insert a few resistance spools in series with the clocks, the spools being removed as extra dials are added. This is found to be a more convenient arrangement than altering the battery power each time dials are added or removed from the circuit.

Electric clocks are peculiarly suited to C.B. exchanges because they can work across the central battery, which provides an unfailing supply of current. The inconvenience of periodically

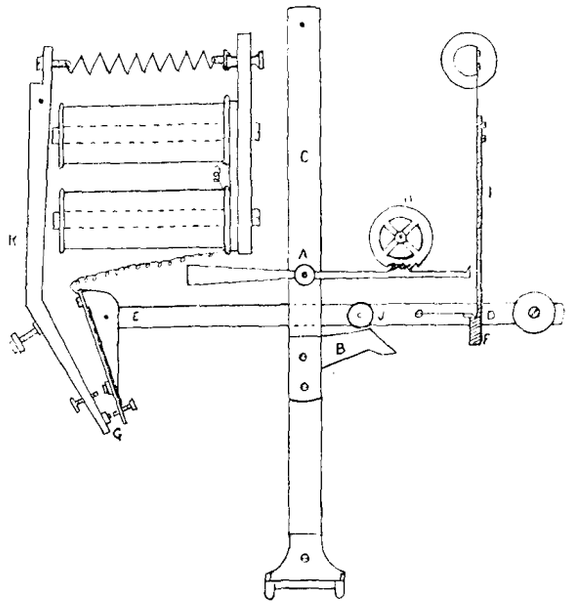


FIG. 5.

changing the battery which arises when working off primary cells is obviated, and also the current supply from accumulators is more constant.

Messrs. Gent & Company's system, which is in use at most of the Company's larger exchanges, consists, like that just described, of an electrically driven master clock controlling a set of dials in series with it, and in all cases they are worked from the exchange storage batteries.

In its earlier form the pendulum movement contained a wheel corresponding to the 'scape wheel of an ordinary clock, but its action is quite different, for instead of driving the pendulum which is the usual office of a 'scape wheel, the pendulum drives the wheel; the pendulum movement however need not be further described, as it has now been superseded by an improved and simpified form, called the "Horne" pattern, shown in Fig. 5. A crutch C, which is forked at the lower end to engage with the pendulum, carries a cam B, and also a light arm A pivotted on the crutch. Behind the crutch is the gravity arm D, centred at E, carrying a gold contact-screw G: gold being used because it is equally suitable with, and at the present price much cheaper than, platinum. The gravity arm is normally held up by the catch F.

The wheel H, contains fifteen teeth, one of which is cut deeper than the rest, and a pin on the arm A engages with the wheel and pushes it one tooth forward each time the crutch C makes to the right. The pendulum swinging seconds, the wheel moves a complete revolution each half-minute. At every swing to the right the light arm A passes through a slot in the flat brass strip I, until the pin engages with the extra deep tooth on H, mentioned above. This allows of the arm A rising so that it no longer passes through the slot in I, but pushes it back so that the gravity arm releases from the catch F.

A roller J attached to the arm runs down the cam B, as the pendulum swings to the left, supplying energy sufficient to keep it swinging freely for the next half-minute. The downward movement of the gravity arm is arrested by the contact G making with the armature contact, when a circuit is established through the electro-magnet and the dials. The armature pulls up and flicks

the arm on to the catch F, again ready for the cycle of operations to be repeated at the next half-minute.

The pendulum rod is made of wood, well varnished for protection against atmospheric moisture, with an iron and zinc bob in proportions suitable for compensation.

The dial mechanism is shown in Fig. 6. The electro-magnet contains only one bobbin, but it will be seen that the armature and poles are shaped in such a way that when energised both poles assist in attracting the armature, and there is a good magnetic circuit.

The bobbin is wound to a resistance of 4 ohms and works with a minimum current of 150 milliamperes; two dials in series should therefore work well across one dry cell, the current being equal to

$$\frac{1{\cdot}5 \text{ volts} \times 10{\cdot}0}{8 + (\cdot 25 \text{ int. R. of cell})} = 182 \text{ m.a.};$$

this is handy to remember when testing dials. If installations are worked off Leclanché or dry cells, one extra cell for every two dials is the battery power allowed.

Another system that possesses distinguishing features, is the Magneta Company's; as the name suggests, the driving current is derived from a small magneto-generator or inductor, as the makers term it, consisting of a permanent magnet and a fixed coil on which current impulses are induced by the movement of an iron core. As in the synchronome system, the dials and master clock are all in series, but in this case the master clock is not electrically driven. It consists of an ordinary key wound clock with two trains of wheels—viz., a going train and a power train, the latter corresponding to the striking train in an ordinary clock. The power train is released once every minute, causing the iron core of the inductor to make half a turn; a current impulse passes round the circuit and the hands of all the dials move one step forward. The dial mechanism is of the polarised type, one impulse moving the armature in one direction, and the next impulse being of opposite sign moving it back. Each movement of the polarised armature carries the minute hand one step forward. Another feature of this system is the entire absence of contacts either in the master clock or the dials, thus removing a source of trouble that must always be reckoned with where contacts are employed. The greater the number of dials on a circuit the larger must be the inductor, and as the energy for driving it is derived from the weight on the power train, this weight becomes heavier and the winding more laborious the larger the installation. The master clock is wound daily or every two days as the case may be.

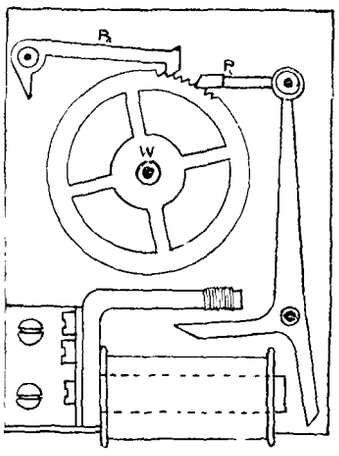
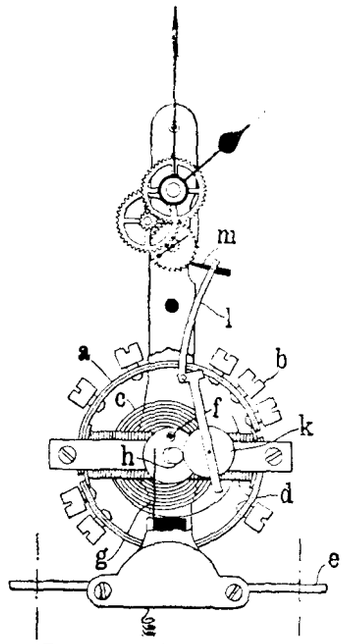
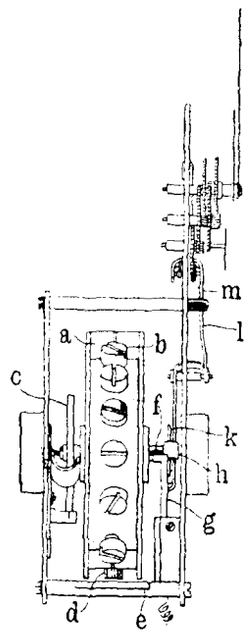


FIG. 6.

The clocks of the Self-Winding Clock Company on the Metropolitan, District and Tube railway stations are examples of independent electric clocks. Each clock has the ordinary works and is spring driven; the only addition is the electric winder which is controlled by a contact within the clock which is made hourly. The winder is very simple, being an ordinary electro-magnet with a driving click attached to its armature. On contact being made, the armature vibrates and the click drives a ratchet wheel, and this action continues until the spring is fully wound, when the circuit automatically opens.

The clocks are placed in parallel across the railway company's 60-volt signal mains, and each winder is in series with a lamp resistance which absorbs most of the voltage, leaving about 5 volts only across the terminals of the winder. Being in parallel across the mains, should one clock fail the others on the same circuit are not affected. These clocks are also synchronised every hour, but the synchronising or timing arrangements are quite separate and must not be confused with the self-winding apparatus





FRONT AND SIDE VIEWS OF "EUREKA" ELECTRIC CLOCK.

FIG. 7. FIG. 8.

described above. Separate leads are run from the signal mains and the clocks joined up in series groups of twenty, a synchronising magnet being fitted behind each dial. One extra single make and break relay is added to the series, and current at 60 volts from the mains brought through its contacts to control a second group of twenty dials and so on.

The synchronising current is controlled by an ordinary regulator clock which is timed daily from Big Ben at Westminster: it may be observed that the first stroke of the hour on the Westminster clock denotes the true Greenwich mean time. The master clock makes contact hourly, and, precisely at the hour, a momentary current is sent round a group of clocks. Each armature as it pulls up can operate the minute hand. Should the latter be either fast or slow, it is moved so that it points exactly to the hour, and thus all the clocks on the system are kept in unison.

The Eureka is the latest development of an independent electric clock: much originality is displayed in its design, and the care bestowed on every detail both electrical and mechanical augurs well for its success. The feature that first strikes one is the large balance wheel A, Figs. 7, 8 and 9, which is like an ordinary watch balance wheel, very much magnified. It is about 3 inches in diameter and 12 ounces in weight. An electro-magnet wound with enamelled copper wire to 36 ohms is fixed across the inside of the balance wheel as shown in Figs. 7 and 8, the lettering being the same in each. A is the rim of the wheel, D the core, R the coil, P and P^1 two flat plates of soft iron forming a return magnetic path. S is an iron screw passing through the rim and connecting the core with the iron plates, forming a yoke.

The wheel and coil are mounted on ball bearings, which permit the balance to work with less friction than would a jewelled bearing.

A large spiral spring, attached to the balance, governs its time of swing, and is adjusted so that the wheel makes forty swings or twenty complete periods per minute. One end of the coil makes on the frame and the other is brought to the platinum pin F, one side of which is insulated with ivory. As the balance swings the pin makes contact with the platinum-tipped spring G, which is so placed that the pin F passes alternately first in front and then

behind it, the result being that current only passes at each alternate swing as the ivory part of the pin makes contact with the spring G at every other beat; current, therefore, is only fed to the magnet coil once every period, or double swing.

As the duration of contact is only one-eightieth second, and occurs but once in three seconds, the current consumption from the single dry cell that works the clock is extremely small, and some of the early Eureka clocks have been working from the same dry cell for the last three or four years. The contacts are so placed that the coil is energised when the pole D of the magnet is about 30° from the fixed iron armature E, towards which it is drawn till the coil is vertically over E when contact is broken.

The impulse thus imparted at each period maintains the balance wheel in motion, and is delivered when the balance is at the middle part of its swing and therefore travelling fastest; as in the case of the pendulum, there is least resulting disturbance when the impulse is applied at this point.

Fig. 7 shows how the motion is conveyed to the hands; K is a freely running steel disc, mounted on the arm L, and each time the cam H passes, K is lifted and with it the arm L, pushing the

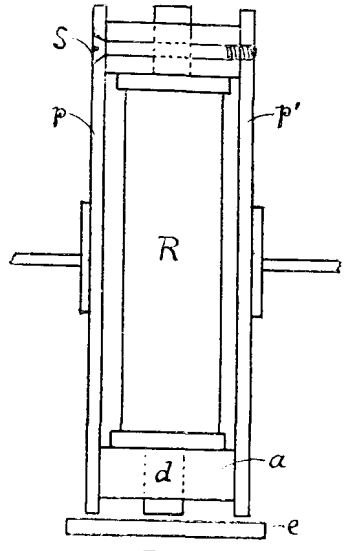


FIG. 9.

driving click M forward by one tooth for each swing of the balance wheel. It might appear, as the impulses given to the balance wheel must necessarily vary in strength as the battery weakens, that accurate time-keeping could not be attained, but springs like the pendulum are subject to the harmonic law; that is to say, the displacement of a spring is proportional to the force exerted upon it if not too great, so that if the magnet R be strongly excited, the balance wheel swings through a large arc and as the battery weakens the swings become smaller, but the period of vibration will depend solely upon the mass of the wheel and upon the strength of the spring and not at all on the amplitude of vibration, and as long as the period of vibration remains constant the clock will keep time.

Although the clockmaking trade has hitherto looked upon electric clocks with suspicion, or regarded them as curiosities not to be taken into serious account, both the series dial systems and the independent or self-contained electric clocks have undoubtedly emerged from the experimental stage, and it is encouraging to note that such an eminent horologist as Sir H. H. Cunnynghame expresses an opinion that electric clocks must be regarded as the timekeepers of the future.

Visitors.—During the month Messrs. Ren Nakashoji, Vice-Minister of Communications and President of the Board for Investigation of Hydro-Electric Power Resources; H. Suzumura, Secretary of the Bureau of Electrical Exploitations; Shiro Uchida, Architect of the Department, and Risuke Wakameda, Electrical Engineer, all of the Department of Communications, Tokyo, Japan, visited Head Office, and subsequently the Gerrard Exchange, the Observation Office and Operating Schools.

THE RELATION OF THE ENGINEER TO THE TELEPHONE INDUSTRY.*

BY FRANK F. FOWLE.

PART I.—ENGINEERING TRAINING AND QUALIFICATIONS.

ONLY recently has the telephone engineer begun to enjoy a rank which establishes him on a plane of equality with engineers in other fields, either as to his professional ability or the scope of his usefulness. For a long period it was quite commonly believed that the telephone industry required little engineering ability beyond that necessary for dealing with switchboards and instruments. This view persisted for a long time after the early days of the art, but happily it has been modified in recent years.

The industry in the United States as a whole now ranks about equally with electric lighting, on a comparison of total investment in plant. The engineering problems are probably not matched for intricacy in any other field. Therefore it is not apparent why the telephone engineer, from the standpoint of the magnitude and development of the art, should have been considered entitled to only an inferior rank. Nevertheless it seems to be a fact that he has been underrated extensively, both by those within and without the industry.

This misapprehension arises no doubt from ignorance in many instances as to the real need for engineering, and in part perhaps from the misconception that the telephone is a good deal of a toy, instead of an apparatus as much liable to misuse as any other machine. It is particularly desirable to correct this view among persons engaged in the commercial and financial sides of the telephone business, and the owners of telephone properties or securities. The purpose of this article is to draw the attention of telephone men to this matter, and to attempt some explanation of the need for, and the nature of engineering.

There are three prominent reasons for this general lack of appreciation. In the first place, telephone engineers have not, because of professional ethics, publicly advanced their claims for recognition; they regard and treat this matter much as do lawyers and physicians. The recognised channels through which engineers may properly announce or present their problems to other engineers for discussion are through papers read before professional societies or published in the technical press. The business public hears little directly of engineering work, except as it may be of such a nature as naturally to command public attention.

In the second place, the telephone art has been subject to peculiar conditions on the commercial side, which as a whole have tended to suppress the free and impartial discussion of engineering problems. The field has been occupied by two great interests, or groups of interests, the "Independents" and the "Bell" companies. Keenness of competition has led to the belief in many instances that free discussion of engineering problems would lead perhaps to disclosures that might be taken advantage of commercially. In view of the circumstances this belief was only natural, but on the other hand it is unfortunate in one respect that it existed because without doubt it has tended to restrict the advancement and recognition of the art. It also has been unfortunate for the engineers who have in so many instances been prevented from bringing their work before the proper professional bodies, for the sake of advancing engineering knowledge and securing that general discussion so important to sound progress. It is to be hoped that in time this obstacle to progress will wholly disappear.

In the third place, the commercial field has been quite largely developed, in farming and rural districts, by small operating companies who seem to have seen little or no need for engineering. It is possible, of course, to install a small telephone plant having a few hundred subscribers without having any real engineering work done. Telephones and switchboards have been quite extensively simplified and systematised, so that good equipment can be purchased in the open market, and pole line construction of the lighter sorts offers few difficulties. The sales staffs of manufacturing companies are usually ready to give such engineering assistance as may be necessary to install the switchboard and place it in

* Extracted from *Telephony*, April 16 and May 7, 1910.

operation. And thus the throwing together of the component parts of a small system, so that it will operate after some fashion, is sometimes easily accomplished. But every company which embarks in business in this manner, passes over entirely such features as a study of the population in the territory served to determine the probable present and future development, the matter of providing adequate talking volume or transmission efficiency, the problem of laying out the most economical distribution system with a given standard of transmission, the proper choice of telephones and switchboards so as to secure the greatest transmission efficiency consistent with the cost, the matter of economically providing for growth in subscribers and traffic, the determination of a schedule of fair and profitable rates and, the problem of how much to set aside from the yearly revenues for a depreciation reserve fund, and how best to subdivide the accounts so as to show the several sources of revenue and the various expenditures according to their character. It is not to be supposed that these matters comprise the whole realm of telephone engineering, but they are fundamental.

