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TELEGRAPH AND TELEPHONE MEN AND WOMEN.

XXVIII.—

MR. J. D. W. STEWART.

THE subject of our notice—Mr. John Dunlop Watson Stewart—is, it is hardly necessary to say, a Scotsman. He was born in Glasgow in February, 1872, and entered the service of the National Telephone Company in that city in July, 1886. After a training in engineering and in other branches of telephone work he was appointed Local Manager at Falkirk in March, 1890. In December, 1890 he was transferred in the same capacity to Kilmarnock, and two years later to Hamilton.

The Company was not slow in recognising Mr. Stewart's abilities, for he was appointed District Manager for the Mid-Lanark district in 1893 at the remarkably early age of 21. The appreciation of his merits continued, for he was promoted to Greenock in 1894; to Aberdeen in 1896, and to



Edinburgh in 1904, where he was responsible for the conversion of the local exchange to Common Battery working, and for the provision of an extensive underground system. In 1909 he left his "native heath" for Belfast, and at the Transfer, in 1912, he was appointed District Manager at Manchester, where he remained until January, 1923, when he was transferred to Newcastle-on-Tyne, his present district.

In the course of his long service, Mr. Stewart has seen the development of the telephone system from its crude beginnings to the complicated organism which it is to-day, and in that development he has taken an active share.

Of Mr. Stewart's qualities it is needless to say much. His successful career is evidence of his organising abilities, and those who know him are aware of his clear-sighted and ready grasp of affairs, and of his methodical and logical mind. Of his private activities we have no record, but we hazard the guess that he must be a golfer.

NOTES ON TELEGRAPH PRACTICE.

BY G. T. ARCHIBALD.

(Continued from page 147.)

XV.—Concerning the Use of Prefixes, Affixes, and other Official Signals.

THE prompt disposal of telegrams is dependent to a not inconsiderable extent upon the limitation of the use of lines and apparatus in the transmission of official instructions as well as of time, names of offices, &c., and code signals are employed to this end. These codes may be defined as the signification of a word or of a number of words by one or two letters which, when constituted as signals, indicate a meaning, the full rendering of which would occupy more time in telegraphing. Some of the codes occupy precedence in the telegrams, others may be classed as intermediate, and others again form the termination signal. The codes included in the first category are known as prefixes, and those in the two latter categories are described respectively as abbreviations and affixes.

The old telegraph companies had used a few code expressions, and it is significant of the early Post Office telegraph administrative efficiency that even in 1870 the desirability of increasing the number was very carefully studied. It is interesting to note that in that year consideration was given to a proposal to introduce a two-letter code for expressions in frequent use in service telegrams relating to the testing and crossing of lines, apparatus faults, &c. The code covered upwards of seventy expressions and included such curiosities as DA = Disconnected, apparently, JU = Join Up, and JD = Joined Up. Only a few of the proposed codes were, however, adopted, and most of them have since become obsolete.

The question of the use of code expressions in service telegrams relating to postal business has been examined from time to time; on each occasion it has been shown that although a little time would be saved in the transmission of the signals, some delay and inconvenience would be occasioned at letter sorting offices by their translation into plain language.

In the process of time, as may be expected, many of the original codes have become obsolete, the significance of others has been changed, and more have been introduced as the service has grown and extended, and as new types of apparatus have made their appearance. Many of the alterations illustrate changes in every-day life and in the means of communication no less than the quest for the simplification of telegraph practice; it seems desirable, therefore, to devote some attention to this aspect of telegraphy, to trace the changes which have been made, and, where possible, to record the reasons for those changes.

The prefix is used to denote the class or type of telegram, whether for delivery or onward transmission, whether it is a Government priority telegram, a telegram upon which the sender has paid for a reply, a telegram upon which the sender has paid for its repetition throughout its transmission in order to ensure correctness, a Press telegram, &c., &c. All telegrams, except service telegrams, for onward transmission have always borne the initial prefix "X," and those for delivery the initial prefix "S." The reason for this distinction was that these two classes of telegram were written on appropriate forms, carbon copies were prepared in the case of

telegrams for delivery, and the service particulars appearing on the two forms were not recorded in the same manner. Distinctive forms are also used for foreign, press, and service telegrams.

Every telegram, except service telegrams, must, as a matter of course, bear one or other of the above prefixes, to which must be added one or more letters signifying to the receiving operator, and all other persons who may be called upon to handle the telegram in its subsequent progress, the type of telegram under treatment, so that (i) it may be written upon the appropriate form, and that (ii) it may be dealt with in a particular manner.

Government priority telegrams have always borne the prefixes XB and SB, Press telegrams have, appropriately, maintained the prefixes XP and SP, all foreign telegrams are prefixed XC and SC, the prefixes applied originally to telegrams for transmission over the Submarine Cable Company's system. The prefix of foreign telegrams handed over to provincial offices by cable companies contain an additional letter to indicate the handing-over office, e.g. foreign telegrams handed over at Liverpool bear the prefix XCL.

Amongst the more recent prefixes adopted are XL and SL = Night telegraph letter, XV and SV = Telegraph Money Order, and XCW and SCW = Radiotelegrams to and from British Coast Stations.

Codes, now obsolete, were used for telegrams which were transmitted over the systems owned by the "Danish-Norwegian," "French Atlantic," "Anglo-American," "Atlantic Telegraph," and "Indo-European" Companies.

Service telegrams other than those on urgent engineering matters were originally prefixed SU for non-urgent and SG for urgent messages, and SSG indicated that the time code and the number of words should also be signalled. The prefix "SG" was only to be used in cases where there was special need of quickly accomplishing some urgent object such as the correction of errors in telegrams already transmitted. All such service telegrams were accorded priority over public telegrams, and the transmission of a telegram of more than 100 words in length could be interrupted to admit of their transmission. Service telegrams for all ordinary purposes were prefixed "SU" and signalled in turn with ordinary telegrams. In 1905 the prefixes were transposed, "U" becoming the designation of Urgent services and "G" that for ordinary or general service telegrams. At the same time "SSU" became the prefix for service telegrams of which the code time and the number of words had to be signalled.

Urgent service messages, originated by the Engineer-in-Chief's Department, carry the prefix DS.

Affixes were and are still few in number. Originally MM indicated the completion of the text of a telegram, and PQ the completion of the work of signalling the service instructions. At this time the text of telegrams and the service instructions were signalled immediately after the name and address of the sender of the telegram; in 1886, however, following the abolition of free addresses on the introduction of the sixpenny telegram, the order of signalling was altered, PQ was abolished and MM became the signal denoting the office of origin. The original "Clear" signal NN is still in use, but the acknowledgment signal RT was amended in 1886 to RD.

Greater changes are noticeable in the intermediate code signals. Many of the early codes in this category serve to carry the mind back to what are usually described as the "good old days" when motor cars and safety bicycles were unknown and the horse was pre-eminent in road communications.

Twenty-six of the forty-two such signals adopted in 1870 had been abandoned by 1886, and only seventeen of them are

still in use. Amongst the intermediate signals, &c., which have been abolished or superseded by other signals are :—

- BP = By first post.
- AQ = Answer quickly.
- CF = Message to be called for.
- WQ = Wait.
- NQ = Ready to receive.
- WP = Messenger to wait.
- BB = By boat.
- MH = Man and Horse.
- PP = Parenthesis.
- LQ = Keep line clear for testing.
- AL = Fresh Heading (News).
- AU = Wait reply, not paid for.
- BM = Best means.
- FQ = Make firmer marks.
- IP = Insufficiently paid.
- SX = Special express, regardless of expense.