A telephone company which embarks in business under such circumstances may, and frequently does, continue for a period of eight or ten years, perhaps, without meeting serious difficulties. The owners may suppose they are making money, but in some cases that fact has been very much in doubt. The most serious obstacles will not arise until the system has grown considerably, or perhaps not until the reconstruction period arrives or the system is consolidated with others. But the day of reckoning will inevitably arrive, and for many companies formed ten or twelve years ago, or longer, has already come.

A great deal might be written upon the necessity of engineering in the successful management of telephone properties, much more than there is space for in a brief article. But it is intended to point out first, in what follows, the fundamental reasons why engineering is an economic necessity, and then to bring out some of its benefits in describing the general relation of the engineer to the business.

The Purpose of Engineering.

Engineering may be defined as the application of science to the industrial arts, manufactures and commerce. Its whole purpose is to promote economy and efficiency in the use of capital, labour and raw materials. Our present-day civilisation is essentially a material one, and the age is one which is marked particularly by great achievements in commerce and industry. On every hand we meet problems which require in their solution the greatest scientific knowledge and skill. But we should couple with this definition of engineering the statement that the engineer must be essentially a good business man; that he must understand the rudiments of finance.

Broadly speaking, it is a fundamental truth that every community must produce wealth from some source, or suffer decline. The measure of success in commercial enterprise is efficiency in the production of wealth, or, otherwise expressed, net profits. Upon this test every venture must ultimately stand or fall. Therefore, it becomes necessary everywhere to avoid waste and extravagance, and to strive always for more economical production and use. And we find as a consequence, wherever applied science is indispensable in the industrial arts, in commerce and manufacturing, in transportation and communication, or in any other of our numerous activities, that the expert in applied science—the engineer—is a most important factor. Upon him rests a large burden of responsibility always, and in many cases his ability to solve the problems met determines the success or failure of the enterprise.

Then we may repeat that engineering is the application of science to industry and commerce, for the purpose of accomplishing things that otherwise would be impossible, and for securing the greatest possible degree of economy in the use of capital, labour and raw materials. This is well demonstrated by a consideration of our industrial and commercial development, in which engineering works of every kind and order of magnitude are everywhere present. The business man and the layman are naturally familiar with those works only whose results take on an outward material form, but the invisible work is oftentimes the substructure upon which the final result depends; it is fundamental and essential to all which follows, and a mistake there may not be outwardly apparent until it is too late to correct it. Take, for example, a telephone distribution system, and suppose that it was planned inadequately to care for the growth in subscribers during the years immediately following the installation; the expense entailed in enlarging the system so soon after it was built could have been much reduced by providing the necessary facilities in the original installation, but how to do this intelligently could only be determined from a development study. The money saved by cutting down the engineering work would, in such a case, be offset many times in the course of a few years. The same illustration would apply to the design of the central office and its equipment. A situation even more serious would arise if the distribution system were to be designed with too little copper to secure adequate transmission: it would still be serious from a financial standpoint if there were too much copper. The proper amount of copper can only be determined from considerations of the laws underlying transmission, and a study of the traffic to be handled.

What has already been said in reference to the lack of engineering among some of the smaller telephone companies will apply, in less degree possibly, to some of the larger companies. There is a manager of a large system who maintained some years ago, that he could operate the business to better advantage without any engineers, but he has had occasion since to change his mind. There are no doubt many business men who now believe as this manager did, not from any lack of good faith in engineers as men, but from ignorance as to the real nature of engineering and the economies it makes possible both in construction and operation.

It would be unfair, however, to pass over the fact that engineering has sometimes been brought into disrepute with owners and business men through incompetence, unscrupulousness or bad judgment on the part of men who professed to be competent engineers. Loss of faith in such cases is only natural, perhaps, but to condemn all engineering on account of it is as unreasonable as condemning the practice of medicine because physicians do not always combat disease successfully. This touches the question of the engineer's education and training, which should be discussed briefly before passing to the application of engineering generally to the telephone business.

Engineering Education and Training.

Proceeding from the general definition of engineering just given, it will be apparent that the foundation of engineering education must be a thorough training in science. This is true regardless of what special field the engineer may enter when he takes up practical work. This basic training ordinarily includes mathematics, physics, chemistry, geology, mechanics, optics, heat, electricity, magnetism, thermodynamics, electro-chemistry, and possibly some allied subjects. These subjects will be studied both in the classroom and the laboratory. The course of training should then be extended to a study of the properties of materials, both raw and manufactured, and the properties of structures and earthworks with regard to their design and construction.

Training of this character is usually common to all engineering courses, and specialisation does not occur to any extent until half the course has been completed. The student must then choose his specialty, and his training thereafter takes on a special character. The subsequent training, speaking generally, will bear more particularly upon the application of the subjects before mentioned to the practical arts. This will embrace the properties of fuels and the laws of combustion, the utilisation of natural resources, the production, transmission, distribution and utilisation of power, the principles of traction and transportation, the means of transmitting intelligence, the production and distribution of artificial light and heat, the sources of water supply and the means of distribution for public consumption, and the principles of sanitation and ventilation and general considerations affecting the public health.

It is not to be supposed that any one course of training will embrace all of these subjects in equal degree. The major portion of the student's time will be devoted to his specialty, but at the same time it is necessary for an engineer in any particular field to know a great deal about the subjects in allied enterprises. This is probably the case in telephone engineering to a greater extent than in most other fields.

The best engineering schools confine their courses more to

theory and principle than to current practice of the day. The latter changes rapidly while the former do not, except as the field of knowledge is constantly expanding. The purpose of the technical school is, in the broadest sense, preparatory; the best schools do not aim to turn out men who are prepared to take immediate charge of responsible work, but, instead, to give them a thorough preparation, consisting of training in abstract and applied theory.

It may well be said that an engineer's training is hardly more than begun when he graduates from a first-class technical school. The real test comes in the application of theory to practice, and every engineer must pass through a course of experience of this kind, to fully qualify himself. At the same time he will become familiar with current engineering practice and with practical work. During this period he should come to know, with close accuracy, the cost of labour and materials entering into construction and operation. But above all, the engineer must possess the ability and sense to apply his technical knowledge and scientific methods in his chosen field of work, to secure always the maximum of output or production for a minimum of outlay. The ability to do this has been called by some, "Engineering sense"; it seems to be a faculty that must largely be inherited rather than acquired. Of course it must be trained and developed, but engineering, like other professions, is one which demands natural qualifications.

Nothing has been said of the engineer's general education and culture. The more of such training the better, for it increases his breadth of view and tends to counteract the somewhat narrowing tendency of a purely technical training. It is becoming increasingly difficult to give the necessary general studies during a four-year technical course, and there is little doubt that engineering education is approaching the same status as preparation for the law, medicine or the ministry. That is, a four years' general college or university course will be required for admission to engineering schools, and the engineering course will become post-graduate work, extending probably over three years. This will result in turning out men better prepared than those who take only a technical course.

It is very desirable that the engineer should have a good training in English; it is vital that he should be able to express himself clearly and forcefully, both in speaking and composition. Drawing, the other element in the art of expression, is surely essential. He should have, too, courses in languages, in economics, civil government, business law, accounting and finance. Or, to put it briefly, he should have in full the preparation which a business man would desire, because he must be himself a good business man to practice his profession successfully.

What has been said above in relation to engineering education is necessarily limited and is intended only to indicate the scope rather than the full substance of such training. But in leaving this matter it may well be emphasized that engineering is a profession and not a trade, and that engineering schools are not comparable in any sense to trade schools; the latter turns out artisans—men trained to use their hands in some form of manual labour and work by rule of thumb or under instructions, while the former turn out men who have been trained mentally to make use of the world's knowledge in the management and direction of affairs. No disparagement is meant or intended to the artisan or the skilled labourer, for whose co-operation the engineer has so much need; but it is intended rather to dispel the views that may be incorrectly held by some persons who do not do justice to engineers in general.

The Engineer's Qualifications.

The rudimentary definition of an engineer is of course "one who practices engineering." It is unfortunate that the term engineer should have other meanings in common use, and on that account it has become necessary to qualify the term by some prefix or adjective, such as consulting, constructing, contracting, operating, etc. There are, moreover, many branches of engineering which make it necessary to add other qualifying terms, such as electrical, mechanical, civil, mining, chemical, industrial, etc.

The definition of an engineer in the professional sense is more difficult to state, partly because there is no legal bar against the practice of engineering by anyone, and quackery and incompetence find no obstacle, whereas lawyers must pass the bar examinations, physicians must pass the State examinations and clergymen must be ordained by the Church. There is no distinguishing mark or title in the profession of engineering which has any legal standing. But there are several engineering societies, whose membership is composed of the foremost men, which have done much to give standing to the profession. Foremost amongst these are the American Institute of Electrical Engineers, the American Society

TELEPHONE ENGINEERING

THEORY ..
1. Primary sources of electric energy.
2. Fundamental laws of electric circuits.
3. Properties of electrical apparatus and machinery.
4. Laws of telephone transmission.
5. Principles of circuit design.
6. Properties and tests of materials.
7. Design of structures.
8. Traffic methods and uses of the theory of probability.
9. Principles of distribution systems.
10. Preparation of development studies.
11. Laws of depreciation.
12. Principles of protection.
13. Laws of electrolysis.
14. Prevention of inductive interferences.
15. Lighting, heating and ventilation of buildings.
16. Principles of equitable rate making.
17. Principles of accounting.

MANUFACTURING
Experimental investigation, design, preparation of specifications, inspection and testing of finished product, in the manufacture of—
18. Switchboards and equipment.
19. Central office apparatus.
20. Telephones.
21. Power machinery.
22. Wire.
23. Cables.
24. Conduits.
25. Pole line hardware.
26. Building fixtures and equipment.

CONSTRUCTION ..
Preparation of estimates, plans and specifications, inspection of materials, and supervision over construction, for—
27. Central office installations.
28. Pole lines and line structures.
29. Subways.
30. Cable installations, aerial, underground and submarine.
31. Wire stringing.
32. Buildings.

OPERATION ..
Supervision over and recommendations in regard to—
33. Forms of organisation.
34. Preparation of traffic and maintenance rules.
35. Maintenance of plant.
36. Traffic loads and efficiency.
37. Service testing.
38. Record and reports.
39. Business policy.
40. Rates and revenue production.
41. Classification of expenses and revenues.
42. Annual charges for depreciation.
43. Acquiring new business.
44. Plant extensions.
45. Welfare work among employees.

FIG. 1.—CLASSIFICATION OF THE FUNCTIONS OF THE TELEPHONE ENGINEER

of Mechanical Engineers and the American Society of Civil Engineers. These societies admit to full membership only such men as are qualified, in the judgment of their contemporaries, by education, training and experience, to take full charge of responsible engineering work. By common consent the professional definition of an engineer may be substantially expressed as follows:—

1. One who possesses a degree received from an engineering or technical school of recognised standing, or the equivalent of technical education; and

2. One who posseses an amount of training obtained in practical experience sufficient to qualify him to take responsible charge of work in his special field; and hence to qualify him for

3. Full membership in one of the recognised engineering societies of the highest standing.

There is no national telephone engineering society, and telephone engineers therefore fall in the broad class of electrical engineers, being eligible for membership in the American Institute of Electrical Engineers. The practical experience necessary to qualify a graduate to take responsible charge of work varies probably from seven to ten years, depending of course upon the individual.

The professional standing of individual engineers will always depend in great degree, of course, upon their individual achievements and attainments, as these become publicly known. It is also affected by their connections with professional bodies and by the estimates of their contemporaries. Telephone engineers are unfortunate in the respect that they have no national organisation, and for that reason are often not well known. For the same reason, too, the character and importance of their work are not as well known as they should be. Hence it appears desirable to go into the scope and nature of telephone engineering quite fully.

Telephone Engineering.

This field of engineering is fundamentally a branch or offshoot of electrical engineering, with which it has a good deal in common; and is also related in not a few of its elements to civil engineering. For example, the theory of telephone transmission is evolved from the same fundamental laws as the theory of power transmission, but the final results are profoundly different. The theoretical side of telephone engineering is in general much more complex than other branches of engineering, and requires skill of a high order to handle it properly. The construction side is highly special, in reference particularly to apparatus and central office installations. The operating side also presents problems that are largely special in their character, relating to maintenance and traffic.

The functions of the telephone engineer are so numerous that in order to make them most clear they have been classified and arranged in a skeleton form of diagram, as shown in Fig. 1. This diagram necessarily indicates at the same time the breadth and scope of telephone engineering, both in theory and practice. The whole engineering field has been separated into four parts: Theory, Manufacturing, Construction and Operation; each of these branches has then been classified in considerable detail. The division of Theory is intended to show the scope of theoretical knowledge which the telephone engineer is called upon to apply in the course of his practical work, and upon his knowledge of which will depend his own efficiency and effectiveness. The division of Manufacturing is intended to show the scope of his usefulness in the manufacturing field. The division of Construction requires little explanation, as perhaps it is the most commonly accepted field of the engineer's activities. The division of Operation is a sphere of the engineer's usefulness which is probably not appreciated among telephone managers to the extent that it ought to be. It has too often been the case that the engineer was dispensed with as soon as the plant was built, and perhaps regarded as a luxury even before this time. As a matter of fact, his services are needed fully as much during the operation of the plant as during its construction.

But every business man will apply to engineering the same test that he applies to all other facilities, services or equipment for the transaction of his business—namely, is it necessary, and if so, does it pay for itself? The engineer must frequently justify his existence, and he cannot shirk the duty of proving that his services are of constant and lasting benefit to the industry, if he hopes to receive proper recognition and reward.

(To be concluded.)

Local Telephone Societies.—With reference to the particulars of telephone societies given in last month's JOURNAL, it should be observed that the percentage of attendance of the *Nottingham Factory* Society was 52·5 and not 42·9; also that the figures of the *West* and *North-East London* Societies were transposed. The percentage of attendance for the former is therefore 31·7.

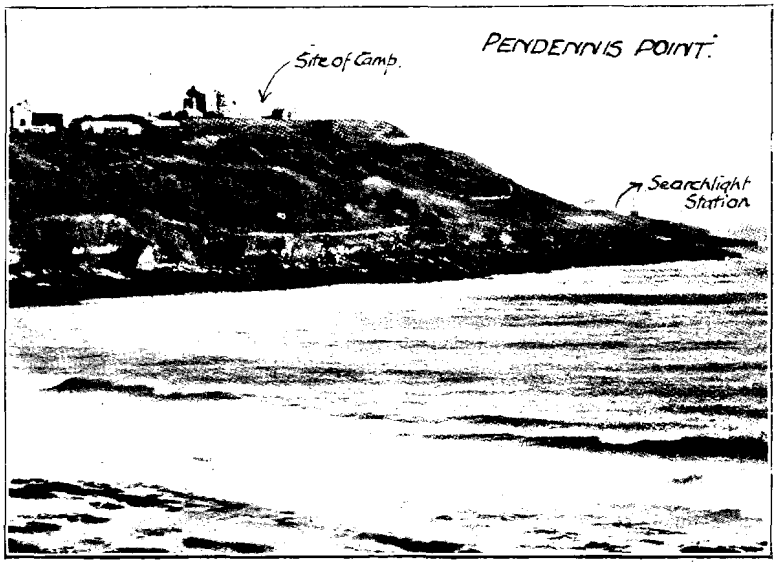
UNDER CANVAS WITH THE ELECTRICAL ENGINEERS TERRITORIAL FORCE.

By HARVEY SMITH, *Metropolitan Engineer's Department.*

IT has been suggested to me that one of the chief reasons which deters many would-be Territorials from joining is the fact that annual training in camp is compulsory. There seems to be an impression that the military discipline, coupled with the discomforts camp life entails, must be particularly irksome to the raw recruit hitherto unused to such luxuries.