Amongst those which have stood the test of time and every change in practice are :—

- CQ = All stations.
- *DF = You are through.
- HQ = How are signals ?
- *IQ = Not through.
- KQ = Say when you are ready.
- RQ = Repetition.
- *TI = Daily Time Signal.
- *TQ = Am I through ?
- YQ = Two or more stations.
- ZM = Weather.
- *ZQ = Attend to switch.

* Now seldom used and might be abolished.

An interesting story is that of the signals used for the purpose of indicating the different parts of a telegram in order that the receiving operator may be enabled to write them in the appropriate sections of telegram forms. In 1870 the break signal, then known as the signal indicating the completion of the names and addresses of the addressee and the sender of a telegram was represented by DQ. From 1886 the break signal was used twice, between the office of destination and the commencement of the text, and between the text and the name from (if any), and it was then altered to II. At the outset the full-stop was represented by III, the comma by AAA, the note of interrogation by UD, the exclamation by MIM, the hyphen by BA, the apostrophe by WG, the horizontal bar or division by MMM, the perpendicular bar or division by S and the end of message by SN. In 1885 it was arranged to signal the word "stroke" for the perpendicular bar, and in the following year the horizontal signal was amended to SSS.

The signals for the note of interrogation, the exclamation, the hyphen, and the apostrophe are still in use, but a curious effect of the development of printing telegraph apparatus must now be recorded. The printers in use reproduced the signals as printed above, with the result that it was frequently necessary to re-write telegrams received on printing telegraph apparatus before they could be delivered to the public. It was essential, therefore, that new codes should be devised which would actuate the printing mechanism in such a way that the appropriate signs would be reproduced on the receiving tape, and in 1907 the following alterations were therefore brought into operation :—

- Full Stop
- Break Signal
- Underline

At the same time, and for a similar reason, it was found necessary to alter the signals for the horizontal and perpendicular

bars or divisions, the signal between a whole number and a fraction, and the erasure signal which became :—

- Bar or Division (/)
- Do. do. (-)
- Signal between whole number and fraction - - - -
- Erasure Signal

On Single Needle, Bell, and Wheatstone ABC circuits, it was the rule to signify the intention to send figures by the signal FI and to indicate the completion of a group by the signal FF. The figures were, of course, signalled in word and not in figure form, thus 3019 was signalled as "FI," three nought one nine "FF."

In the preparation of Wheatstone tape it is now usual to commence the slip by repeating the letter E four times and to allow two spaces between telegrams on the same slip; where erasures are necessary the signal EEEE, perforated as a word, should precede the correct word or words.

The development of machine telegraph apparatus resulted in the addition of a large number of official signals to the authorised list of abbreviations. These are :—

- | | |
|-------------------|-------------------------|
| ADS = Address. | H = Have. |
| AJ = Adjust. | HW = Herewith. |
| AK = Acknowledge. | IP = Improve. |
| ANR = Another. | IR = Irregular. |
| ASA = As soon as. | KRD = Keyboard. |
| ASF = As follows. | LUG = Say last you got. |
| ATD = Attend. | LWGW = Last we got. |
| ATN = Attention. | MEC = Mechanic. |
| AXT = Accident. | MSG = Missing. |
| BTY = Battery. | NFM = Name from. |
| CCL = Cancel. | OOT = Out of turn. |
| CK = Clerk. | PBL = Preamble. |
| CT = Correct. | PFR = Perforator. |
| DGR = Dirigeur. | PTR = Printer. |
| DIF = Difficult. | RVT = Prevent. |
| DUP = Duplicate. | RC = Receive. |
| ER = Error. | RCG = Receiving. |
| EXM = Examine. | ROR = Receiver |
| FG = Following. | (Traducteur). |
| FLD = Failed. | RU = Are you. |
| FLG = Failing. | SL = Serial. |
| FLR = Failure. | UCN = Uncertain. |
| GTNG = Getting | UKN = Unknown. |
| nothing | UMA = You may. |
| from you. | VF = Verify. |

D, G, M, N, Y are added for the terminations "ed," "ing," "ment," "ion," "by," e.g. AKD = Acknowledged, CTN = Correction.

The use of these abbreviations and many others which, although well known, are not authorised, results in an appreciable saving in line time.

The procedure in regard to the signalling of the name of the office of origin calls for special mention. In 1870 it was laid down that the office should be described in accordance with its official designation but as briefly as possible. London was not signalled in the case of telegrams handed in at branch and sub-offices, the name without the district initials being sufficient, e.g. Coal Exchange, Piccadilly Circus, &c. Telegrams handed in at similar offices in the provinces contained the name of the town in addition to the name of the office, e.g. Leeds, Corn Exchange; Birmingham, Five Ways. Within a short time it had been decided that in a number of cases the code name of the office should be signalled instead of the full name. This arrangement was restricted to the principal towns and their largest satellite offices.

In 1885 the practice of signalling code names in the office of origin particulars was abandoned as far as Morse sounder circuits were concerned, except in a small number of cases where the

similarity of Morse signals might lead to error, e.g. York was signalled YO and Cork was signalled in full.

In 1890 the practice of signalling the name of the town before the name of the actual handing-in office was abandoned. From that time it has been customary to signal the office of origin in the reverse order, e.g. Fish Docks, Grimsby.

The question of the signalling of the office of origin is intimately bound up with that of economy in the use of official signals. As has already been shown, every effort was made to reduce these signals to a minimum before Morse sounder working became general. The reason for the change which involved the signalling in full of office names may have been sound at the time, but it is clear that practical telegraph officers felt that the pendulum had swung too far in the opposite direction when the change was made. Steady pressure was brought to bear on the administration to relax the rule, and in 1904 it was decided to allow such abbreviations as St. for street, Rd. for road, &c.

Within a few months the administration came to the conclusion that the public is not as a rule interested in the name of the actual office of origin, and that it is sufficient, generally speaking, to indicate the name of the town in which a telegram is handed in. It was decided, therefore, to make a further attempt, by the use of contracted signals, to shorten the official designation of handing-in offices. A start was made in 1905 in London, when a number of offices in the city had allotted to them an official designation consisting of London and one letter of the alphabet, thus telegrams handed in at High Holborn Branch Office bore London H. as the office of origin. The system proved satisfactory, and in 1906 it was decided to apply it at provincial offices. A start was made at Liverpool and Edinburgh with equally successful results, and, gradually, it was extended to embrace all the larger towns. Finally, in 1918, it was decided to apply the system generally to all branch and town sub offices except those the names of which were a sufficient address for telegrams, i.e. the office of origin of telegrams handed in at Bootle, Liverpool, continued to be signalled as Bootle. Single letters were used as far as possible with the exception of "E," "I," "U," and "T" ("T" is reserved for the office of origin of phonograms). In towns where more than 22 branch and sub offices had to be provided for the code of the office had to be used instead of the single-letter contraction, e.g. Candleriggs B.O. Glasgow is signalled as Glasgow B; Gt. Hamilton Street, Glasgow, is signalled Glasgow GHI.

In London a topographical scheme was applied: thus areas such as Balham, Kensington, and Willesden each have a separate series of one-letter contractions.

At the same time, as a further development of the use of contracted signals, it was arranged that the names of a number of the largest towns should be written and signalled in an abbreviated form in the office of origin and in the address of inland telegrams, but should be shown in full on the delivered copies. The offices concerned are:—

<i>Town.</i>	<i>Abbreviation.</i>
Birmingham ...	Bham.
Edinburgh... ..	Edin.
Liverpool	Lpool.
London	Ldn.
Manchester	Mchr.
Newcastle-on-Tyne ...	N/Tyne.
Nottingham	Nottm.
Southampton	Soton.

In telegrams advising Telegraph Money Orders the name of the office of origin continues to be signalled in full.

Although there does not appear to be much scope for the introduction of new code expressions and abbreviations, it is within the realm of possibility that the development of new types of apparatus may demand specially applicable codes. At present, however, none is in sight.

(To be continued.)

THE AUTOMATIC TRAINING SCHOOL.

BY A TRAFFIC STUDENT.

THE traffic man, steeped in the traditions of manual working enters upon the study of the automatic mysteries with mixed feelings. Here, surely, is a new world, a world peopled by things of steel and iron; stark, cold, and stripped for ever of all the glowing mists of romance. Here, surely, Romance is dead—and with it, Life.

It was with such feelings that the writer entered the somewhat gloomy portals of the temple of the mysteries at King Edward's building for the ceremonies of initiation, known as the fortnight's lecture course at the Automatic Training School. With admirable dramatic insight, the Engineering Department has decreed that the entrance to the Lecture Room shall be through the Demonstration Room; on the threshold of which the romantically inclined student receives his first shock—the shock of a recognition that even things of iron and steel may have a glamour and fascination of their own.

A great room, this Demonstration Room; round which on steel frames are displayed in impressive array some of the most cunningly devised mechanisms that the human brain has conceived. Complete automatic systems are there in miniature, with all their elements revealed, all their co-ordinated movements displayed. Intermittingly, the whirring of the line-switches and selectors, searching through contact banks with lightning speed, strikes the ear; punctuated here and there by the sharp "click" of the simultaneous release of the elements in the complicated trains of switches at the touch of the switch-hook of the calling line—strange, unaccustomed sounds; linked by and superimposed upon an insistent droning buzz which compels attention. Enquiries reveal the cause—a rotary line switch undergoing what is somewhat euphemistically known as a "life-test," which is a test designed to show how long the unfortunate subject takes to die. Like King Charles II, the particular line-switch seen by the writer was an unconscionable time a-dying; but there it was, day after day, hunting—hunting—for . . . Death. One felt almost sorry for that line-switch.

But the lectures banished these melancholy feelings. Only a fortnight was allotted for covering the whole field of automatic working; and it can confidently be said that everything humanly possible was done to achieve the desired end. Ably conceived and ably carried out, the scheme of training did indeed cover the whole ground—though the pace was hot in the later stages. One by one the mysteries were unveiled—the line-switch, the selector, the director—with its almost uncanny assumption of the human function of direction—the Coder Call Indicator position, and the Cordless B position, in a perfectly developed crescendo of complexity, tempered as much as it could be by the rare and happy gift of the lecturer for clothing a deep technical knowledge in homely language. Lecturer and demonstrators, enthusiasts all, freely gave of their best in a spirit of happy co-operation which bodes well for the more intimate relationships between the Engineering and Traffic Branches which the satisfactory development of the automatic system implies.

"Will it really work?" was the unspoken question at the back of the mind of more than one Traffic man whose previous knowledge of the system mainly came from books and lectures. Triumphant the demonstrations answered "Yes"; but closer acquaintance with the marvellously intricate details of the mechanism, with its relay contacts adjusted to a thousandth of an inch and its "slow" release measured in terms of less than half a second, suggested the thought that the key to the success of the system as a working proposition lies not so much in the brains of its scientists as in the hands of its maintenance staff.

All too rapidly the fortnight passed, leaving abiding memories of a triumph of engineering skill. As for Romance—as a concrete expression of this, one's thoughts turn instantly to the Demonstration Room, with its serried array of mechanisms and its droning line-switch restlessly hunting—hunting—for . . . Death, death, that its Tribe might live longer. For the Machine no less than the Man, this is the Law of Life—and therefore of Romance; and though one cannot but regret the passing of the human touch in the field of Telephony, the Law must take its course. "The King is dead . . . long live the King!"

"Farewell, Romance! the cave-men said;
With bone well carved he went away,
'Flint arms the ignoble arrowhead,
And jasper tips the spear to-day.
Changed are the Gods of Hunt and Dance,
And he with these. Farewell, Romance!"

* * * * *
'Romance!' The season-tickets mourn,
'He never ran to catch his train,
But passed with coach and guard and horn—
And left the local—late again!'
Confound Romance! . . . And all unseen,
Romance brought up the nine-fifteen.

His hand was on the lever laid,
His oil-can soothed the worrying cranks,
His whistle waked the snowbound grade,
His fog-horn cut the reeking banks;
By dock and deep and mine and mill,
The Boy-god reckless laboured still!

Robed, crowned, and throned, he wove his spell,
Where heart-blood beat or hearth-smoke curled,
With inconsidered miracle,
Hedged in a backward-gazing world;
Then taught his chosen bard to say:
'Our King was with us—Yesterday!'"

SOUND CARRIED BY LIGHT.

THE report in these notes of the phenomena experienced at Birmingham, Alabama, in which the voices of men operating a searchlight were carried to wireless aerials and made audible to listeners several miles away, indicates in an interesting way the influence which light may be made to assert upon wireless transmission. The precise nature of the phenomena in Alabama is apparently not yet known. There are, however, other examples of the action of light upon the rapidly alternating currents used in wireless transmission which show that such action may have a quite definite value.

Light may be used as the medium for incorporating the frequencies of sound with the electrical frequencies. One method, which is comparatively little known, offers a substitute for the type of microphone now commonly in use. It utilises a thin beam of light—a miniature searchlight—to convey audible frequencies to the electrical apparatus. Two tiny mirrors may be used. One is attached to a diaphragm so that it will vibrate in sympathy with the audible frequencies actuating the diaphragm, or it may be delicately suspended in such a way that it will itself vibrate to these frequencies.

A beam of light is directed upon this mirror, which is reflected by the mirror on to a photo-electric cell consisting of a piece of selenium interposed in a circuit through which current is flowing. It is fairly well known that selenium offers resistance to the passage of current through it, and that it is extremely sensitive to light. Its resistance will vary accordingly as the amount of light falling upon it varies. Thus the beam of light from the mirror, which is in a state of constant vibration while the delicately balanced mirror is receiving audible frequencies, will cause very rapid variations in the resistance of the selenium. In this way the frequencies of sound are incorporated with the current, and are transmitted in the usual way.

The phenomena at Alabama cannot be explained by this process. It is suggested that the arc light produced violet rays capable of ionising the ether, thus transmitting the voices through the air in a definite channel. But it is doubtful whether this would be so since the violet rays, which are the smallest visible rays of the spectrum, would probably not have a wave-length small enough to ionise the ether. It seems more feasible to suppose that the intense light would produce smaller vibrations in the ultra-violet range, or beyond, in one of the gaps in the range of etheric vibrations of which we know so little at present, and that these vibrations would cause the ionisation.

The etheric vibrations occur in octaves of definite frequencies, from the smallest, including X-rays and gamma rays, to ultra-violet rays, light rays, heat rays, and the rays or pulses which we call wireless "waves." But gaps occur which are at present unknown and unexplored.—(Manchester Guardian).

THE TELEPHONE SYSTEM OF THE UNITED STATES.

AN OUTLINE OF ITS DEVELOPMENT, ORGANISATION, AND CONTROL.*

BY WM. DAY, M.I.E.E.

SYNOPSIS: Exclusive Specialization—The Pioneers—Statistical Development—Extension of Communication Range—Evolution of a National Service—Commission Control—Imaginative Achievement—Creating a Tradition—A Notable Episode—Advertisement and Publicity—Comparisons and Tendencies—Instructed Opinion.

ALTHOUGH we must always carry in mind our particular responsibilities, it is well that we consider from time to time the machinery whereby the basic discoveries and labours of the Scientist, Technician and Engineer have been, and are being, crystallised into a great public utility such as the Telephone industry.