So far as the Electrical Engineers corps is concerned, the reader is asked to judge for himself, after reading these notes, whether the impression is justified. My own experience of a first year's camp in the corps proved particularly enjoyable. The open-air life, the novel surroundings and general atmosphere of the social, military and technical sides of the camp, combine to make one feel that the short training has come all too quickly to an end.

The Electrical Engineers (London Division) is a branch of the Royal Engineers, and provides detachments to man certain of the various searchlight stations situated at all defended seaports.



There are three main reasons which tend to make the annual training in camp specially attractive—

1. Camps must of necessity be formed on the sea coast.

2. The searchlights at each seaport only enable a small number of men to be trained at a time. This necessitates the camps being spread over the whole of the summer months, and each man can therefore choose a time for attendance most convenient to himself.

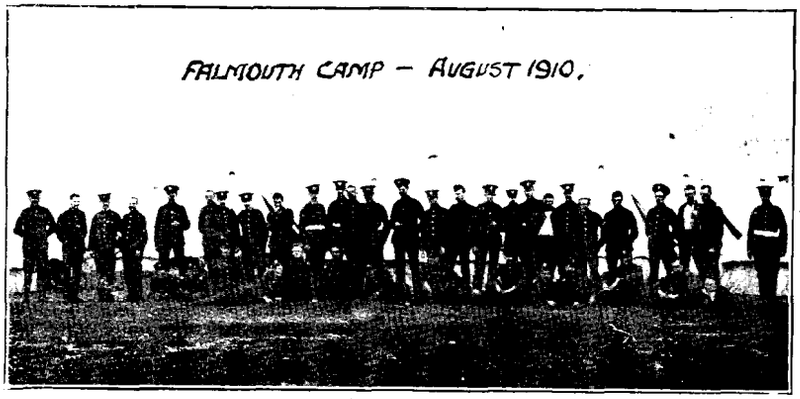
3. The military side of the training is naturally not so rigorous as in other corps, and the technical training received in handling the apparatus in each searchlight station is of real value, far more than is the knowledge gleaned from text books.

During the year 1910 camps have been formed at the following seaports:—Weymouth, Plymouth, Harwich, Sheerness, Dover and Falmouth. It was my good fortune to be sent to the Falmouth camp, and these notes are intended to convey an idea of the life during the short period of training received there. Each camp varies slightly in routine, much depending on the number of officers present and their zeal for military *versus* technical training.

Those who know Falmouth will appreciate the unique position chosen for the site of the camp, viz., on the high ground of Pendennis Point, overlooking the Castle Drive. To quote the words of the guide book:

> "The view from the hill, overlooking as it does the bay, harbour, St. Mawe's River, the River Fal, Penryn River, Flushing and Falmouth Town, and the undulating panorama of country, is unrivalled even in Cornwall."

The recruit's first night under canvas is usually considered to be a somewhat sleepless one, due no doubt to the novelty of his position. In my own case, however, no difficulty was experienced, the regular wash of the breakers on the beach below making a most excellent soporific. The regulation Army bell tent is, I believe,



intended to accommodate ten occupants under ordinary conditions, and I am afraid I should consider it fairly well packed at that. What it must have been during the South African War, when as many as 30 were told off to one tent, must be imagined; personally I considered that with the four other occupants who made up the complement of my own tent we were quite comfortable and desired no further company.

Each bed consists of a waterproof sheet laid on the ground on the top of which is laid in succession a straw mattress, pillow and three blankets. These, with on overcoat thrown over the whole, form ample protection against the cool night air. Unfortunately, the Government does not appear to cater for men over 5 feet 6 inches or so, and, if over this "standard" length, one's toes have a habit of creeping out of cover during repose. Such small inconveniences as earwigs, etc., soon become insignificant; indeed, without the usual "earwig hunt" prior to getting between the blankets, one of the excitements of camp life would be lost.

Reveillé, or its equivalent, is usually at 5.30 a.m. The energetic man, however, who has had the forethought to clean his equipment overnight turns over with a self-satisfied smile for an extra half hour's sleep, for the first parade of the day is not until 7 a.m. A high standard of cleanliness is required at this parade, which is of an hour's duration and acts as an appetiser for breakfast. Boots must be brushed, belts, etc., must be "blancoed." Buttons must be polished and rifles must be cleaned, and a spectator walking through the camp at 6.30 a.m. would be very much impressed with the zeal and energy with which each man polished, brushed or rubbed.

Breakfast follows at 8 a.m. after which a rush is made for the tents, for each man's bed must be rolled up and the tent thoroughly tidied. The untidy bachelor learns during his "camp" the value of neatness if he learns nothing else, for there is usually considerable competition amongst the various tents for the "tent prize" awarded to the best kept tent during the camp, and it is surprising how quickly a man's untidy habits are eradicated.

The morning parade is generally from 9.30 a.m. until 12·30 p.m. This is a technical parade and consists of actually working the searchlights under service conditions, tuning up, as it were, for the night run. The arc lamps used for the searchlights are of a very large type. Each lamp is supplied with current from a separate dynamo, which in turn is driven by a 25 horse-power oil engine. The searchlight station consists of an engine room containing the engine and dynamo, and an emplacement containing the arc lamp. Each separate station is controlled by telephone and motor connections to a common directing station from which all the instructions for running are received.

The arc lamps used are of the horizontal carbon type, 38 mn. positive and 26 mn. negative. The current used can be as much as 150 amperes at 60 volts and the light obtained is so powerful that it is difficult to ascertain its candle power. It has been roughly estimated at 40,000, but is probably more than this.

Adjustments made to the carbons are under cover of a darkened glass screen as the intense light would be very harmful if allowed to fall on the naked eye.

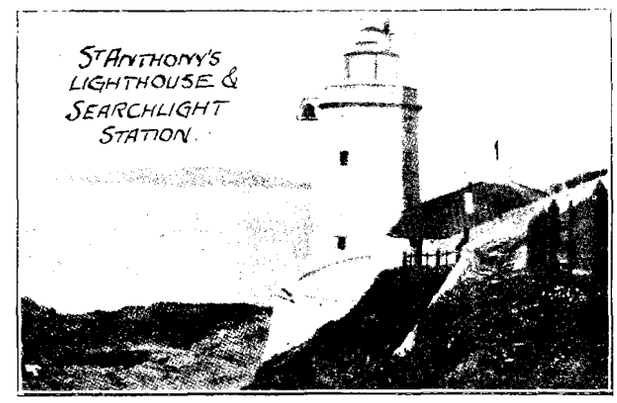
The emplacement being usually right on the fringe of the coast the men in charge of the lamp are fortunate in working with the continual smell of the briny in their nostrils. In stormy weather the lookout must be grand indeed with the huge waves breaking on the rocks below and dashing the spray high in the air.

Needless to say at the end of a morning parade one has obtained a thorough appetite for dinner. It is usual for the afternoon to be free, prior to an all-night run of the lamps, and it is on such afternoons that the true delights of camp life are realised and appreciated. The least energetic stretch themselves on the shady side of their tent and while the hours away in smoking or "yarning." Those whose spirits are more buoyant provide a free entertainment by organising "bear baiting" or "cock fighting," but the majority wend their way with towels down to the rocks below. After a morning's turn with engine or lamp (during which needless to say a fair proportion of grease, oil and carbon dust is picked up) there is nothing more enjoyable than a plunge in the clear water from the top of a suitably placed rock. The Cornish coast is noted for the clearness and colour of the water.

If no night run with the lights has been arranged the afternoon is generally devoted to military drill, only this time of a more interesting nature, consisting of skirmishing and practice in the use of cover, etc.

An "all-night run" is an experience well worth any discomfort experienced, more especially when the men are told off into "shifts." Each man parades with a blanket and marches or proceeds by boat to his separate searchlight station. He is then instructed as to the time his shift commences and the light he is stationed on, and is turned adrift to obtain his precious few hours' sleep. On one occasion I and my fellow lamp-man had to resort to the cold comfort of the bare rocks, and in fear of oversleeping ourselves we carefully gauged the progress of the incoming tide, and so arranged our position on a comfortably hollowed-out rock that the spray from the advancing waves would prove an effectual "alarm." As it happened the efficacy of our arrangement was not put to the test, for the unique situation was not at all conducive to sleep of a sound nature.

Constant attention is required once the lamps are under weigh, as on no account must the light go out unexpectedly. The beams of light from the arc are traversed (viz., moved along their allotted path) by means of motors coupled to the projector and controlled from the directing station. Standing behind the lamp and looking along the direction of the beam one realises how difficult it would be



for any hostile vessel to enter the harbour. The effective range of the light is 1,500 to 2,000 yards, and the different beams from the various lights are so traversed that the whole harbour is well explored. Each object on which the beam falls is brought vividly into relief, forming a splendid mark for the gunners in the fort behind. It is customary to traverse the beams as quickly as possible back to their first position once the sweep is over, the outward motion being done slowly in order that the surface of the water can be well explored. By these means a vessel can be prevented from creeping into the harbour behind the light as

would be the case had the traverse been of slow speed both outward and inward.

The lamp men are protected in a measure from the shells from an attacking force by the stout concrete base of the emplacement.

Sufficient perhaps has now been said to show that a Territorial soldier's lot in the Electrical Engineers is by no means an unenviable one. The position of the camp makes the life as healthy as one could wish. The pay of 1*s.* 8*d.* per day upwards while in camp supplies a certain amount of pocket money; the work is of an extremely interesting and useful nature: a sufficient amount of leisure is given to prevent any complaint of overwork: and last but by no means least, there is the feeling that one is fulfilling a duty owed by every loyal Briton to make himself efficient for the service his country may at some future date require from him.

The reader, if interested, is requested to refer to Mr. Grinsted's article in the January, 1909, JOURNAL, which gives further information with respect to the general work of the corps throughout the year.

TELEPHONE WOMEN.

LXXVI.—HARRIET MARTHA YEATES.

MISS YEATES, the Clerk-in-Charge of Portsmouth, joined the the service early in 1894. She has served under six district managers, and, amongst other things, remembers the time when pole-changers were in use in exchanges. This fact is more

HARRIET MARTHA YEATES.

especially impressed on her mind as on one occasion when the ringing failed inquiries were made, and it was found that the caretaker had stopped the pole-changer because the noise it made interfered with the slumbers of her infant. In the early part of her time it was no uncommon thing for the operators to have a book or a piece of crochet work to beguile away the intervals between calls, but the conditions under which operators now work have changed entirely and have improved both as to pay and hours of work.

Miss Yeates has no particular hobby, but takes a great interest in the staff, and four years ago she started a very successful thrift club amongst the operators. In 1905 she served several months in some exchanges in the Metropolitan area, and Portsmouth profited considerably by the experience which she gained there.

LXXVII.—CONSTANCE HORNER.

As an organisation practically indispensable to the whole business community, the telephone business is young, but as proof of its progressive nature the earlier experiences of those who have been in the business even for a short time, read like ancient history.

CONSTANCE HORNER.

Miss Horner, who is the Senior Supervisor at Leicester Central Exchange, entered the Company's service in January, 1893, and has continued therein without a break. She was the fifth operator to be engaged at Leicester, when the exchange was situated in the top rooms of Exchange Buildings, Rutland Street, and there were less than 400 subscribers connected. The service was overhead earth circuit and there was no sub-exchanges, and therefore no junctions.

Miss Horner has witnessed the removal of the exchange from the original premises to the Company's own building on the opposite side of the same street, and the growth of subscribers from 400 to nearly 4,000. Metallic circuits underground have replaced the old circuits, and ten sub-exchanges, served by some 40 junctions, have grown up round the central.

Leicester was formerly part of the Nottingham district, and so Miss Horner has served under as many as five district managers, viz., Messrs. Bennett, Cook, Williamson, Sibley and Ashton.

The outstanding feature of Miss Horner's disposition is gentleness, and she is particularly successful in dealing with irate subscribers. Kindness is the main note in her dealings with her subordinates, and however exacting the circumstances may be, either in regard to subscribers or staff, she never loses her temper. She holds the esteem of her superior officers and is worthy of a place in our gallery of "Telephone Women."

The National Telephone Journal.

"BY THE STAFF FOR THE STAFF."

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VOL. V.] OCTOBER, 1910. [No. 55.

SOME OCTOBER REFLECTIONS.

ALTHOUGH Jan. 1 is the official commencement of the New Year, the date on which resolutions are made, and new leaves turned over, and alas! so often soon blotted again, there is probably some date between Sept. 1 and Oct. 1 wherefrom busy folks could most fittingly date the beginning of their new year. It is about this time that they and their staffs come back into the battle of industry with revived energies and hopes to plan and work almost unremittingly until the quieter days of the following August. The telephone man forms no exception to the rule. With the beginning of October the tide of business is in full flood and shows little signs of ebbing until the next July. The telephone service—like those sacred temple lamps which are never permitted to go out—is continuously alive day and night, summer and winter, and the operators may not inaptly be compared to those vestal virgins whose duty it was to keep the flame alight. But, putting metaphor aside, although even the holiday season makes its claims on the telephone, and, indeed, in seaside and other resorts an increased claim, yet in August and September there is, generally speaking, a lull (partial and varying in degree, but still sufficient to be noticeable) in the activities of the year. The successive absences of colleagues and clients on vacation make themselves felt, until at length one's own holiday makes the final chasm which separates 1908-9 from 1909-10 or 1910-11 from 1911-12. But these comparatively quiet days are past again, and the gigantic task of the staff appointed to take an inventory of the Company's plant looms before us.

The interesting article on an engineer's training and qualifications, by Mr. FRANK FOWLE, which we reprint from *Telephony*, and that by our contributor "P. T. W.," on education, reminds us that at this time of the year the telephone societies commence their sessions—another proof, if any were needed, that October begins the telephone man's year. A scheme of prize competitions similar to those which were productive of such excellent papers last year is again announced, and some particulars of it are given elsewhere in our columns. The words "education," "higher education" and "technical education" are become familiar in our mouths as "household words." They form an ever-present subject of discussion in Press and on platform, and must continue to do so while deficient education continues to be a national failing. We need not repeat our appreciation of the good work which the telephone societies and correspondence classes are doing; we only urge members of the staff to take full advantage of them. Mr. FOWLE in making out a strong case for the importance of the status of the telephone engineer requires of him a range of knowledge truly encyclopædic. The realm of telephone engineering, so far from being narrow, is wider than most other branches of engineering. The telephone engineer in addition to being an electrical expert must have a considerable knowledge of civil engineering, building, lighting and heating, and be something of an accountant and financial expert.

Real education—whether technical or general, whether in science or letters—is that kind which is continuous and pre-eminently voluntary. Opposed to it is that forced kind which has for its objective the passing of an examination and there ceases. For all the broader purposes of culture and self-development it is absolutely useless. It may qualify a man for entry into this or that service, but it will carry him no further. One becomes increasingly familiar with a type of educational advertisement making resplendent but crudely worded offers, such as "We secure you a good salary," "More knowledge means more pay," and so forth. We will indulge in no cant about despising money and the power for social improvement it carries with it; we know that everyone hopes and desires to see his efforts rewarded by an increase in salary. But it may be said at once that he whose every hour of study is dedicated only to the hope of pecuniary gain, who touches on no subject except it seems to promise more pay, who in fact eschews all knowledge as labour lost unless he can see it paying tangible interest on the mental capital he expends, has a mistaken sense of the value of education and is probably foredoomed to disappointment. Knowledge pays an abundant interest on the mental capital to which we have referred; but it must be acquired generously and for its own sake. Then it will bear fruit in the immediate and certain ripening of a man's mental powers which must inevitably react on his earning capacity.

OPERATOR AND PUBLIC—ANOTHER SIDE.

To arrive at the golden mean seems strangely enough to be one of the permanent insoluble problems which never cease to afflict the world. The relations of telephone operator and public form no exception to the rule. Not long ago we had occasion to refer to the extraordinary decision of an American judge, that a telephone company had no right to dictate what language a client should use over their wires—even when he insulted the operator. Now a paragraph is going the rounds of the Press to the effect that in a town in East Prussia, a genial and much-respected citizen

after being kept waiting at the telephone for some time ventured mildly to remonstrate with "my dear girl." For this "insulting expression" to the operator, who of course is a government official, he was served with a notice of police proceedings and is understood to be awaiting the direst penalties. There would thus seem to be a ludicrous disparity between the practice of two civilised countries, when in one case the subscriber is free to affront the operator and in the other the telephonist can tyrannise over the citizen—for that of course is what this extreme sacredness of the person of the official portends.