It is of great importance that technicians—whatever their rank—should avoid nourishing the impression that they are so absorbed in the solution of fascinating technical problems that they have no time to share in that wider outlook upon industrial organisation which gives zest to effort, and develops a corporate sense of responsibility in which it is a privilege to share. The advantages gained by an exclusive specialisation—by that I mean the unremitting and concentrated attention upon a particular problem or set of cognate technical questions—need not be overlooked in order to arrive at the conclusion that it produces a type of mind—narrow in outlook and aloof from those considerations in which in our more generous moments we all desire to share, concerning the welfare of the community as affected by the industry in which we are engaged. If this conception is right, then it is not out of place to consider the development of those immense organisations in the United States through which the telephone is made available to a great population.

The qualities which characterised the American Telephone System have all grown from the right beginnings made by a small group of men who controlled its development during the first 10 years of its history. Alexander Graham Bell, Thomas Sanders, Gardiner Hubbard, Thos. Watson, W. H. Forbes, Theo. N. Vail appear, each according to his ability and temperament, to have instinctively recognised and followed those principles and practices which were ultimately to make the telephone industry into an efficient and progressive engineering utility. Bell it was who first conceived the idea and then demonstrated the possibility of linking acoustical resonance with the propagation of electrical currents so as to transmit human speech. Sanders and Gardiner Hubbard supplied the money for Bell's experiments. These three men agreed jointly to own Bell's patent rights, and may thus be regarded as constituting the first telephone organisation ever formed. Soon afterwards, together with Thos. Watson—Bell's mechanic and co-worker—they formed themselves into what is usually referred to as the "Bell Telephone Company Gardiner Hubbard Trustee." Gardiner Hubbard became responsible for the business side of the Company, and adopted at the outset one of the fundamental principles of the Bell organisation, viz., the leasing of telephones instead of selling them. This was bitterly opposed at the time, but Hubbard stood his ground and won through. To Sanders fell the then difficult task of persuading people to back the telephone financially, and in the course of his efforts he risked his own fortune. Later, however, he succeeded in interesting some business men in the New England States and the New England Company was formed. To this Company were assigned all the Bell Company's patent rights, but they had to buy the apparatus from the Bell Company, and an agreement was also entered into concerning long lines.

These arrangements constituted the first step towards that regional organisation and federated relationship which constitutes the Bell organisation as we know it to-day.

This New England Company was so successful that another Company, the Bell Telephone Company—an entirely distinct organisation from the Bell Telephone Gardiner Hubbard Trustee Company—was formed to serve the rest of the country, with Vail as its general manager.

Later a son-in-law of Emerson—Wm. H. Forbes—a man of great social and business distinction, joined the company as director and was made chairman. Pushing ahead with tremendous energy—they were all out for big prizes which for most men are the necessary incentives to their greatest effort—and exercising great foresight they amalgamated the three companies then existing, viz., The New England Company, the Bell Telephone Company Gardiner Hubbard Trustee, and the Bell Telephone Company into one organisation with the title of the National Bell Company. This organisation had to meet serious competition from the Western Union Telegraph Company, which, by this time, had entered the telephone field, and, after a fight, an agreement was reached whereby the Western Union Telegraph Company should take all telegraph traffic and the National Bell

* An amplification of some notes which formed the basis of an informal address to the London Centre of the Society of Post Office Engineers, October, 1925.

Company all the telephone work. The National Bell Company was then re-capitalised and reorganised and formed into the American Bell Company. Subsequently this Company made application to be allowed to increase its capital so as to provide for the construction of long lines. This was refused, and so an additional company, viz., The American Telephone & Telegraph Company was formed, with Theo. N. Vail as president. Fourteen years later the American Bell Telephone Company became the American Telephone & Telegraph Company, with headquarters in New York, and, ultimately, with Theodore N. Vail as president.

The character of the pioneers associated with the changes I have outlined were those which mark all pioneer effort whatsoever—courage and faith; courage in that they risked their personal fortunes in the development of the telephone industry in the hope of great reward, and faith because they all believed tremendously that the telephone was destined to become a mighty instrument in the service of man.

Two of their names outshine the rest—Bell, of course, as the immortal inventor of the telephone, and Vail, the ex-telegraphist and ex-civil servant, whose name will rank high among the captains of industry and far-seeing organisers in a land where circumstances peculiarly favour the high development of this particular type of ability.

Here let us pause in our consideration of the evolution of the machinery of organisation to glance at the statistical development and the extension of the range of communication which had occurred in the United States.

In June, 1875—just 50 years ago—A. Graham Bell, working with Thos. A. Watson in an attic in Boston, discovered that speech could be transmitted over a wire. Nine months later these two pioneers were conversing over the first telephone circuit ever installed—a single wire between two rooms on a top floor. Soon afterwards Lord Kelvin, during a visit to an Exposition at Philadelphia, declared that Bell's invention was the greatest thing he had seen in America. To-day, as we look back upon fifty years of progress, we see that Lord Kelvin's tribute was more than merited. Potentially, at least, Bell's invention was revolutionary and one of the biggest events in that tremendous and ceaseless struggle through which it is decreed mankind must pass.

Thence forward the story of telephonic development in America is a record of more than notable accomplishments alike in the realms of scientific research, of applied knowledge, of organisation, and of finance.

A year after the first sentence had been spoken an overhead line, two miles long, had been erected, and five years afterwards 40,000 stations were in existence. In fifteen years over 200,000 stations were working, whilst in 1894, 19 years after Bell's great triumph, the number had increased to 300,000. These developments had taken place under the stimulus of the Bell Company who had obtained the famous Bell patents.

But in 1894 these basic patents expired, and what are known as independent companies came into the field. A remarkable acceleration now took place.

By 1901 a million telephones were in service; by 1906 over 3½ million; by 1910 nearly 6,000,000 and by 1919 12,500,000, whilst to-day the number of telephones in the United States has probably exceeded 17 millions, a figure roughly approximate to the number of motor vehicles in use there and averaging one to every six people. To this extent it may be said, with certain reservations to be referred to later, that a national service is in being.

The mere increase in number of telephone stations, however, is by no means the most important aspect, at least from the technical standpoint, of telephonic development.

During the period under review marvellous applications—marvellous although now commonplace—of scientific knowledge followed in rapid succession with the result that the range of communication increased continuously.

As already mentioned, in 1876 conversation took place over a circuit two miles long.

In 1884, less than ten years after Bell's historic achievement, it is on record that conversation took place over hard drawn copper wire between Boston and New York (230 odd miles).

By 1892 the range of commercial conversation had so increased that speech was possible between New York and Chicago (900 miles).

In 1902 the first conversation took place over an underground cable 10 miles in length—which at that date was considered an achievement.

But four years later the underground cables had been so improved that the conversation range had been extended to well over 100 miles (New York to Philadelphia).

By 1911 the citizens of New York were talking to those of Denver (2,100 miles apart).

Two years later, in 1913, conversation was taking place via an underground cable between Boston and Washington (450 miles) and via an overhead line between New York and Salt Lake City (2,600 miles).

In 1915 the first conversation between Boston and San Francisco was held and trans-continental telephony (3,650 miles) was an accomplished fact. As technicians we can appreciate the immensity of the efforts, and the diversity of the instrumentalities which have rendered possible such a record of practical accomplishment.

Since 1915 there has been a continuation of this development more particularly in main underground construction. Broadcasting has taken its

place as a public utility—and transatlantic radio telephony has crowned all previous achievements.

Such in briefest skeleton is the record of telephonic progress in the United States.

Now let us glance at the functioning of this vast machinery of communication.