SECOND INTERNATIONAL CONFERENCE OF ENGINEERS OF TELEPHONE AND TELEGRAPH ADMINISTRATIONS.

THE Second International Conference of the Engineers attached to the Government Telephone and Telegraph Systems of Europe was held in Paris from Sept. 4 to 10.

The conference was presided over by M. Estaunié, the Director of the Telephone Administration of France. Among those present were Dr. Breisig and Dr. Strecker (Germany), Herr Arthur Linninger (Austria), MM. Roosen and Colson (Belgium), M. W. G. Thomsen (Denmark), MM. Bordelongue, Seligmann-Lui, Devaux Charbonnel and Bouchard, Engineers-in-Chief of Telegraphs, and M. Milon (France), M. A. E. R. Collette (Holland), MM. Kolossvary, J. Höllös and Béla Gáti (Hungary), Professor di Pirro (Italy), M. Iversen (Norway) and MM. Landstrom and Carl Egner (Sweden).

The British Post Office engineers present were Major O'Meara, Messrs. A. J. Stubbs, J. E. Taylor, F. L. Henley, F. Addey, H. R. Moore, H. Brown, and J. G. Lucas.

In addition to the engineers of the Government Administrations, certain others attached to commercial organisations were invited, among them being Dr. Ebeling of Berlin, Mr. J. J. Carty, Engineer-in-Chief, American Telephone & Telegraph Company, Mr. C. E. Scribner, Engineer-in-Chief, Western Electric Company, and Mr. Gill, Engineer-in-Chief of the National Telephone Company.

Six questions upon which papers had been prepared were discussed at the conference. On the first of these—"Manual *versus* Automatic Switchboards"—the interesting point of the discussion was a speech by Mr. Carty in which he dealt very forcibly with the necessity of working out a clear fundamental plan providing for the future growth of the whole system, before any attempt was made to discuss the switchboard situation. He emphasised very strongly the necessity of testing any proposition for equipment by considering how that equipment would work as a part of the completed organisation contemplated by the fundamental plan. He pointed out that the expression "automatic *versus* manual" was very misleading, because in the so-called manual system there were many automatic operations and in the so-called automatic system there must be, unless the system became impracticable, a great many operators. The advocates of the manual system therefore admitted the possibility of a large amount of automatic work and the question roughly was, where was it best to employ the manual labour and where the automatic apparatus. He summed up by saying that he had made a very large number of most careful investigations, and so far, he had not found any so-called automatic system which would successfully conduct the telephone service. After Mr. Carty's speech there was very little discussion.

The second question was the very important one of the standardisation of telephone measurements, and it was agreed that for calculations, the telephone current should be considered as being composed of a pure sine wave current with a frequency constant of 5,000, *i.e.*, a frequency of roughly 800 periods per second. It was also agreed that it was desirable from an international point of view to have a term of comparison in which the efficiency of a circuit could be expressed, and it was agreed to use for this the attenuation length, *i.e.*, the attenuation constant multiplied by the length. It was further agreed that with the apparatus in use and in the case of an ordinary copper aerial line joined directly to the apparatus the relation between the attenuation length and the audibility of the speech might be regarded as follows:—

	Attenuation length.
Very good	2·5
Good	3·5
Practical limit	4·8

It was agreed that a further study was necessary to define the attenuation length for other uniform lines and for non-uniform lines, and generally that the whole matter should come up again at the next conference for verification. It was also agreed that a committee should settle the actual apparatus by which the attenuation length should be measured.

[The above is open to considerable criticism and the practice which the National Telephone Company has observed for many years is much more precise and complete; but since the effect of the above paragraph is to make the resolutions rather tentative than absolute the matter will no doubt be completed satisfactorily later on. The relation between the standard mile and the attenuation length is as follows:—The Company's standard cable has an attenuation length of ·107 and therefore if the decimal place of a cable reading is moved one to the left, this reading will be 7 per cent. too low, *e.g.*, 30 miles of standard cable has an attenuation length

$$l\alpha = 3 \times 1{\cdot}07.$$]

In the discussion on long distance telephony the main feature of interest was the contribution by Mr. Carty dealing with some of the recent American work. He stated that an underground cable was projected between New York and Washington and another between New York and Boston.

He stated also that the difficulties connected with the loading of No. 8 open wire had been altogether overcome, and that practically every long telephone line in the country had telegraphs superimposed thereon, and also that increasing use was being made of phantom (superimposed) circuits for telephone work, and he repeated the information known already to many of our readers, but apparently new to many members of the conference, that the efficiency of the phantom circuit is considerably greater than that of the side circuit, and also greater than the straight circuit would be without any superimposing coils in it.

He stated that up to recently they had to make a choice between having a circuit loaded or phantomed. Recently, however, it has become possible to load the side circuits and also the phantom circuits. This undoubtedly marks a great advance, and should do much to extend the distance between towns over which speech can be conducted at economical rates.

In the discussion of new processes for the preservation of poles, the chief feature was a new method employed by the Hungarian Administration for getting the creosote into that part of the pole where likely to do the most good. From the butt of the pole to a distance a little above the ground line a series of holes are made by piercers so constructed as to merely separate the tissue without breaking it. The poles are put into the tanks, and it is said that a shorter time than usual allows the creosote to get into the wood to a greater depth in the butt section than by the usual process.

There were also discussions on the co-existence of strong and weak current lines and on multiple telegraphy.

WE understand that it is proposed to offer the same premiums for papers read before the telephone societies as were offered last year. The delay in the awarding of these premiums has been caused by the number of papers submitted, which have given the examiners a very much more difficult task than was originally anticipated.

In announcing the premiums for the ensuing season the committee wish the attention of secretaries and officers of the various societies drawn to the necessity which exists for complying strictly with the rules, as a considerable amount of difficulty has been caused through neglect of these rules in the past season.

THE PUPIN SYSTEM APPLIED TO AERIAL TELEPHONE LINES.

DR. EBELING in the *Electrotechnische Zeitschrift* gives particulars of some trials which have been made of the Pupin system, which has already been used with excellent results in telephone cables, on aerial long-distance lines in Germany. Most of the trials were made by the Siemens & Halske Company with the co-operation of the Imperial German Post Office.

Protection against Lightning.

The first question to be considered was whether on the insertion of induction coils in aerial lines the apparatus would be capable of resisting electrical discharges. As a good permanent state of insulation plays a large part in aerial lines, it was decided not to

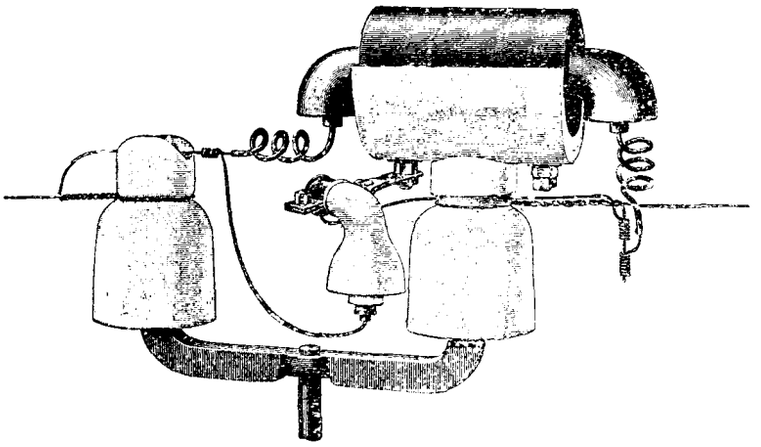

FIG. 1.

employ arresters with earthed connections, and preference was given to an apparatus short-circuiting the coil. This apparatus was mounted in a primitive fashion on the Berlin-Magdeburg line (see Fig. 1) and worked very well. Only the arresters were damaged by lightning and not the coils, although the discharges

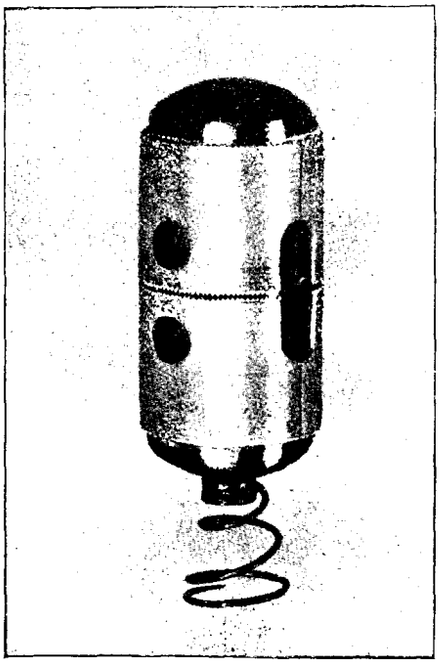

FIG. 2.

were sufficiently strong to fuse the line wire. Consequently lightning arresters have been regularly employed on pupinised lines and the apparatus has always been an arrester mounted in parallel with the coil. The external form has changed in course of time but the principle has always remained the same. Fig. 2 shows the vacuum arrester as it is used to-day. It will be seen that it is completed by a rudimentary arrester formed by the metal cylinders prolonging the two metallic caps and leaving only a small space

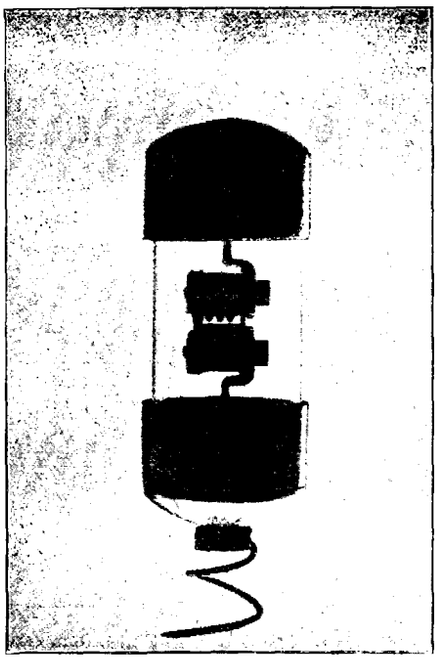

FIG. 3.

between them. The edges of this space are pointed so as to form the points of the arrester. This rudimentary form of protector has been chosen because the coil is protected as far as possible, even when the glass covering is broken by a violent shock of lightning. In this case the spring of the vacuum arrester approaches the metal cylinders and short circuits the coil in such a way that any new strokes of lightning are unable to damage it. Fig. 3 shows the vacuum arrester alone and distinguishes the internal parts.

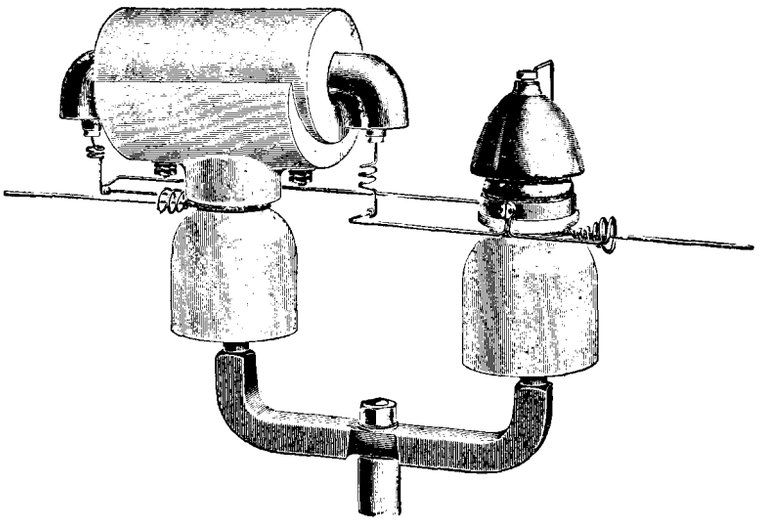

FIG. 4.

Lines with Single Coils.

The first aerial lines were provided with single coils on the A and B circuits. This was because it was desired to set up as simple conditions as possible and avoid difficulties of insulation and derangements which might have occurred if the A and B wire had been introduced into the same apparatus.

Coils Enclosed in a Cylindrical Elongated Covering.—Berlin-Frankfort-on-Main line (first equipment). It was decided to equip a line as long as possible so as to give the Pupin system a fair trial, the first line experimented on (Berlin-Magdeburg) being only 150 km. in length. A new bronze wire 2·5 mm. in diameter was run on the Berlin-Frankfort route—a distance of 580 km. (about 360 miles).

This trial promised to give results all the more interesting in that there existed between the two terminal points one line of 4 mm. bronze and another of 5 mm. which could be compared with the trial line. The 4 mm. line was of the same length of 580 km., so that the results obtained could be determined exactly, while the 5 mm. line which was run on a different route was 540 km. in length. All lines were double wire.

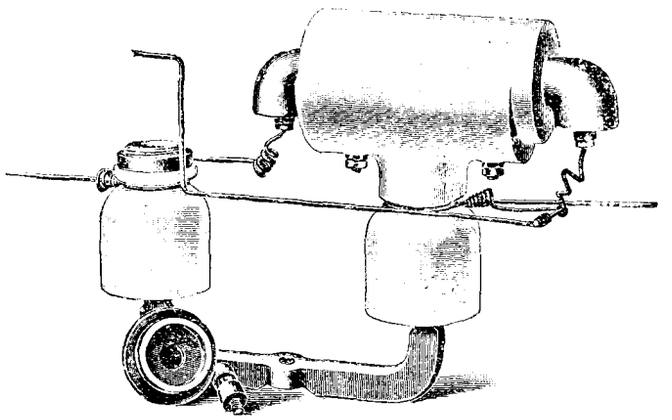

FIG. 5.

The coil cases, placed at every 5 km. along the lines, had in general the same form (Fig. 4)—that employed in the Berlin-Magdeburg line. The cylindrical coils had a core and an envelope of special magnetic material by which they were surrounded and in which the two outgoing sleeves were fixed. It was thought necessary to be particularly careful in the first aerial line of any great length that the material of the iron core should not produce at higher frequencies greater losses which would destroy good transmission of the voice. The permeability of this iron was, certainly, relatively slight, but great enough to produce sufficient self-induction.

The lightning arrester, which was fixed on a second insulator, was of novel form. The vacuum arrester was placed in an ebonite bell which could be easily unscrewed. Fig. 5 shows the apparatus with the arrester open. Fig. 6 shows the coil case on the arms of the pole.

The line was first of all run entirely without coils, so that the results given by the line without coils could be ascertained. But the points where the coils were to be placed were marked in advance and measures were taken that the fixing of the apparatus could easily and rapidly be made.

Attempts at conversation on the three above-mentioned lines were then made, and it was found that the volume obtained on the 4 mm. and especially on the 5 mm. line were, as might be expected, considerably greater than that of the trial line before the fixing of the coils.

The coils were at length fixed on the trial line and attempts at conversation were made. The line with the greatest volume was still the 5 mm. line of 540 km. length. Then came the Pupin line with volume slightly weaker, and lastly the bronze line of 4 mm. The relation between the values of the volume on the three lines varied slightly on different days, due to the variable quality of the insulation of the lines; but generally the relation remained the same.

The results obtained by the trial conversations correspond in their results with the values given by calculations. For a long telephone line the product of the attenuation constant and the length of the line would form a basis. Neglecting the leakance—which is permissible since the insulation of the lines during the trials was at least 10 megohms—the value of the co-efficient of attenuation for the lines without coils is given by the equation

$$\beta = \sqrt{\frac{p\,C}{2}\left\{\sqrt{p^2 L^2 + R^2} - p\,L\right\}}$$

C being the mutual capacity R and L the resistance and the inductance of the loop per km., and $p = 2\pi n$, n being the frequency.

For the loaded lines this equation takes the following simplified form:—

$$\beta = \frac{R_1}{2}\sqrt{\frac{C}{L}}$$

in which R_1 represents the resistance per kilometre value of line + coils.

The effective resistance of the different coils was about 8·7 ohms, and the self-induction about 0·11 henry. As the coils were placed at intervals of about 5 km., the fifth part of these values should be introduced into the calculation. The following table

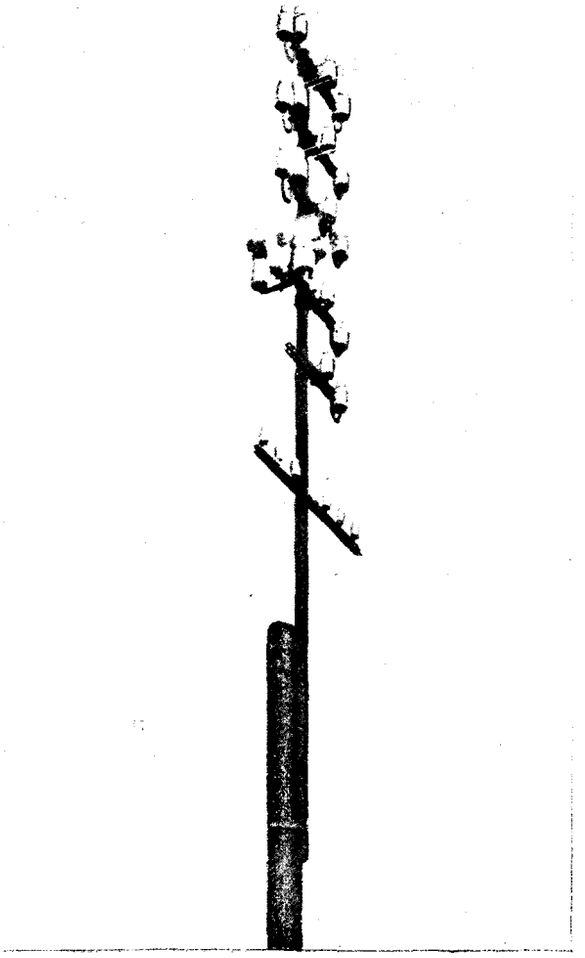

FIG. 6.

contains the numerical values employed for the electric constants of the lines obtained at 900 periods:—

(*a*) Effective resistance in ohms per kilometre of loop.
(*b*) Inductance in henries per kilometre of loop.
(*c*) Mutual capacity per kilometre in microfarads.
(*d*) Attenuation constant.

Lines.	*a.*	*b.*	*c.*	*d.*
Bronze line of 5 mm.	1·92	$186 \cdot 10^{-4}$	0·0063	0·00176
,, ,, 4 mm.	3·00	$194 \cdot 10^{-4}$	0·0060	0·00262
,, ,, 2·5 mm. without coil	7·70	$214 \cdot 10^{-4}$	0·0055	0·00591
,, ,, 2·5 mm. with coil ...	11·18	$4{,}610 \cdot 10^{-4}$	0·0055	0·00193

All these values should be considered as theoretic data. Relatively to the value of β = 0·00193, the pupinised line corresponds to a line without coils of 4·7 mm. of diameter.

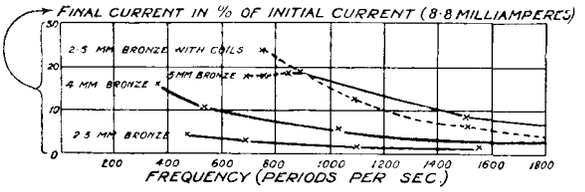

FIG. 7.

As the length of the 5 mm. line is about 540 km., and that of the other line is about 580 km., the following value is obtained for the product of the attenuation constant and of the length :—

1. For the line of 5 mm. ... ... βl = 0·95
2. ,, ,, 4 mm. ... ... βl = 1·52
3. ,, ,, 2·5 mm. without coils βl = 3·43
4. ,, ,, 2·5 mm. with coils ... βl = 1·12

The smaller the value of βl the greater the strength of the line. that is to say, the greater the intensity of transmission. It is generally said that a line permits good talking when the value of βl does not exceed 1·5, and that the talking is still efficient when βl = 2·5. The value of βl = 1·52 for the 4 mm. line, and indicates that this line reaches the limit of good talking; the line of 5 mm. and the pupinised line of 2·5 mm. are beneath this limit, the corresponding values being 0·95 and 1·12. Their power may therefore be considered as very good. On the other hand, that of the 2·5 mm. line, without coils, of which the value of βl = 3·43 may be considered as inefficient. It approaches indeed the limit of practical communication, which corresponds to βl = 3·5 to 4.

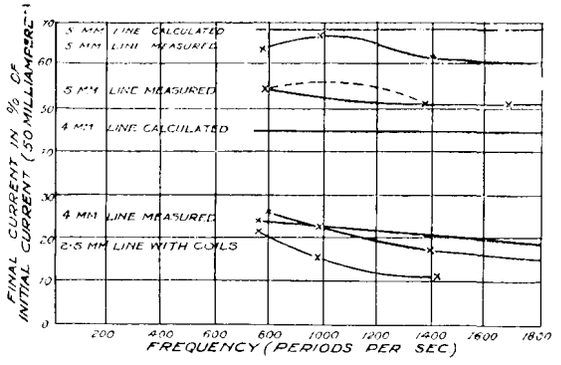

FIG. 8.

In all cases the values of βl show that the 2·5 mm. line, not equipped, has an effective volume well below that of the bronze line of 4 mm., whilst the volume on that line, equipped with coils, was stronger than that of the 4 mm. line, but inferior to that of the 5 mm. line. It will be seen, consequently, that the results determined by the values of the line and the coils agree with those which were obtained in the trial conversations.

When during the trial conversations the ordinary lines were joined up with the Pupin line and to the other trial lines, it was noticed, especially when the joined-up lines were short, that the power of the Pupin line diminished slightly in comparison with that of the ordinary lines. In certain cases the Pupin line was no longer noticeably superior to the ordinary 4 mm. line. This attenuation of sound which arose without doubt from the effects of reflection, could be diminished in certain cases by the employment of appropriate transformers. It might be said that the bronze line of 2·5 mm. equipped with coils, was at least equivalent in all cases to a line of 4 mm., and that the volume on that line exceeded very noticeably that of the ordinary line of 4 mm. when the local lines were joined up to the two extremities of the line.

Measurements by dynamometer were likewise made of the line. The results of these measurements are indicated in Fig. 8. The final current corresponding to a constant initial current of 8·8 milliamperes was measured at different frequencies between 600 and 1,800 periods. The curves showed very nearly the values corresponding to the results obtained in the trial conversations.

These values cannot be scientifically utilised for various reasons. Firstly, the dynamometer employed was not adapted for such measurements because its resistance and self-inductance were relatively great: they were respectively about 400 ohms and 0·4 henry, but for this reason it resembled a telephonic station, that is why the values obtained appear to us instructive. Further, the intensities were much too strong, which is important in relation to the line equipped with coils, because the effective resistance at high frequencies was much more considerable than in the case of telephonic currents.

In all cases the curves show that the bronze line of 2·5 mm., which is much inferior to the 4 mm. line when it does not include the coils, become more powerful when equipped with coils and then takes rank between the bronze line of 4 mm. and that of 5 mm.

All the curves fell considerably at high frequencies, but that was due to the dynamometer and not to the lines. This will be understood if one considers the impedance of the dynamometer

$$\sqrt{R^2 + (2 \pi n L)^2} \text{ for } n = 900 \text{ and } 1{,}800$$

attains a value of about 2,300 and 4,500 ohms against a value of 400 ohms at 0·4 henry for the direct current resistance.

These results naturally did not give us full satisfaction. Therefore we were obliged to employ a final apparatus offering the smallest losses possible. We used a bolometer to take measurements. It is true that this instrument is not very sensitive inasmuch as it is necessary to employ still greater intensities to obtain perceptible differences. The initial current had an intensity of 50 milliamperes, that is to say that it was five times stronger than with the dynamometer.

Fig. 8 shows the results obtained with the bolometer for the 5 mm. line, the 4 mm. line and the Pupin line: the measurements on the 5 and 4 mm. lines being taken on two different dates. It will be seen that the measurements vary very greatly, particularly those of the 5 mm. line. The values ascertained by the measurements differ also from the theoretic values, *i.e.*, those obtained by calculation, which are represented by a thicker stroke: the difference, indeed, is very noticeable. After what has been said it is not astonishing that the Pupin line gave, with the high intensities which are employed, inferior values to the 4 mm line. In any case the result of these bolometer measurements was that the heavy fall in the intensity noticed at high frequencies in the dynamometer measurements proceeded from the great resistance and high self-inductance of the dynamometer

(To be continued.)

ENTHUSIASM AND ENERGY.

BY STERIKER GASSIOT HARE.

THERE is indeed much truth expressed in the article by Mr. A. C. Nick in the September issue of the JOURNAL, upon the subject of "Enthusiasm and Energy"; at the same time one may not agree with him in all points.

Man or youth cannot be made enthusiasts; you cannot coerce or enforce enthusiasm into their system, but you can, if necessary, enforce energy.

I repeat—man or youth cannot be made enthusiastic; there must be something that appeals to one's nature, and if this something touches a certain point or talent possessed, action will take place, enthusiasm will find a vent and energy be produced.

Everyone that is born into the world, male or female, is endowed with a special gift, and all human beings are brought into the world for a specific purpose—viz., for use and not abuse. It is the duty of parents, guardians and all who have the custody of youth to train with wisdom and discretion, teaching the elementary yet most important lessons day by day, duty to God and duty to man. Under such influence and training youth will imbibe divine (otherwise good) inspiration that makes an enthusiast.

As time passes and the mind of youth expands, so the brain becomes active and ambition sets in.

Brain asks: What would you like to be?

Enthusiasm replies: A soldier, sailor, doctor, lawyer, clergyman.

And ambition echoes: So you shall, my boy.

Energy prompts the youth to open his mind, and with a frank heart, pours out his desire to the parent or guardian, who has trained him so far. The wise counsellor will encourage the youth in his ardent desire, and if necessary deprive himself in order that the boy shall have every opportunity of making his mark in the profession he has selected.

With this opportunity the young enthusiast sets forth with energy, and coupled with steady undaunted perseverance, in due time reaches the goal that was divinely inspired in the days of youth.

How many army recruits have become generals in our British Army? Cabin boys to British admirals? Chemist's boys to physicians? Solicitors' clerks to barristers? Mechanics to engineers? University students to archbishops? etc.—and what is the reason of such success? The solution of the problem is, that the enthusiast has not been thwarted but encouraged.

I may be asked: Does not youth often fail even though he may have the opportunities? I admit he does, but failure in such instances, in whatever form it may take, may be due to unfavourable circumstances that present themselves, or undue influences, such, for instance, as alluded to by Mr. Nick in his article. I would go even further than he asserts. There are those who sow that others may reap—in other words steal the honour from the one who has fought for it and to whom it is due.

An enthusiast is bound to succeed if not unduly hindered, and I firmly assert that businesses, and professions in general, would be in a far more prosperous condition if enthusiasm was not stunted as it is at the present day.

Again, there is a class of enthusiasts who are practically dead to work, who have no energy, or rather prefer a little more slumber, a little more sleep. But this type of man is not wanted to-day and to him I say: If you won't work, neither shall you eat.

Lastly, a man may be energetic because the necessaries of life compel him to be. What a miserable, pitiable condition—no ambition, no enthusiasm. Well, even such are worthy of sympathy and pity, and I think that in such cases as these with patient dealing and by good example you may possibly lead them in the pathway of enthusiasm. "It is never too late to mend" is an old proverb, and, whatever mistakes one may have made, do not stop and cry over spilt milk.

I would conclude by stating I consider it a good test as to whether a man is entitled to be described as enthusiastic and energetic, to take the attendance book, for twelve months, and note the time kept. If he has been punctual at his post he may claim to be energetic and an enthusiast—otherwise not.

THREE TELEPHONE SONNETS.

WE have pleasure in publishing some sonnets on the subject of the telephone, which were the outcome of a visit to a telephone exchange, by Miss Millicent Murby, who will be remembered by our London readers, as lecturing at some of the entertainments of the Staff Benevolent Society. She is well known to a wider circle in connection with social and woman-suffrage questions.

CONSCIOUSNESS.

Could we but view the air invisible,
A woof of warring atoms we are told
Our penetrative vision would behold:
And on the turmoil of this strife ineffable,
Our inspiration battens: myriad-fold
We multiply the conflicts there unrolled.
Sound waves persist when sound's inaudible:
The ambient air holds indiscernible
All jarring clangours from all times of old,
But threaded through as warp of woven gold,
Fair thoughts and fancies pass innumerable
Spun by the love that longing hearts enfold,
Riching the ether by their course patrolled
With purport of a depth unfathomable.

THE FARSPEAKER.

Threading the air, taut-stretched, the copper wires
Throw back the sunlight in a glint of gold—
A dazzling screen before their secrets rolled,
Significant of hidden throbbing fires.
Not from the housetops we proclaim desires,
Nor to the world our dearest dreams unfold,
Though from our gladness, rightly may it hold
Some cherished loveliness within transpires.
But when to hear thee I can wait no more,
Silent—alone—I wake the fairy light
That flashes forth and links me up to thee.
And then beyond the intervening roar
Of noisy streets, a bell calls suddenly:
A magic glow a sound—and we unite!

THE TELEPHONE.

The Exchange—a hive of low-voiced hurrying bees
Who hover murmuring o'er the flashing keys,
And their invisible charges try to please
With honey-sound of the arousing bell.
The emotions this engenders—who can tell?
Is it the lover hears? it pleases well,
And commerce quickens 'neath the eager spell
That man to man relates, his work to ease.
But oft the sound is fraught with tragedies,
And, nerve-racked or debt-haunted, men cry "Peace!"
To the irritant summons of that knell
That rouses them to tortures worse than hell.

Like Norns, the operators never cease
Weaving, inconscient, human destinies.

LONDON NOTES.

THE question as to whether the Territorial scheme will prove a success or otherwise is giving rise to much controversy. Some say it will not be possible to raise the number of men considered by Mr. Haldane as necessary; others again think that it would be possible to raise even more than this number.

With a view of finding out what the Metropolitan staff are doing for the Force the Chief Officers have been good enough to ascertain particulars as follows:—

Department.	Number of male staff.	Territorial Force. Officers.	Men.	Per cent.
Metropolitan Engineers	848	1	40	4·9
,, Electricians	522	—	46	9·0
,, Stores managers ..	250	—	4	1·6
,, Traffic	227	—	6	3·0
,, Contract	100	—	4	3·0
,, Chief accountants ..	150	—	9	
	2,115	1	109	5·2

Besides the above there are three Territorial Reserve and three Naval Reserve men.

THE percentage of men belonging to the Force is disappointing. Why the number is so small is difficult to get at. It is admitted, of course, that a man must be prepared to make sacrifices. He must give up a bit of his annual holiday and attend on drill nights during a portion of the year, but there are compensations. He has the satisfaction of knowing that he is doing something for his country; his physique is improved; he learns both to give and take orders; he forms many pleasant friendships, and if he joins one of the Engineers corps, which are specially suitable for the Company's staff, he adds to his technical knowledge.

Let us hope that in the future we shall raise the figure of 5 per cent. to something like 15 or 20 per cent. It would be interesting, and possibly it would stimulate recruiting, if the JOURNAL would obtain and publish returns from other districts showing what they are doing for the defence of the conutry.

THE beginning of the end in the shape of the inventory has come, and October will see many of the Metropolitan staff away in the country. Well, we wish the chosen ones good luck and good weather, and we have no doubt they will be able to give a good account of themselves in the "wilds." Some of their experiences should make good copy for "London Notes," and we shall be glad to hear from them.

HORTICULTURE has many votaries amongst the Metropolitan staff. After a strenuous day in the City, it is pleasant to get "back to the land," even if one never succeeds in growing anything really well except weeds. However, we have at least one expert; to wit: Mr. W. Bower, of the Western Fitting Department. A recent issue of the *Hackney and Kingsland Gazette* announces that on Sept. 5, at Dalston Amateur Dahlia Society, he carried off four first, one second, and two special prizes, and at the Middleton Show on the following

Saturday, he captured two first, one second, two third, and also a special prize for the best bloom in the show. We congratulate Mr. Bower.

ON Sept. 3rd the North-East Division held their annual beanfeast. They journeyed to Clacton-on-Sea where they dined at the "Hotel Central," and then took to boating, bathing and various games in the afternoon. Mr. C. E. Tattersall was the prime mover and seems to have done things in his usual style. On being questioned as to what sort of a time they had, he replied that they had an excellent day and everyone caught the train home. There have been times when on the festive occasions more than one man has missed the train home.