The national service is provided mainly by an organisation of corporations known as the Bell System, and also by a number of independent or home companies standing more or less outside the Bell interest. The Bell system consists of the American Telephone and Telegraph Company, the Operating Telephone Companies known as "Associated Companies" and the Western Electric Company. The Telephone and Telegraph Company maintains the research and headquarters organising staffs required for standardisation of facilities. It also provides for long-distance communication. The Company has contractual and financial relationship with the Operating Companies and with the Western Electric Company.

The Associated Companies provide and maintain the telephone service, i.e., operators, plant, etc., in the areas in which they operate.

The Western Electric Company manufacture plant for the American Telephone and Telegraph Company and Associated Companies.

It will be seen that the first of the corporations referred to viz.: the A. T. & T. Co. performs for the other two such functions as can be efficiently rendered by a centralised organisation, the second controls local service, whilst the third is the manufacturing organisation for the whole combination. At first the Bell Companies operated mainly in more densely populated areas where the new industry could be more easily made to pay. It inevitably followed that the smaller communities demanded telephonic facilities and home or independent companies were formed and strongly established themselves in thousands of the smaller towns. Then the Bell interests commenced operations in areas hitherto served by independent companies, and vice versa. This resulted in a certain duplication of plant. Next came, of course, the public demand for a single telephone plant to a town and the independents withdrew from some areas, and the Bell interests from others—the Bell Companies, however, still operating mainly in the larger centres.

The position, as I understand it to-day, is that the independent companies which number approximately 9,300 are now in helpful mutual relationship with the great Bell organisations. The independent companies serve some where in the neighbourhood of 5 million stations, whilst the Bell interests serve, say, 12 million.

In 1907 state regulation was enforced, and to-day capital issues and standards of service are regulated by Commissioners subject to the right of appeal to the highest court in the land—the Supreme Court of the United States. There is a community service, a State service, and an inter-State service. The rates for the two former are regulated by State Utility Commissioners acting within the limits imposed by any particular State and the latter by inter-State Commerce Commissioners. The State Utility Commissioners are appointed by the Governors of the various States, and the inter-State Commerce Commissioners by the President. It is worthy of note here that there is no uniformity of State Utility Laws.

At first, commission control was very popular because it enforced a reduction in rates. But of late this popularity has waned because it has not been possible to continue such a policy. Moreover there are serious practical difficulties and limitations in the way of Commission Control. It is not an easy thing to regulate in such a way as to penalize inefficient management and bad service and to reward the efficient and good. Yet this will have to be done if Commission Control is to stand against a reasoned scrutiny, and it necessitates that the commissions shall be, both themselves and through their staffs, men closely in touch with the Telephone Industry in all its varied and inter-connected aspects.

Again, under Commission Control it is not unknown for a community to be deprived of the advantages of the telephone service owing to the inability of the local company to carry on having in mind the rates allowed by the Commissioners. Herein is a big difference between the two countries. In the States the system serves territories; in this country it functions as an organism.

I think I am but stating a fact when I say that "State Regulation through Commissioners" as it affects the telephone communication system of America is by no means a settled thing. Indeed, there is a school of thought—powerful although not in the ascendant—which advocates State Ownership and state operation.

It is also true I think to say that commission control is costly and cumbersome. Some there are who consider that the tendency is for it to become more so—others think that the procedure will be simplified.

In any case we may safely assume that, splendid as the telephone service in America undoubtedly is, critics are not wanting who hold that under a different form of administration it would be much better.

That of course is an attitude common to critics interested and disinterested in all countries and concerning all things.

As we glance at the great telephone system in the States it is well to remember that it rests fundamentally upon the imaginative achievements of a few men. Men like Bell and Hubbard, Forbes and Vail formed their conceptions far in advance of practical accomplishments. It is fortunate for America that, whatever may seem to be the faults in its machinery through and by which its telephone service functions, an inadequate vision concerning

the future possibilities for the telephone cannot be charged against those responsible for forming public opinion. And this reflection leads me to a few observations concerning the methods of advertisement and publicity. There is no doubt that if the telephone service in this country were in private hands there would be a far greater amount of advertisement than is now the case, but it is equally true that should the American Telephone system be nationalised on lines similar to ours then there would immediately follow a cessation of advertisement. A Government Department is considered by many—not necessarily hostile to State ownership—unsuited to carry on the work of advertising agency, and the amount of criticism which would inevitably be directed against its operations, and their cost would in the end strangle it for really effective propaganda. But there is a legitimate publicity very highly developed in America, and not less in the telephone industry than in others, which might I suggest be pursued here with effective results. It consists in the spreading of truthful facts or information concerning the industry which may be of interest and importance to people generally in such a way as to increase the value to the whole community of this great social utility. And such a publicity does more than result in a numerical increase in the number of telephones connected to a system. It forms in the public mind an atmosphere which, reacting upon those engaged in such utilities, helps to create and sustain a great tradition that the success of such a service is to be measured not by the dividends it pays to the few or the many, not by the salaries, wages and conditions of employment it gives to those through whom it functions, but by the extent to which it is affording the greatest possible service as an ally of industry, as an agency around which and upon which modern civilisation business and commerce are built and also upon the rapidity, efficiency and temper with which it can be transformed into an arm of defence in the day of national emergency.

Contemplating the telephone development in America, we cannot but admire the extent to which such a tradition even in so young a telephony industry has gripped those engaged in its service. And this spirit was worthily displayed by T. N. Vail and Postmaster-General Burleson in the negotiations concerning the temporary, and for all he then knew, the permanent handing over of his service to the direct control of the State on the entry of the United States into the War.

Vail, it must be remembered although the chief servant of his company, had also been an autocrat like other great industrial magnates, but now, for a time at least he was to be stripped of anything approaching absolute power. And when this event came this is what he said:—

“We fully realise the exigencies that have forced the Government to take action, and it is our wish and purpose to co-operate and assist in every possible way. The officers of this company will do everything in their power to make your work a success. We believe that every employee will render the best service, and all will be done to carry out the plans and wishes of this Department. Any views of our own as to Government ownership will be brushed aside and the Government will receive the same warm and hearty support as if this matter had never been agitated.”

He went on to assert that “we are here to tender you any assistance we can render, and are entirely at your service.” A notable episode and one illustrating how great traditions are formed.

It is inevitable, in considering the achievements in the U.S. that we should draw comparisons with our own service. For myself I consider that any statistical comparison between the two countries to be of very little use. We have all seen such comparisons, and generally they are made to appear unfavourable to the administration in this country. Although, be it emphasised, not or very seldom in respect of engineering achievement or technical progress.

The insistence upon the statistical inferiority of the service in Great Britain and other countries is inspired by a desire to impress upon the citizens of the U.S. not so much that their service is efficient as that this efficiency is due to the fact that the telephones in America are practically in the hands of a private monopoly regulated but not owned by the Government.

Then again when we are faced by such comparisons we must bear in mind the enormous difference in population, in wealth, in size; in the general strategical, political, economic and geographical position of the two countries.

These differences are so great as to render a comparison useless.

But if this be presented to us then it is well to bear in mind that the telephonic industry in this country may be divided into four periods.

First, the period of indecision and uncertainty.

Second, the pre and post transfer and transitional periods.

Third, the period of the great War.

Fourth, the period of prolonged economic depression.

It is obvious that not one of these were favourable to telephonic development. Some had a retarding effect upon the development rate; whilst others were fatal to almost any progress. It must also be clear that looking at development from this standpoint the causes which I have outlined were of such a nature and magnitude as to render futile any consideration as to the merits or demerits of any form of administration—Government or otherwise.

As regards future development we must bear in mind that the telephone depends for success upon success. If everyone had a telephone, everyone would find it indispensable. On the other hand, when few stations can be called, the telephone is of little use. There remains an immense field for cultivation in the homes of the people. The parallel with electricity supply in domestic service is remarkably close up to this point, but whereas anyone who can prevail upon the local supply authority to accept his custom can enjoy

the amenities of an electric home without regard to his neighbour's doings, the telephone subscriber cannot benefit to the like extent unless his friends and clients follow his example. The former is an individual—the latter a social service.

On the other hand, it is quite legitimate to point to the rapid increase of conversational range, to the continuously developing facilities and conveniences in the States or, for that matter any other country, and to ask how stands Great Britain in this respect?

It is a question that need not be feared. On the testimony of foreign authorities we have as stable and as efficient a communication system as is to be found anywhere. Our main underground cables—the backbone of the Telephone system in this country—is unsurpassed and is still being developed, whilst the installation of the Automatic system in the great centres of this country will provide facilities at least equal to those in other countries including America.

But change is a law of life, and telephone administrations are not exempt although for long periods they may appear to be.

There are big events moving in the telephone world. Financiers acting through International Telephone Corporations are taking advantage of the depleted exchequers of European countries to obtain great and valuable concessions. Recently a journal, in commenting upon this development, said that soon these gentlemen would turn their attention to this country. No wonder! what a magnificently valuable concession would be the right to telephone the London Area for example, or South Lancashire.

At present such proposals may seem remote from practical possibilities and serious consideration. Yet we must not be blind to the fact that there is a strong body of public opinion in favour of something on the American lines, viz.: private ownership under public control for all utilities as a possible contribution to the solution of our industrial difficulties.

I do not overlook, of course, the forces opposed to such ideas, I merely emphasise a fact not so prominent in our thoughts as I think it may well become.

How far will such opinion react upon the telephone industry in this country? No one can tell. But that there will be vast alterations and modifications I haven't the least doubt. The form they will take will depend ultimately upon economic and political developments in this country. It is public discussion that in the long run creates opinion and determines broad lines of policy. Therefore I submit that it is wise, occasionally, to take counsel together concerning the wider aspects of our calling, and so nourish a nucleus of instructed opinion which, by gradually, if imperceptibly, permeating an ever wider sphere of thought may render no mean service to the Commonwealth.

THE T. & T. SOCIETY OF LONDON.

The final meeting of this society took place on April 19 at the Institute of Electrical Engineers.

The report of the 1925-6 session having been duly passed, as also the balance-sheet which carried the very satisfactory balance forward of well over £40, it was unanimously agreed to elect E. H. Shaughnessy, Esq., O.B.E., M.I.E.E. (Assistant Engineer in-Chief) to the chairmanship of the Society for the new session 1926-27.

This business over and the retiring Chairman having been appropriately thanked for his excellent services during a term of office which was marked by conspicuous success, Mr. Shaughnessy, proceeded to give a lecture on The Rugby Wireless Station.

During a period of 1½ hours, aided by excellent lantern slides, the lecturer gave a fascinating description of this, now famous radio centre, in all the necessary details, yet without weariness, at least to his listeners. Mr. Shaughnessy, in his unique racy manner, reduced the technical matter to the simplest terms possible, so that it was difficult to conceive—looking round on the audience—how anyone could have failed to grasp something of the mightiness and much of the wonder of that miracle in brick, and stone, and wood, and ebonite, and china, and steel, and copper; yet which despite the thousands of horse-power potentialities behind it, nevertheless depended for the completion of its mission upon a frail filament enclosed in fragile glass. Such was the impression the writer carried away with him after listening to one of the most engaging of lecturers in a most dexterous handling of one of the most engaging of modern scientific subjects.

J. J. T.

(Mr. Shaughnessy's lecture will be published in extenso in the June and subsequent issues of the Journal.—EDITOR, T. & T. J.)

TELEGRAPHIC MEMORABILIA.

THE year 1926 seems to be full of adieux to veterans of the Telegraph Service in the C.T.O., and last month marked another "last official appearance," when Mr. G. F. A. Lange, Assistant Superintendent of the Cable Room, retired upon reaching the age-limit. Mr. Lange was one of the survivors of the old Foreign Gallery (then known as "F(G)") a section of the C.T.O. which at the time dealt exclusively with all foreign telegrams such as telegrams for the cable companies are now dealt with at the present "Abstract" points.

With the taking over of the Submarine Telegraph Company in 1889, Mr. Lange was amongst the first to be selected to assist with the transfer, his knowledge of both French and German being something more of an accomplishment in those days than it is considered to be to-day. Therefore he was on more than one occasion selected for special duty when certain crowned heads visited this country owing to his versatility in this direction. To the very end of his service he manifested a high sense of duty, and one is confident that the very last entry in the Divisional Diary was as faithful in its accuracy as at any previous moment of his official career, a career, let it be repeated with gracious emphasis, marked throughout by a sincere devotion to the veriest detail of the daily round, and now in his up-river home may he and his good spouse spend many years and many sunny days.

The Telegraph and Telephone Age describes a wonderful appliance for assisting the deaf to hear even though invalidated to 60% loss of normal hearing power. It is known as the Audiphone, was thought out by experts of the Western Electric Company, and strangest feature of all utilises in its make-up certain fundamental elements of telephony, cable telegraphy, and wireless. The receiver weighs six-tenths of an ounce, contains a microphone, an amplifier with two very small vacuum tubes, and the necessary batteries. Finally *permalloy* is utilised in the magnetic circuit of this tiny receiver, thus increasing its sensitiveness and preventing acoustic shock! The receiver is fitted to the ear at will by means of a moulded impression of the outer ear, and it is stated, is worn with the utmost comfort.

The Optophone is another piece of apparatus which practically owes its inception to the intense study of wireless radiography.

There is apparently more than a mere chance that this marvellous invention may ultimately be developed to that practical and economic stage where every blind person may be able to read a book by *hearing the light waves* reflected from it. That wonder, truly, of converting light waves into sound waves!

The report of the Direct Spanish Telegraph Company for 1925 states that the balance available, including the sum brought forward, amounts to £10,678. The 10% preference dividend absorbed £3,000; a dividend of 10% free of tax, was declared on the ordinary shares, and a balance of £1,213 is carried forward, although the traffic receipts showed a decrease of £8,824. During the year the company's Porthcurnow-Bilbao cable was interrupted for two days, and was repaired by the Telegraph Construction & Maintenance Co., Ltd. The new cable was laid and opened for traffic on Sept. 8 last. New overhead lines have been erected between the landing place, Arrigunaga, and Bilbao.

The Cable Room Monthly continues to provide some interesting matter for its readers, but if the writer of these notes may be so bold, he would suggest that a little more vigilant *reader* should be engaged. There is, for example, no such section as the R.R.O. nowadays, and the name of at least one of the Cable Room officers recently promoted is wrongly spelt, to go no farther.

AUSTRALIA.—One cannot quite make out the exact situation in Australia as regards wireless.

A Melbourne firm recently informed Reuter's Trade Service agent that there was a very noticeable increase in the demand for high-grade sets and that a recent shipment from America had been quickly disposed of, while the same authority says that if the number of listening licences can be accepted as an indication, wireless is losing a great deal of its popularity. There were 4,055 licences in existence in January, but it is estimated that at the end of March the total will be only 2,500.

Against this we have the *Times* correspondent who states that the Australian Postmaster-General reports that the growing popularity of broadcasting is enabling the companies to contemplate wider activities. The revenue from licence fees is divided amongst the broadcasting companies, a larger proportion being paid to those which operate high-power stations than to those whose transmitters are of medium or small power. The area allotted to each company is divided into zones, and the amount of the licence fee depends upon the zone in which the listener lives. Up to the end of last year the total number of licences was in the neighbourhood of 80,000, and the revenue from fees about £130,000.