WE presume that the inventory will prevent for the present the final in the golf match between Head Office and Salisbury House. It will be remembered that Mr Gill and Mr. Cook, representing Head Office, won the first round against Mr. Lowe and Mr. Shackleton, while the second was won by the Salisbury House men. We hope that the inventory work will not prevent the final coming off before the end of the license.

THE Chess Club announce that the programmes for the coming season with regard to matches to be played has almost been completed. Ten matches have been arranged, and it is possible that two more may be added. New clubs entering the Civil Service and Municipal League are Westminster City Council and the Admiralty.

The opening night for the coming season will be Tuesday, Oct. 4, at "Ye Mecca," 140, Cheapside, E.C.

The club night throughout the season will be every Tuesday from 6 p.m. to 9.30 p.m.

A club handicap tournament will be held, the winner of which to receive a medal.

The secretary has not received any entries to date for the draught section, but no doubt these will follow when once the season starts.

GLASGOW NOTES.

THE new building being erected by the Company in Hope Street, in which the Douglas Exchange will be housed, is nearing completion, and it is anticipated that the exchange will be in operation by April, 1911. The ceremony of placing a jar in the memorial stone was quietly performed on Wednesday, Sept. 7; the jar contains the business cards of the architects, builders and principal officers of the Company, together with a copy of a local newspaper, a copy of the JOURNAL, table of rates, etc., etc.

WE have pleasure in recording that Mr. John D. C. Mackay, of the Glasgow office, who qualified in accountancy and law with honours in January, 1910, and was then admitted Associate of the Corporation of Accountants, Limited, has now been admitted Fellow of the London Association of Accountants, Limited.

FURTHER progress has been made in the unification of the Post Office and National systems. The Department's subscribers at Bearsden and Milngavie were successfully transferred to the respective Company's exchanges on Sept. 3 and 17, and at the time of writing it is expected that a similar transfer will be made to the Company's Clarkston Exchange on Sept. 24.

Society. The Telephone Society begins its session on Wednesday, Oct. 12, when a lecture will be delivered by Professor Magnus MacLean on "Kelvin: Investigations and Apparatus for Electric Signalling." During the session a lecture will be delivered on "Telegraphy," and the society is also to be favoured with a lecture by Professor Muir, Lecturer on Natural Philosophy at the Technical College. Opportunity is being provided for papers to be submitted under the conditions of the Head Office premium competition. The meetings will be held in the well-equipped lecture hall at the Technical College.

Operators' Society.—The arrangements for the coming session are well in hand and the first meeting will be held on Monday, Oct. 10. An interesting session is anticipated; papers dealing principally with traffic matters will be read before the society and as hitherto the club will supply the social part of the programme.

THERE has been some excitement on the bowling greens for some little time, and the results of the clubs' competitions are now announced.

Championship prize, single handed (presented by Mr. Geo. Johnstone), won by Mr. Wm. Stewart.

President's prize for pairs game, won by Messrs. Thos. Curr and F. Springer.

Rink Competition—Prizes presented by the Club.

First prize won by Messrs. W. Fursman, R. Brown, A. Blair and W. S. McKie (skip).

Second prize won by H. Sutherland, J. McMeeking, J. Kennedy and W. Wright (skip).

A successful season was brought to a close on Saturday, Sept. 17, when a match with Crosshill Victoria took place on Queens Park Green.

Bell Golf Club.—The August medal was played for on Aug. 20, when Mr. W. S. Stewart was returned the winner with the nett score of 87.

THE return golf match between teams representing Scotland, East and West, was played at Bathgate on Saturday, Sept. 10. The weather was not all that could have been desired but this had no deterrent effect. West was again victorious but by a dimished lead, the results being, West seven games, East six games and one drawn game. The arrangements were in the capable hands of Mr. J. H. Allan of Edinburgh. Details are subjoined:—

East.		*West.*	
R. Allan, Edinburgh	0	J. Lowe, Greenock	1
J. H. Allan, Edinburgh	0	W. A. Valentine, Glasgow	1
A. Robson, Edinburgh	0	W. Lang, Glasgow	1
W. Knox, Edinburgh	0	W. Stewart, Glasgow	1
T. Elliott, Galashiels	0	J. A. Swanson, Greencck	1
R. Inglis, Kirkcaldy	1	A. Shearer, Glasgow	0
R. C. Wilson, Edinburgh	0	H. Thomson, Glasgow	1
H. V. Main, Edinburgh	1	D. B. Hebenton, Glasgow	0
A. F. Dunn, Edinburgh	½	W. Allan, Glasgow	½
John Robertson, Edinburgh	0	R. Brough, Glasgow	1
C. L. Stewart, Edinburgh	1	T. Smart, Greenock	0
R. Dobson, Hawick	1	J. F. Murray, Glasgow	0
C. McFarlane, Edinburgh	1	A. S Duncan, Glasgow	0
R. B. Rae, Edinburgh	1	R. F. Kirkwood, Glasgow	0
	6½		7½

Many will regret to hear of the death of Mr. Archie Marshall who served the Company in Glasgow in the nineties, and was later employed in Birmingham. For some years he had been with the China & Japan Telephone Company, and was finally assistant manager at Singapore. He died on Wednesday, Aug. 31.

THIS is the elucidation of a mysterious "No reply." The calling subscriber, when questioned re the call, could not remember anything about it, but when pressed further said in a rich Irish brogue:

"Sure, Miss, I'll tell you how it was. As a matter of fact I didn't ask for the number at all, but P——'s traveller was in the other day saying it was a long time since I had given him an order. I told him I had tried to get his firm on the 'phone on Saturday but the operator said there was no reply, so I gave my order elsewhere. I only told him that to put him off, because the leather he sent me last time was very bad, and I thought I would try someone else.

"Just tell your Boss that, Miss, and I'll take the blame if there is going to be any trouble."

IN common with the rest of the country, arrangements are now being made for the forthcoming session in connection with the Correspondence Classes and the Technical College Evening Classes, and while locally there is a small decrease in the entries for the former, there is a corresponding increase under the latter. An interesting point in this connection is the fact that over 200 operators have arranged to attend School Board Evening Classes for English and arithmetic. This represents a large proportion of the entire staff, and and special classes have been arranged for them by the Glasgow and Govan School Boards.

AN unprecedented request has just been made by a large firm of warehousemen in the city. Two years ago their telephone service was brought up to date by the installation of a large private branch exchange and their experience of this has been eminently satisfactory. They now ask to be supplied with information as to the number of ineffective calls resulting from all their junction lines being engaged, so that they seem to realise the importance of the "open door." This is a point which is usually left to the Company to drive home.

CORRESPONDENCE.

THE CORRESPONDING CLERK.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

I HAVE read, with interest, A. H. Hudson's paper under the above heading, but I fail to see the necessity, as mentioned in the third paragraph, for the clerk to "go through" the files and extract those batches of papers bearing the current day's date, when by the use of Sch. No. 2092 and entries in a diary, all the clerk would have to do would be to refer to the diary each day for the "batch" numbers of the papers required that day, and then extract them from the filing cabinet, without wasting the time taken to "go through" the files.

Short particulars of the filing system in use at Manchester may be of interest.

Batch Number System of Filing Correspondence.

To commence this system the following requisites are necessary:—

1 double drawer card index cabinet.
1 large filing cabinet.
1 set of numerical cards.
1 set of alphabetical cards.
2 large letter baskets and
A quantity of Shannon cases.

Shannon cases may also be used in place of the large filing cabinet, but the cabinet will be found to save a great deal of time.

Numbering.—No numbers are allotted to the letters when received, this being done when replied to, or, where no answer is necessary, before filing.

The system of numbering is, that each morning, each individual typist is given a numerical card similar to the enclosed (No. 1). After the letters are dictated, if no previous batch of papers is referred to, or handed to the typist,

she refers to the card cabinet to see if there has at any earlier date been correspondence on the same subject. If so, she gives her letter the same reference number; if not, she gives it a number taken from the numerical

No. 1.

Dept.	No.	Name.	Subject.
	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		

card given her in the morning (of course, no two numerical cards bear the same numbers) and fills in on the card the subject matter of the correspondence on the same line as such number on the numerical card. These cards are then handed back to the file clerk who cross-references same under as many headings as she thinks they are likely to be asked for. For instance, should you receive a letter from Messrs. Heenan & Froude *re* damaged cable in connection with the London County Council, this would appear on the following cards:—

We will assume the batch number is No. 5.

Numerical Card.

1. .....
2. .....
3. .....
4. .....
5. Heenan & Froude—Damaged cable—L.C.C.
6. .....

Alphabetical Cards.

Card He.

5. Heenan & Froude—Damaged cable—L.C.C.

Card Da.

5. Damaged cable—Heenan & Froude—L.C.C.

Card Ca.

5. Cable damaged—L.C.C.—Heenan & Froude.

Card Lo.

5. London County Co.—Damaged cable—Heenan & F.

Card Co.

5. County C. London—Damaged Cable—Heenan & F.

The above makes the finding of correspondence a very simple matter.

Dead Matters.—"Dead" letters (letters finished with) are filed away, in batch number order, in Shannon cases and can be readily turned up at any future date.

Turning Up Letters.—All that is necessary to turn up a batch of papers is to refer to the card index, obtain the number, turn to the cabinet and take out the batch bearing that number. From this you will see it is not necessary for the clerks to trouble the file clerk to find their papers; each can find their own, but the file clerk must watch that no one takes a batch away without leaving his or her signature, which is entered on a card and placed in number order in the cabinet, this card being taken out and destroyed when the papers are returned.

Diary Notes.—To prevent matters being delayed, or to ensure that certain matters are cleared up, or dealt with on dates required, each clerk is furnished with a batch of diary slips (Sch. 2092), one of which he places at the head of papers so required, the file clerk entering the batch numbers against the respective dates in the diary.

General.—Each evening all batches of papers, both pending and dead, are brought to the correspondence room where two large letter baskets are kept, one marked "pending matters" and the other "dead matters." Each clerk when bringing in his or her papers must sort same into their respective baskets, drawing a blue line right across the top letter of any batch that is "dead" and initialling same, together with date. The following morning the file clerk goes through the "pending" basket, enters all diary notes and files away in filing cabinet, then turns to the "dead" basket and files away all "dead" matters in Shannon cases.

This method in theory may sound complicated, and one that takes up a great deal of time, but when once got fairly going is very simple, and in comparison to most methods very quick.

Of course all outward letters bear batch (or reference) number, and in the great majority of instances it will be found that the person replying will quote such number.

MARY DUFFY,
Manchester, Sept. 5. Chief Correspondence Clerk.

RECORDS OF CALLS.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

No doubt most recording clerks have had to put up with some very forcible remarks and threats from divers subscribers with regard to the recording of calls, and it is quite refreshing to have a subscriber admit that the calls recorded are correct. The following occurred recently at the Hull district office:—

A lady called in one day and in a most violent manner denounced the Company and its method of registering calls. I, however, used my most persuasive powers and eventually obtained the necessary deposit. Some months later she called in again to pay a further deposit, and, noticing a great difference in her manner, I ventured to ask if the record of calls was now satisfactory. Imagine my surprise on receiving the following reply:—"Oh yes, I have found out where the trouble was. My youngest son has a tricycle at home and in order to 'exercise it,' he gets up between five and six in the morning; not satisfied with this, he must have three or four friends with him, consequently, the telephone being handy, it was used to summon the said friends."

It appears the good lady had asked her elder children if they used the telephone and they denied doing so. It was not until one of her lady friends asked her to stop the boy from ringing up so early in a morning that the mystery was solved, as after getting out of bed and going to the telephone, she was invariably greeted with the query, "Is Reggie coming out?"

We have found out housemaids, servants, clerks, etc., using instruments without permission, but fancy a poor little toy tricycle being the cause of all the bother!

Hull, Sept. 19. H. B. PEGDEN.

A TELEPHONE PHRASE BOOK.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

TELEPHONY and phonography, like youth and love, go hand in hand.

With the aid of the "winged art" innumerable telephonic communications are committed to paper.

It is certain that a large number of the Company's staff, and particularly the clerical staff, are phonographers.

Sir Isaac Pitman & Sons, whose system of shorthand I use, have long ago issued hand-books wherein their system is adapted to various businesses, etc.; for instance, they publish the "Banking Phrase Book," "Insurance Phrase Book," "Legal Phrase Book," and others.

In these are given—both in longhand and shorthand—elaborate lists of frequently used phrases which are peculiar to the respective trades, etc, with which they deal.

There are almost innumerable phrases in everyday use exclusively applying to OUR business—namely, that of telephony—and on my suggestion Sir Isaac Pitman & Sons have expressed their willingness to publish a book to be entitled "The Telephonic Phrase Book" (or, possibly, the "Telephonic and Telegraphic Phrase Book."

The value of such a book will, I believe, be readily appreciated, more especially by those of my colleagues, who are, like myself, keen phonographers.

If you can kindly find space for this letter in the JOURNAL I shall be grateful, and I invite suggestions, either through the JOURNAL or by post to me direct, from any of your readers who are sufficiently interested.

District Office, Dover, Sept. 15. EDGAR W. WILSON.

THE TELEPHONE LOAD LINE.

TO THE EDITOR OF THE NATIONAL TELEPHONE JOURNAL.

WITH reference to the point raised by Mr. Sansome in the September number of the JOURNAL regarding the relation between the number of outgoing junctions at an exchange and the average "junction valuation" of calls, I have the following observations to make:—

1. Table C (July number) represents the average "junction valuation," and this refers to all classes of junction calls.

2. In London we have a complicated junction system involving six junction centres and 84 other exchanges. As an exchange grows in size, so it requires more junctions, and this implies: (*a*) Gradual transfer from signal to order wire working; (*b*) more direct junction communication. A junction call thus becomes easier and easier to operate until the exchange is of a certain size.

3. In the illustration given by Mr. Sansome, although the junctions are increased, the facility for completing junction connections is not increased, and consequently there is no reason why the value of a junction call should fall.

4. Table C, as stated in the June number, is used with reserve in London.

London, Sept. 20. H. DEANE, Assistant Traffic Manager.

EXAMINATION SUCCESSES.

Belfast—Board of Education, South Kensington: W. S. Keown, second class certificate, practical mathematics, stage 2. H. Jervis, second class certificate, magnetism and electricity, stage 1. R. Connor, second class certificate, magnetism and electricity, stage 1. W. J. Currie, first class certificate, practical mathematics, stage 1, and second class certificate, magnetism and electricity, stage 1. G. Anderson, second class certificate, practical mathematics, stage 2. R. Woods, second class certificate, practical mathematics, stage 1.

Burnley.—Tom Hargreaves, City and Guilds of London, electrical eng., pass; Board of Education, mathematics, stage 2, second class certificate. H. Adams, Board of Education, pure mathematics, stage 2, second class certificate; City and Guilds of London, ordinary telephony, second class certificate; T. G. Turley, City and Guilds of London, ordinary telephony, second class certificate. J. H. Taylor, Board of Education, magnetism and electricity, stage 2, second class certificate; theoretical mechanics (fluids), stage 1, second class certificate; theoretical mechanics (solids), stage 1, second class certificate. A. Hargreaves, Board of Education, pure mathematics,

stage 1, second class certificate. E. F. Catton, City and Guilds of London, ordinary telephony, second class certificate.

Engineer-in-Chief's Staff.—The following successes have been gained by members of the Engineer-in-Chief's staff in the examinations recently held by the City and Guilds Institute:—Telephony: F. W. Friday, first class (honours) and silver medal; E. Strong, first class (honours); J. R. Hembrough, second class (honours); W. Hicks, second class (honours); E. Foulger, second class (ordinary); A. R. Fraser, second class (ordinary); R. S. Rowe, second class (ordinary). Telegraphy: J. W. Wheeler, first class (ordinary).

The following have passed the examinations instituted by the Board of Education:—W. Hicks, practical mathematics; R. S. Rowe, practical mathematics.

INVENTORY OF PLANT.

THE work of taking the inventory of the Company's plant will commence on Oct. 3, the centres which will be taken first being Bristol, Plymouth, Reading, Huddersfield, Halifax, and Wolverhampton. The following list shows those who have been detailed to undertake this work. Some of them are already on the Engineering staff and the others have been temporarily added to it for the purpose:

In charge .. .. A. WATTS.

HEADQUARTERS STAFF.

R. Aitken, W. J. Gray, G. M. Maddock, } Engineer-in-Chief's Staff.
R. Bryson, Chief Clerk, Metropolitan.
A. M. Watt, Secretary's Audit Staff.
F. Street, C. F. Blake Brown, C. Hughes, } Engineer-in-Chief's Staff.
J. McClintock, Draughtsman, Greenock.
R. B. Rae, Engineer's Clerk, Edinburgh.
P. R. Cockrem, Cost Clerk, Nottingham.

TRAVELLING STAFF.

Divisional Officers—

Fulton, D. B.	Engineer	E.-in-C. Staff, H. O.
Gilbert, A. B.	Engineer	Glasgow.
Roberts, A.	Electrician	Liverpool.
Shackleton, J. M. ..	Engineer	Metropolitan.
Taylor, W. F.	Contract Manager ..	Metropolitan.
Terras, J. S.	Engineer	Birmingham.
Waite, B.	District Manager ..	Cardiff.
Wolstenholme, C. W.	Engineer	Liverpool.

Sectional Officers—

Barr, F.	Local Manager	Sheffield.
Brown, F. G.	Local Engineer ..	Metropolitan.
Byng, E. S.	Asst. Engineer	Metropolitan.
Cleary, W.	Asst. Engineer	Manchester.
Drabwell, C. E. ..	Clerk	Metropolitan
Dixon, J. T.	Cost Clerk	Liverpool.
Dring, G.	Local Manager	Worcester.
Escott, H.	Exch. Electrician ..	Manchester.
Frost, J.	Engineer	Blackburn.
Harper, T.	Local Manager	Bournemouth.
Hibberd, F. W. ..	Chief Clerk	Met. Engineers.
Hives, F. G.	Local Manager	Reading.
Hunt, R. W.	Div. Engineer	L'pool.
Jackson, R. W. ..	Engineer	Newcastle.
Jarratt, E. G.	Local Manager	Wolverhampton.
Jones, J. E.	Electrician	Bristol.
Kidd, A. M.	District Manager ..	Cork.
Lewis, T.	Local Engineer ..	Metropolitan.
Parry, J.	Exchange Manager ..	Liverpool.
Pettigrew, T.	Asst. Electrician ..	Glasgow.
Price L.	Engineer	H. O.
Redhead, C. H. ..	Engineer	Dublin.
Roberts, F. W. ..	Local Manager	Brighton.
Scutt, W. D.	Electrician	Leeds.
Squire, F. W.	Chief Clerk	Exeter.
Storrie, J. H.	District Manager ..	Kirkcaldy.
Tattersall, J. T. ..	Engineer	Hull.
Tucker, R. V.	Chief Clerk	Birmingham.
Weatherburn, S. W. ..	Local Manager	Kendal.
Weston, C. S.	Chief Clerk	Guildford.

Clerks—

Airey, J. (Cost Clerk, Blackburn), Cooper, E. B. (Supt.'s Office, Birmingham), Clutterbuck, F. W. A. (Ex. Man. in training, Bristol), Dunkerley, H. (Clerk, Oldham), Edgar, J. F. (Contract Officer, Nottingham), Fraser, E. J. (Stores Clerk, Edinburgh), Gould, W. W. (Clerk, Wolverhampton), Gilchrist, R. F. (Cost Clerk, Glasgow), Hood, J. (Chief Clerk, Stirling), Holdsworth, F. (Clerk, Bradford), Moulton, H. R. (Clerk, Metropolitan Accts.), Moore, W. E. (Stores Clerk, Brighton), Pratt, W. J. (Cost Clerk, Norwich), Purcell, J. (Stores Clerk, Dublin), Preston, O. (Clerk, Newcastle), Simpson, A. E. (Clerk, Bradford), Smart, E. W. (Electricians Clerk, Cardiff)), Surplice, R. (Supt.'s Clerk, Dublin), Welsh, R. (Stores Clerk, M'ter), Wilson, J. (Clerk, Bolton), Wright, W. R. (Clerk, Metropolitan Accts.).

Draughtsmen—

Adams, C. (Draughtsman, Belfast), Allport, A. W. (Draughtsman, B'ham), Bathgate, J. H. (Draughtsman, Manchester), Batho, G. (Draughtsman, Liverpool), Bennett, S. Y. (Sub-Engineer, Bath), Donnellan, — (Draughtsman, Wolverhampton), Hallam, A. (Draughtsman, Manchester), Halliday, E. I. (Draughtsman, Liverpool), Hardy, A. H. (Draughtsman, Southampton), Heggie, J. W. (Draughtsman, Glasgow), Hill, J. N. (Draughtsman, Met. Engineers), Hunt, L. W. (Chief Inspector and Draughtsman, Ipswich), McNab, A. (Draughtsman, Edinburgh), Millett, H. G. (Eng., Electrical and Clerical, Bristol), Thorpe, W. R. (Draughtsman, Met. Engineers), Towers, R. (Draughtsman, Liverpool).

Enumerators—

Armstrong, E. (Local Mgr., Hastings), Audsley, R. (Local Mgr., Paisley), Anderson, S. C. (Foreman, M'chester), Batchelor, G. (Asst. Engineer, Southampton), Bailey, W. (Sub-Engineer, Birmingham), Barnes, T. M. (Foreman, Wolverhampton), Bell, R. W. (Local Mgr., Rochdale), Beattie, W. (Local Mgr., Wigan), Bennett, S. Y. (Sub-Engineer, Bath), Baillies, D. C. (Inspector, Glasgow), Bewick, G. E. (H. O. Switchboard Staff), Bruce, R. (Asst. Engineer, Belfast), Bufton, C. W. (Local Manager, Canterbury), Cleary, J. (Asst. Engr., Stockport), Castleton, W. (Local Mgr., Scarboro'), Carey, P. (Linesman Insp., Cork), Coles, W. H. H. (Linesman Insp., Chippenham), Cunningham, T. (Foreman, Liverpool), Denham, P. R. (Acting Draughtsman, Portsmouth), Devon, J. C. (Foreman, Liverpool), Dipple, W. H. (Eng. Inspector, B'ham), Dolman, R. (Inspector, Birmingham), Donaldson, J. (Eng. Inspector, Glasgow), Elsom, J. (Foreman, Metropolitan), Findlay, R. (Foreman, Metropolitan), Fisher, W. (Foreman, Newcastle), Ffrench, C. M. (Local Mgr., Stroud), J. Frost (Sub-Engineer, Hanley), Gaskins, F. W. (Asst. Engr., Newcastle), Gallard, G. H. (Asst. Engineer, Metropolitan), Graham, J. (Asst. Electrician, Edinburgh), Graham, R. S. (Sub-Engineer, Glasgow), Graham, D. (Switchboard Fitter, Glasgow), Gregory, E. (Local Manager, Durham), Greenwood, T. E. (Inspector-in-Charge, Beverley), Ginn, H. G. (Sub-Engineer, Cardiff), Greaves, J. E. (Local Manager, Burton), Gray, G. (Test Clerk, Birmingham), Hobson, J. W. (Engineer, Dundee), Hall, C. W. (Asst. Engineer, Newcastle), Hague, E. L. (Asst. Engineer, Cardiff), Hopps, F. (Sub-Engineer, Nottingham), Hilton, W. B. (Instrument Insp., Darwen), Hutchinson, D. (Asst. Engineer, Metropolitan), Hunt, G. (Foreman Faultsman, Dublin), Kenworthy, H. M. (Asst. Electrician, Dublin), Kennedy, J. (Foreman, Glasgow), Kitcheman, S. (Asst. Engineer, Belfast), Lewin, P. (Chief Inspector, Norwich), Lyon, H. (Walking Foreman, Metropolitan), Lucas, H. (Foreman, Metropolitan), Macnamara, W. H. (Chief Insp., Bristol), McDowell, J. (Foreman, Belfast), McCann, J. E. (H. O. Switchboard Staff), McLean, M. (Sub-Engineer, Glasgow), McDowell, A. (Asst. Engineer, Belfast), McKenzie, R. (Engineer, Stirling), McMeaking J. W. (Asst. Engineer, Glasgow), McPhail, W. (Asst. Engineer, Paisley), Moon, F. (Asst. Engineer, Burnley), Morgan, A. H. T. (Sub-Engr., Torquay), Morris, L. C. (Insp.-in-Charge, Rhyl), Millett, H. J. (Elec. Engineering and Clerical, Gloucester), Mushens, A. (Local Mgr., West Hartlepool), Nicols, H. (Local Manager, Chatham), Paynter A., Paynter, J. (Foremen, Manchester), Pagan, D. (Sub-Engineer, Edinburgh), Pearson, R. S. (Engineer, Leicester), Powell, W. H. (Asst. Engineer, Birmingham), Padgett, W. (Electrician, Portsmouth), Podmore, A. (Sub-Engineer, Sheffield), Pipe, S. E. (Chief Inspector, Middlesbro'), Radford, J. (Electrician, Swansea), Rhodes, T. C. (Local Mgr., Bedford), Roberts, F. H. (Exch. Inspector, Nottingham), Rogers, W. J. (Wayleave Officer, Luton), Richardson, T. (Local Manager, Elgin), Romain, W. (Asst. Engineer, Metropolitan), Riley, O. (Walking Foreman, Metropolitan), Satchwell, W. A. (Exch. Inspector, Manchester), Sim, W. (Engineer, Exeter), Smith, H. T. (Local Manager, Lincoln), Spargo, A. (Local Mgr., Stockport), Stevens, F. (Asst. Engineer, Swansea), Stallard, E. G. (Foreman, Bristol), Sullivan, W. A. (Exchange Inspector, Metropolitan), Suggitt, R. (Asst. Engineer, Bradford), Swift, F. (Instrument Insp. Bradford), Starkey, H. Y. (Asst. Engineer, Luton), Tate, G. (Chief Inspector, Newcastle), Thorpe, L. (Foreman, Metropolitan), Talbot, G. N. (Asst. Engr., Metropolitan), Thomas, R. (Foreman, Liverpool), Turner, C. H. (Foreman, Birmingham), Tite, W. (Exchange Inspector, Metropolitan), Usherwood, G. E. (Foreman, Blackpool), Wallace, G. (Sub-Engineer, Dublin), Whittle, J. G. and Williams, C. (Divisional Maintenance Electricians, Liverpool), Wran, A. R. (Engineer, Plymouth).

Special Work—

Blight, W. (Div. Maint. Elect., Metropolitan), Bryant, G. H. (Electrician, Metropolitan), Head, F. G. (Sub-Engineer, Bristol), Johnson, R. P. (Sub-Engineer, Birmingham), Morgan, E. C. (Local Manager, Weston-super-Mare), Peck, H. S. (Ex. Electrician, Metropolitan), Phillips, C. H. (Asst. Engineer, Metropolitan).

MID-YORKS BENEVOLENT SOCIETY.

Receipts and Expenditure for year ending Aug. 31, 1910.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Members' subscriptions ..	20	11	10	By Grants made to members of society	13	15	0
,, Company's subscriptions (£2 7s. 4d., £19 4s. 8d.)	21	12	0	,, Sundries	0	0	10
,, Amount due from Company as per August subscriptions—see *contra* ..	1	7	2	,, Amount due from Company—as *per contra* ..	1	7	2
,, Balance brought forward from Aug. 31, 1909 ..	37	7	5	,, Amount in treasurer's hands	1	10	2
,, Bank interest, Dec. 31, 1909	0	16	9	,, Cash as per bank book ..	65	2	0
	£81	15	2		£81	15	2

W. V. Morten, chairman. T. A. Crowther, secretary. W. R. Senior, treasurer.

NEWS OF THE STAFF.

Mr. C. H. DAVIDSON has been transferred to the position of Chief Inspector, Cambridge, from a similar position at Great Yarmouth. Before leaving Yarmouth he was the recipient of an umbrella and music from the local staff as evidencing their appreciation and good wishes.

Mr. T. W. CATENHURST, Local Manager, Lowestoft, has been transferred to a similar position at Londonderry. He has been for several years in the East Coast district and, prior to his leaving, was presented with a set of ebony-backed brushes as a token of the good wishes of his staff.

Mr. L. F. MORICE, Assistant Engineer, Bristol, has been promoted to be Engineer for the Portsmouth area. On the occasion of his leaving Bristol he was presented by the Engineer, on behalf of the staff, with a kit bag. In making the presentation Mr. Preston voiced the feelings of the staff when he expressed regret that Mr. Morice was leaving Bristol, and also when he wished him every success in his new appointment, and added that he no doubt had secured this by always being eager to gain knowledge which had made him efficient.

Miss BESSIE MADELEINE FRICKER, of Dover, has been appointed Travelling Supervisor for the East Kent (Dover) district.

Mr. H. J. CORKE, who had been Local Manager at Folkestone for sixteen years, was the recipient of a handsome marble clock, suitably inscribed, from the East Kent district staff on the occasion of his transfer as Local Manager to Ashton-under-Lyne.

Miss GERTRUDE GRINDROD, Operator, Keighley, resigned on Sept. 8 after ten years' service, to go to Canada. She was presented with a mother-of-pearl blouse watch by the Keighley staff, as a token of the esteem and regard in which she was held by them.

Miss JESSIE SHACKLETON, Operator, Keighley, who recently left the Company's service to become the Private Branch Exchange Operator for the Stockbridge Finishing Company, was presented with a silver-backed mirror by the staff.

Miss GRACE FORREST, Operator, Royal Exchange, Glasgow, has been promoted to be Supervisor, Belfast. She received a pendant and chain from the staff in her exchange.

Miss AGNES BLACK, Operator-in-Charge, Pollokshaw's Exchange, Glasgow, left on May 26, to be Operator in G. & J. Weir's private branch exchange. She was the recipient of several personal presents from the staff in her exchange.

Miss MARGARET FYFE, Operator, Royal Exchange, Glasgow, has been promoted to be Supervisor in the Argyle Exchange.

Miss JEANIE BRIDGES, Operator-in-Charge, Bearsden Exchange, Glasgow, left on Sept. 15 to go to South Africa. She was presented with a silver manicure set and silver thimble by the staff in her exchange.

Miss ANNIE THOMSON, Senior Supervisor, Royal Exchange, Glasgow, has been transferred to Hillhead Exchange, Glasgow, in the same capacity.

Miss JANE SKELLY, Supervisor, Royal Exchange, Glasgow, has been promoted to be Senior Supervisor in the same exchange.

Miss ROSETTA ISAACS, Supervisor, Hillhead Exchange, Glasgow, has been transferred to Royal Exchange, Glasgow, as Supervisor.

Miss JESSIE CLARK, Supervisor, Argyle Exchange, Glasgow, has been promoted to be Chief Operator, South Exchange.

Miss ELSIE WATERWORTH, Operator, City Exchange, Manchester, left the Company's service on Aug. 4, and on leaving was presented by the City Exchange operating staff with a gold bangle.

Miss HILDA GRACE THOMAS, Operator, Newport, Mon, resigned on Sept. 1, after two years' service, to take up another appointment. She was presented by her colleagues with a gold brooch as a token of esteem and remembrance.

Miss MARION OVERTON has been promoted from Supervisor to Monitor, Leeds Central Exchange.

Miss CONSTANCE E. HILL has been promoted from Supervisor to Monitor, Leeds Central Exchange.

Miss LILIAN CHIPPENDALE has been promoted from Operator to Supervisor, Leeds Central Exchange.

Miss ALICE A. DANIELS has been promoted from Operator to Supervisor, Leeds Central Exchange.

Miss NELLIE N. MYERS, Chapeltown Exchange, has been promoted from Senior Operator-in-Charge to be Supervisor at the Leeds Central Exchange.

Miss MARY A. HOWES, Operator, Leeds, has been promoted to be Senior Operator-in-Charge at Chapeltown.

Mr. E. A. ELLETT, Contract Officer, Isle of Wight centre, on his transfer to the London district, was presented by the District Manager, on behalf of the staff, with a handsome marble dining room clock, with an escutcheon suitably engraved, as a token of their regard.

Mr. G. TATE, Contract Officer, Hastings, has been transferred to Gravesend.