Reuter's Brisbane agency informs us that the Seamen's Unions are demanding that wireless apparatus should be installed in all vessels, irrespective of tonnage. In shipping circles the opinion is expressed that if the steamer *Dorrigo*, which recently foundered near Maryborough, Queensland, had possessed a wireless installation, all her crew would have been saved.

BULGARIA.—The Sofia correspondent of Reuter states that Ludwig Mayer, secretary of the International Posts and Telegraphs Association,

took part in the eleventh congress of the Association of Bulgarian Posts and Telegraphs, which was opened at Sofia on April 4.

CHILE.—From Santiago de Chile via the Trade Service of Reuter, we hear that a new long-range broadcasting station has been opened at Santiago de Chile, working with a power of 1,000 kw, which is capable of being tripled at any moment. The call letters are CMAC.

COLOMBIA.—Also from the Bogota branch of the same agency, that the Colombian Government has entered into a contract with the Marconi Co. for the erection and installation of additional wireless stations in various parts of the Republic. An engineer, Herr Carl Clemp, has been engaged for a year to organise the whole of the Republic's wireless services and to supervise the construction of ten new receiving stations which it has been decided to erect at Popayán, Manizales, Cartagona, Tunja, Honda, Bucaramanga, Barrancabermeja, Ibaqué, Ocana, and Pasto. The State School of Wireless Telegraphy and Telephony established at Bogotá will also be entirely re-equipped.

CZECHO-SLOVAKIA.—The Praha Agency, on the question of progress while admitting that the advance is slow, maintains that in spite of this rather slow beginning of broadcasting in Czecho-Slovakia, that country's electro-technical industry is very favourably situated, and so offers a solid basis for progress in wireless. At present the industry is employed especially in the manufacture of spare parts, with which it supplies a very large number of customers. Nevertheless, several works have also begun to manufacture good receiving sets, which they are producing at advantageous prices. A system of relays has yet to be organised between Prague, Brno, and Bratislava, so that each of the three towns may broadcast the theatrical performances and concerts given by the other two.

DUTCH EAST INDIES.—The Government of the Dutch East Indies has authorised the erection of a large radio broadcasting station and the private use of receiving sets under licence, according to the latest *Commerce Reports* to hand.

ECUADOR.—Reuter's Quito Trade Service reports that the Government of Ecuador has granted the request of a firm in Guayaquil to act for five years as exclusive importers of radio-telephone apparatus. The concessionaires undertake to erect two broadcasting stations, one at Guayaquil and the other at Quito, and to divide equally all profits accruing from the radio business between the Government and itself.

EL SALVADOR.—From San Salvador we learn that a wireless station has been erected on the roof of the National Theatre at San Salvador, capital of the Republic of El Salvador, and will shortly be put into operation.

FRANCE.—A direct wireless-telegraph service has lately been established between France (Paris, Sainte Assise) and Buenos Aires.

Says the *Electrical Review* in a recent issue, "One of the Continental broadcast radio-telephone transmitting stations which English listeners have become accustomed to hear in this country is that of L'Ecole Supérieure des Postes et des Télégraphes at Paris. It is known by its call signal FPTT, its nominal wave-length being 458 metres and power 500 watts.

The aerial masts are fixed on the flat roof of the Central Telegraph Office building in the French capital. It is one of the three well-known Paris stations, and is housed in the training college itself, in the Rue de Grenelle. From small beginnings it has come to be one of the best known in Europe, and now transmits each evening from 8.30 p.m. Notwithstanding its small power its signals are well received within a radius of 1,200 miles, and are heard regularly over the whole of Western Europe from Sweden to Spain, as well as in Northern Africa.

Representatives of the principal wireless telegraph companies interested in international radio communication met last month at Monte Carlo, under the presidency of Mr. T. M. Perkins, American member of the Reparation Commission. The British delegates to the conference were Mr. Frederick Kellaway, managing director of Marconi's Wireless Telegraph Co., Ltd., and Lieut.-Colonel Simpson, deputy managing director. The United States were represented by Mr. Owen D. Young, president of the General Electric Co. and the Radio Corporation, General James C. Harboard, formerly with the American Army in France, and Colonel Roosevelt. M. Emile Girardeau, director of the Compagnie de Télégraphie sans Fil and of the Compagnie Radio France, was the principal French delegate, while the Telefunken Co. and the Italo-Radio Co. were also represented. The International Wireless Telegraphy Committee has held its preceding meetings in New York, London, and Berlin. The chief aim of the present conference is to prepare for the opening up within a short period of wireless communication between Brazil and other countries. The powerful station at Rio de Janeiro is nearing completion, and satisfactory trials have already been made. April 21 was fixed as the date on which direct wireless services between Brazil and the United States, France, Great Britain, Germany, and Italy will be inaugurated. The Rio de Janeiro station has twelve pylons 200 metres high, and has a power of 500 kw. Transmission on a short-wave will be employed as well as on the long wave which has already been tested.

GERMANY.—From Berlin we learn that the German Atlantic Telegraph Co. reports receipts of 738,226 marks in 1924, and it is proposed to pay a dividend at the rate of 6% on the preference shares, as in the previous year. The directors state that the work of producing the cable that is to be laid between Emden and the Azores, where it is to be connected with the cable of the Commercial Cable Co. and the Western Union Telegraph Co., is in full course, and it is reckoned that the connexion will be completed during the present year.

HOLLAND.—The British Commercial Secretary at the Hague, Mr. R. V. Laming, O.B.E., informs the Department of Overseas Trade that a new contract has been concluded between the N.V. Nederlandsche Seintoestellenfabriek (of Hilversum) and the Hilversumsche Draadloze Omroep, which terminates the contract of May, 1925, between the parties mentioned, to be operative from March 1, 1926. Article 1 places at the disposal of the H.D.O. certain hours per week for transmission purposes, and the N.S.F. binds itself to allot the remaining hours for transmission to the H.D.O. as desired, in so far as they are not already granted to others, and not to grant the use of the transmitting apparatus to other bodies before having given the H.D.O. the option of refusal.

The following rather stiff conditions are imposed. Article 2 stipulates that so soon as the Government grants permission for the use of the second transmitter, it shall be ready for use by the H.D.O. within two months thereof, but in any case not before June 1 1926; it will operate on the same wave-length as the existing transmitter, and with at least the same capacity in the aerial. The H.D.O. guarantees a minimum of 31 hours per week for the old transmitter at present in use. The N.S.F. is to see that the old and new transmitters function properly, including the provision of the material and *personnel* for the control thereof. The H.D.O. binds itself not to utilise the transmitter for advertising on behalf of firms or persons competing with the N.S.F., to submit its weekly programmes fourteen days in advance to the N.S.F., and to remunerate the latter for the use of the old and new transmitters, *personnel*, materials, licence, studio, and a maximum of two line transmissions per 31 hours on the old transmitter, and 40 hours on the new transmitter. On the eventual conclusion of a permanent contract with a probable national broadcasting body, the present contract is not to be referred to as a precedent.

INDIA.—Through the India Office we learn that the Government of India is determined to rapidly modernise the telegraph system. The Creed-Wheatstone automatic system of working has been entirely replaced by modern multiplex systems, i.e., Baudot, Murray, and Morkrum; laboratory experiments on the Echelon method of working (i.e., between more than two stations on the same wire) have been carried out with a view to its early introduction. A considerable amount of experimental work has been carried out with Baudot re-transmitters in the Research Laboratory; a four-channel set, with single-disc distributors, has been designed and tried in conjunction with two quad terminal sets through artificial lines. After a number of preliminary trials, a scheme of connexion has been evolved which has now been adopted with entire success as the standard in the Department. Experiments in connexion with multiplex working were also carried out in the laboratory with Western Electric valves and relays and with valves only; the experiments were very encouraging.