Mr. T. GIRDLER, Contract Officer, Hastings, has been transferred to Glasgow.

Mr. J. G. GROVER, Contract Officer, Brighton, has been transferred to Eastbourne.

Mr. H. H. CLARKE, Contract Officer, Brighton, has been transferred to Hastings.

Mr. A. E. EVERSHED, Contract Officer, Eastbourne, has been transferred to Manchester.

Mr. A. N. WILKINS, Contract Officer, Brighton, has been transferred to Dorking.

Mr. A. BRACKLEY, Inspector, Brighton, has been transferred to Eastbourne.

Mr. W. BRICKETT, Inspector, Brighton, has been transferred to Hastings.

Mr. W. GUNN, Inspector, Brighton, has been transferred to Eastbourne.

Mr. H. MALLETT, Inspector, Hastings, has been transferred to Brighton.

Mr. J. GAMBIER, Fitter, Brighton, has been transferred to Bournemouth.

Mr. D. GUNN, Wayleave Officer, Brighton, has been transferred to Folkestone.

Mr. A. BOYLE, Instrument Inspector, Limerick, resigned his position in the Company's service on Aug. 27, on which date the staff presented him with a dressing case. Mr. Boyle is about to sail for Sydney, New South Wales, and the staff wish him every success.

Mr. ALAN F. HOLT, Correspondence Clerk, Blackburn, left the service on Sept. 3 to take up a position in the Government Telephone Department, Winnipeg. He was presented with a travelling rug and safety razor by the district staff.

Mr. J. W. PARRY, Contract Officer, Warrington, has been transferred as a Contract Officer at Manchester, and was presented by the members of the Warrington staff with a silver-mounted umbrella.

METROPOLITAN STAFF CHANGES.

Mr. N. LAYTON, Inspector, North, has been transferred as Inspector to Hampstead.

Mr. T. S. WILLARD, Clerk, Statistical Office, has been appointed Senior Clerk, Correspondence Department.

Mr. R. F. GILL, Inspector, Holborn, has been appointed Test Clerk, North.

Mr. C. W. TREACHER, Chief Inspector, Paddington, has been transferred as Chief Inspector to Gerrard Street.

Traffic Department.

Miss FLORENCE DINGLE, Supervisor, London Wall, promoted to be Senior Supervisor, Paddington.

Miss EDITH JONES, Operator, Hop, to be Supervisor, London Wall.

Miss VERA RIX, Supervisor, Gerrard, to be Supervisor, Operating School.

Miss FLORENCE EAST, Operator, Paddington, to be Supervisor, Gerrard.

Miss MARGARET CLEMENTS, Operator, Bank, to be Supervisor, Avenue.

Miss ANNIE KINSEY, Supervisor, Hop, to be Supervisor, Battersea.

Miss FRANCES SMITH, Operator, Woolwich, to be Supervisor-in-Charge, Dartford.

Miss MAY DE CHASTELAIN, Operator, Kensington, to be Supervisor, Hammersmith.

Miss MAUD HOGGINS, Operator, Redhill, to be Supervisor-in-Charge, Reigate.

On Miss ANNIE LIDDELL'S promotion from the Operating School to be Senior Supervisor at New Cross she was presented by her late colleagues with four volumes of Ruskin's works.

On Miss EDITH TRINGHAM'S promotion from the School to Hammersmith she was presented with Mrs. Browning's poems.

Miss FLORENCE HARE, Operator, on her transfer to Richmond in a similar capacity, was presented with a gold brooch.

Miss OLIVE HART, Operator, Bromley, on her transfer to London Wall, was presented with a gold bracelet by her late colleagues.

Miss NELLIE SMITH, similarly transferred to London Wall, was presented with a writing desk.

Miss HELEN COLE, Operator, Holborn Exchange, was presented with a hand-painted mirror, a fire screen and a flower basket by the staff, and with a fruit stand, rose bowl and an art pot by personal friends.

Miss CHARLOTTE JEFFERIES, Supervisor, on leaving Avenue, was presented with a cream and sugar stand by the staff.

MARRIAGES.

Miss ELIZABETH M. ELLIS, Operator, Gillingham, left the Company's service on Aug. 4 to be married to Mr. J. B. ROUSE, Storekeeper at Chatham.

Mr. ROUSE, in view of his approaching marriage, was the recipient of a brass curb and fire irons from the staff of Chatham centre. The presentation was made by the Local Manager, Mr. J. C. Nichols, who expressed the good wishes of the staff.

Miss EDITH CORRIN, Operator, Douglas, who has been in the service since October, 1903, is leaving to be married. She was presented with a silver cake dish, cream jug, and sugar basin by the staff.

Miss E. HAMILTON, Operator, Warrington, who joined the Company's service Nov. 1, 1895, upon resigning to be married was presented by the combined Warrington staff with a Sheraton eight-day striking clock.

Miss ELIZABETH GORMAN, Operator-in- Charge, Maryhill Exchange, Glasgow, left on Sept. 1 to be married. She was presented with a silver lustre teapot and hot water jug by the staff in her exchange.

Miss CATHERINE MACCONNOCHIE, Chief Operator, South Exchange, Glasgow, who left the Company's service on Sept. 1 to go to Nova Scotia to be married, was presented with a case of cutlery by the staff in her exchange. Miss MacConnochie was also presented with a silver-mounted crystal salad bowl by a few of the chiefs and senior officers of the Traffic Department, which they asked her to accept with their sincere wishes for her future happiness.

Miss CHRISTINA O'REGAN, Senior Operator, Cork, was, on the occasion of her recent marriage, presented with a dinner service subscribed for by the staff in the South of Ireland district.

Mr. A. E. SUTHERLAND, Head Office, Engineers Department, Nottingham Factory, was the recipient of an oak bookcase bureau on the occasion of his marriage, Mr. J. W. Briggs making the presentation on behalf of the Engineers' and the Factory staff combined.

Mr. E. JACKSON-SMITH, of the Engineer-in Chief's Department, Nottingham Factory, was the recipient of a Gladstone bag, silver cruet and case of razors, from the combined Engineers' and Factory Managers' staffs on the occasion of his wedding.

Mr. G. HAMER, Contract Officer, was presented with a dinner service by the staff in view of his approaching marriage. The presentation was made by the Local Manager (Mr. F. Barr).

London Traffic Department.

Miss MABEL THAIN, Operator, Gerrard, on leaving to be married, was presented with a plated toast rack and a flower centre.

Miss HENRIETTA PEREIRA, Supervisor, Gerrard, who left to be married. was presented with a dinner service by the staff, the operators in her division also presenting her with a cruet.

Miss ETHEL GORDON, Operator, Battersea, on leaving to be married was presented with a tea service, trinket set and pickle jar.

Miss PHYLLIS CRAWLEY, who has resigned for a similar reason from the same exchange, also received a tea service and a pickle jar.

Miss ALICE COLLIP, Operator-in-Charge, Reigate, who has resigned on account of her approaching marriage, was presented by the Redhill staff and colleagues in the Croydon district with a silver-mounted oak biscuit barrel.

Miss MARGARET BROOMHAM, Operator, Enfield, on leaving the service to be married was presented with a silver cake basket by the exchange staff (Operating and Maintenance) and a few friends in the North district.

Miss JESSIE COOPER on leaving Bromley for London Wall and in view of her pending resignation to be married, was presented with an *epergne* and art pots by the Bromley Engineer, Maintenance and Traffic staffs.

Miss NELLIE HOTCHKISS, Operator, Avenue, was presented with a fire screen on leaving the service to be married.

Miss MARY LONGHURST, Operator, London Wall, on resigning to be married, was presented by the staff with a tea service, set of table glass, hot water jug and coffee pot and stand. Miss Longhurst, who had for some time acted as caterer with marked success, also received a large number of gifts from personal friends among the staff.

Miss LOUISA HAYNES, Operator, on leaving Hammersmith to be married, was presented with a tea service and a cut glass celery vase.

Miss FLORENCE DREW, Supervisor, Holborn, on leaving the service to be married, was presented by the staff with a tea service. Miss Drew was also the recipient of a fruit stand and several useful articles from her colleagues on the supervising staff.

OBITUARY.

It is with sincere regret that we have to chronicle the death of one of the oldest members in the Company's service, Mr. ARTHUR TILL WALLER, which occurred on Friday, Sept. 16. Mr. Waller had been seriously ill since March last, but recent reports were so favourable that we had hoped soon to have him with us again. The sad end came very suddenly from the bursting of a blood vessel in the brain.

Mr. Waller entered the service of the Bell Telephone Company as a junior clerk, at the offices in Coleman Street, on Oct. 21, 1879. He was appointed stationery clerk in 1883, and afterwards held positions in the cashier's office at Oxford Court and at the Metropolitan offices, when the latter were separated from Head Office. From 1896 to 1904 he was Cashier of the Western district, and from 1905 to 1910 he was Cashier at Salisbury House.

Mr. Waller was always to the fore in any works for the benefit of the staff. He did splendid work as hon. secretary of the National Telephone Staff Benevolent Society, and it is not too much to say that he had a great deal to do with the actual formation of the society. He was on the committee of the National Provident Club and on the local committee of the Staff Transfer Association. The introduction of the instalment system for season tickets which is now so largely taken advantage of by the staff was due, in the first instance, to Mr. Waller. In fact there has been no work for the benefit of the staff or work of charity in which Mr. Waller did not interest himself.

His loss will be long felt by the staff by whom he was regarded with affection and respect.

His portrait appeared in the November, 1909, number of the JOURNAL on the occasion of his completing 30 years service with the Company.

We regret to announce the death of Mr. FREDERICK THOMAS RUSHTON, a member of the staff of the Company's Solicitor, who died suddenly in August last.

Mr. Rushton was admitted a solicitor in 1873, and for some time practised on his own account at New Inn, London. He joined the Company's service about five years ago, and has been engaged chiefly in connection with the Conveyancing Department.

Mr. Rushton was of a quiet and retiring disposition, invariably courteous to all with whom he had business relations, and extremely popular with his colleagues, who very sincerely regret his loss.

We have to record the death of Jointer C. MASON which took place very suddenly at West Bromwich about midday on Sept. 5. He complained of feeling unwell on that day, and went into the exchange, where he remained some time. On stating that he felt better, he started to go home but collapsed before he could get to the tram terminus and died almost immediately. An inquest was held at which the jury returned a verdict of "Death from natural causes."

He joined the Company's service in September, 1897, as a labourer and was a good, steady, reliable workman.

We regret also to record that Foreman GEORGE NICOL met with a fatal accident at Banchory, Kincardineshire, on Sept. 15. Deceased had occasion to go on to the roof of an engine house when his foot slipped and he fell through a glass roof light on to the engine in motion, sustaining such injuries that death must have been instantaneous. The deceased, who had been in the Company's service for the long period of 26 years, was held in the highest esteem by all who knew him. Out of respect to his memory the staff placed two wreaths on his grave, and all in the centre mourn the loss of an honourable workman.

Miss FLORENCE RICHER, late Supervisor, Avenue, the presentation to whom was recorded in last month's JOURNAL, was erroneously described as leaving to be married. Her name should have been included in "News of the Staff" as resigning merely.

STAFF GATHERINGS AND SPORTS.

Brighton.—On Sept. 10 a party of the Company's Brighton staff held the second half-day outing of the season, the rendezvous being the "Shepherd and Dog," Fulking. Sixty-two sat down to tea. Mr. C. Moorhouse (who was accompanied by Mrs. Moorhouse), District Manager, presided, and there were also present Mr. F. W. Roberts (Local Manager) and Mrs. Roberts, Mr. L. Parsons (Chief Clerk) and Mrs. Parsons, Mr. D. Wallace (Contract Manager), Mr. H. Hatton (Electrician), Mr. G. Dowman (Engineer), Miss Trott (Clerk-in Charge, Brighton Exchange), Mr. T. Rogers (Head Office audit staff), Mr. H. J. Maclure (Contract Manager, Birmingham), and other principal officers. After tea the opportunity was taken to present Mr. F. W. Roberts with a handsome gold hunter watch, subscribed for by the Sussex staff, as a memento of his 25 years' service with the Company. All grades took part in the subscription, including the local Directors. Mr. Moorhouse made the presentation in a few well-chosen words, and Mr. Roberts feelingly responded, giving a short *resumé* of events during his seven years in Brighton, which he is about to leave, having been appointed to a position on the Inventory staff.

Leeds.—*Chambers Challenge Cup.*—Mid-Yorks district won the final tie against East Yorks, on Aug. 27, at the Grammar School Ground, Bridlington. Although East went in first. and made 110, Mid-Yorks were able in a failing light to beat them by seven wickets, Keighley making 80 not out.

Coventry.—At a well-attended meeting of the staff, held at Priory Row Assembly Rooms on Sept. 8 with Mr. J. Mewburn, District Manager, in the chair, Mr. John Scott, Assistant Provincial Superintendent, gave an excellent and well-thought out address upon the present and future prospects of the staff, at the same time giving a report as to what work the Staff Transfer Association has done and is doing in the interests of all sections of the staff. At the close of the address several questions were asked the speaker, who briefly replied to the various points raised. During the evening Mr. Scott presented certificates to the successful students in last year's telephony classes.

Edinburgh.—The staff at Edinburgh held the last of the summer rambles on Sept. 3. Having taken train to Loanhead, the party of 60 walked to Roslin, where tea was taken. A beautiful afternoon favoured the excursion and the interesting walk was much enjoyed.

Ampère Golf Club.—Mr. R. Gilmour, District Manager, has very kindly presented to the club a very handsome shield to be played for annually, and the first competition for it, held over the Musselburgh course on Sept. 3, drew out a large number of the members. Mr. H. V. Main won the custody of the shield and first prize; Mr. C. L. Stewart, second; Mr. R. Allan, third; Mr. D. Matheson, fourth.

Portsmouth.—On Aug. 27 the operators and friends in the Isle of Wight and a few operators from Portsmouth Exchange met at Ryde and proceeded by brake to Shanklin, where, after visiting the Chine and other places of interest, tea was served. After tea music and singing was indulged in; then the party adjourned to the sands, and after the inevitable photograph had been taken a return was made to Ryde by brake, and at 9.20 the boat to Southsea taking the Portsmouth contingent home after a very enjoyable afternoon. The party was accompanied by Mr. S. J. Pharo, Traffic Manager.

Preston.—On Sept. 25 a farewell supper was given by Mr. D. Munro, Chief Electrician at Preston, on the occasion of his terminating his services with the Company to take up a Government appointment in Ceylon. Mr. Munro first entered the Company's service some eighteen years ago at Glasgow, and after serving in various other districts in the north he was, eight years ago, transferred to Preston, and during that time has had charge of the Electrical Department, gaining the respect and esteem of all with whom he came into contact. Mr. S. P. Johnson, who, in the absence of the District Manager, Mr. J. Lemon, presided in the chair, presented Mr. Munro, on behalf of the staff of the North-West Lancashire district, with a handsome travelling trunk, shaving outfit and a watch. After being suitably acknowledged, a very enjoyable musical programme was gone through. The proceedings were brought to a close by singing "Auld Lang Syne" in true Scotch fashion.

On Sept. 26 Mr. Munro entertained the operators and friends at the "White Horse" restaurant. The proceedings were interspersed with intervals for music, dancing and refreshments. After a very pleasant evening the most hearty wishes were expressed for his welfare in the position which he is about to take up.

LEICESTER TELEPHONE SOCIETY.

THE fifth annual general meeting of this society was held at the Foresters' Institute on Sept. 9 under the chairmanship of Mr. Melton Marsden. The president, having briefly reviewed the past session, called upon the hon. secretary (Mr. R. F. Ellison) to read the balance sheet, which, it was pleasing to find, showed a credit balance. The attendance was very satisfactory and augurs well for the coming session. The election of officers for 1910-11 was then proceeded with as follows:—Hon. president, Mr. Alfred Coleman. President, Mr. Lucas. Vice-presidents, Mr. J. N. Lowe, Mr. Melton Marsden. Hon. secretary and treasurer, Mr. P. V. Sansome. Committee: Miss Law, Miss Horner, Messrs. W. E. Pearson, E. Rendell, A. W. Garrard, W. Baker, H. C. Flint, W. J. Bailey, A. Revitt, C. Derrick (presidents *ex officio* members of committee).