When purchasing stores, increasing use is being made of local sources of supply. Hard-drawn copper line wire is now being manufactured satisfactorily in India, and over 600 tons of this wire of local manufacture was purchased by the Department in 1924-25. The telegraph workshops show an increased output. The training of men in the manufacture of high-speed apparatus has been very successful, and complete Baudot instruments and all spare parts, which were previously received from England, are now manufactured at the workshops at very favourable rates. A special machine was designed and made in the workshops to convert Wheatstone tape into Baudot tape, to prevent the loss which would have been incurred by scrapping a large stock of the former. In the construction branch of the workshops, 30,020 galvanised tubes for telegraph poles, and 185,214 brackets with fittings for supporting line wires were made. The output from the iron foundry weighed 664 tons.

The total line and wire mileages of the Indian telegraph system were at 94,037 and 477,839 respectively, on March 31, 1925. There has been a considerable increase in traffic recently.

Commerce Reports states that the Indian Radio Telegraph Co. is reported to be planning the construction of a 12-kw. broadcasting station at Calcutta. Details are not yet available, but it is understood that this is one of two stations to be built in India, the other to be at Bombay.

IRAQ.—The ban on the importation of radio equipment into Iraq, states *Commerce Reports*, has been lifted. Purchasers of radio sets must register with the Director of Posts and Telegraphs, however, and obtain a permit before a set may be used. Iraq has no broadcasting station, and reception is very unsatisfactory during eight or nine months of the year, which indicates that it is not likely that a profitable market will develop in the near future.

LIVERPOOL.—The Western Union Cable Co. has opened a new office in the Liverpool Produce Exchange to afford direct communication with the produce exchanges in New York and Chicago. As the exchanges in Liverpool and America are "open" simultaneously only during one hour each day, the new premises will only be in use from 3.15 to 4.30 p.m. each day. The new direct cable gives a "three minutes' round trip" service. At the opening ceremony a cable of congratulation was sent to the American exchanges, "hoping that the extended facilities for trade provided by the Western Union will result in increased trade to the mutual benefit of both exchanges."

NEW RADIO CIRCUIT.—The daily Press reports that Sir Oliver Lodge has designed a new circuit which will ensure perfect reception without aerial tuning, and will thus avoid the use of reaction. Sir Oliver, in a statement to Pressmen, said that the reports were entirely premature, but that he expected to be in a position to make an announcement on the subject in about a month's time.

NEW ZEALAND.—The New Zealand correspondent of the *Electrical Review* states that New Zealand is a stormy coast, but the loss of life occasioned by wrecks, and the number of wrecks themselves to a certain extent, will in future be reduced, for all coast-wise ships must now be fitted with wireless sets, and all navigators who secure their master's or mate's certificates on these vessels will in future need to comply with the New Zealand enactment, which makes it a part of that examination to qualify as a "wireless signaller." On and after January, 1926, every candidate for a home trade certificate will be required to produce a certificate in the form of an examiner's authority, issued by the Minister of Telegraphs, to the effect that the candidate has passed some satisfactory examination as a wireless signaller. The examination provided by the Minister is not of a technical nature, but consists of a test of the candidate's practical knowledge and manipulation of transmitting and receiving apparatus, similar to that now required to be installed on all ships. The candidate is required to send and receive for a period of five minutes each, at a speed of not less than ten words per minute, and will be required also to know something of the usual procedure between sea and land stations, and have a practical working knowledge of the regulations governing wireless signalling.

PERSIA.—Most surely East met West on the 27th ult., when a wireless message of congratulation was signalled from London (Rugby) on the occasion of the inauguration of the new high-power station to Teheran, the capital of one of the most ancient kingdoms of the world.

The new Shah, in the midst of his accession festivities, opened the station for world-wide communication.

POLAND.—Reuter's Warsaw correspondent reports that a new broadcasting station was opened on the 18th of last month at Warsaw by the Prime Minister, Count Skrzynski.

RUSSIA.—It has been announced by Marconi's Wireless Telegraph Co.' Ltd., that a radio-telegraph service from London to Moscow (Russia) was inaugurated on March 31. Commercial and private messages are accepted at any Marconi office. It is understood that this service works via Vienna from London.

For some time past experiments with short waves have been in progress at the Russian Soviet Government Laboratory at Nishni-Novgorod and it is reported that by the use of a 1,520-W transmitter devised by Prof. Bontch-Brouyevitch (head of the laboratory) and Herr Tabarinow, messages have been successfully transmitted to Chile and Porto Rico on wave-lengths of 83, 102, and 104 metres. The object of the experiments is to provide a practicable form of radio communication with remote parts of Soviet Russia which are not provided with telegraph communication. Prof. Bontch-Brouyevitch is also reported to be experimenting with a 100-W transmitter for use at the Chabolovka radio-telegraph station, near Moscow.

The T. and T. Age speaking of the wide-spread interest taken in radio matters, adds there are six broadcasting stations of 2,000 watts under construction, and one of 50,000 watts, with five stations in Moscow, where the public reading rooms are equipped with receivers and loud-speakers so that people too poor to purchase a set are able to listen. It is estimated that over 20,000 Russians in Moscow alone have managed to build and operate their own sets without the knowledge of the authorities. Broadcasting in Russia is under the control of the Commissariat of Posts and Telegraphs.

The name Popoff has been given to the new broadcasting station at Sokolonika, Moscow, in memory of the deceased Russian scientist, Prof. Popoff.

SWEDEN.—Telegrams to Russia, which were formerly collected and dispatched by the Store Nordiske Telegrafskabs station at Goteburg, will in future be sent by the telegraph station at Stockholm, with Helsingfors acting as a relay point for messages between Stockholm and Leningrad. *Commerce Reports* believes that swifter communication between the two countries will result from the change of stations.

THE WHITE SEA CABLE.—A special expedition is to be organised this year for the restoration of the cable between Archangel and Murmansk, which is now out of service, the length being about 500 miles.

VENEZUELA.—A concession has been granted to a native company to establish and develop broadcasting in Venezuela. The Government proposes to erect a high-power station in Caracas and stations in each of the other States. Hitherto there have been no privately-owned radio-telegraph stations, clubs, or societies in the Republic, although permission has been given to one or two oil exploration companies to erect radio-telephone stations exclusively for communication between the oilfields and their offices. Hitherto this permission has not been taken advantage of, says Reuter's agency.

PERSONAL.—Between the Football Match Centels *versus* Barts, and the Dance arranged by these two friendly opponents at Australia House, London, the sum of £55 was handed over to Lord Stanmore on behalf of St. Bartholomew's Hospital funds. This result was much appreciated and gracefully acknowledged by the Treasurer of the above institution.

Despite the many calls upon the purses of the C.T.O. staff it is felt that every member of that generous body would wish to be reminded of the "Adair Wounded Fund Appeal."

Leadership.—"No one with merely selfish aims, no man who is a self secker, can be a real leader of men."—Anon. J. J. T.

The
Telegraph and Telephone Journal.

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

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NOTICES.

As the object of the JOURNAL is the interchange of information on all subjects affecting the Telegraph and Telephone Service, the Managing Editor will be glad to consider contributions, and all communications together with photographs, diagrams, or other illustrations, should be addressed to him at the G.P.O. North, London, E.C.1. The Managing Editor will not be responsible for any manuscripts which he finds himself unable to use, but he will take the utmost care to return such manuscripts as promptly as possible. Photographs illustrating accepted articles will be returned if desired.

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THE RATE OF TELEPHONE PROGRESS.

It is interesting to record that during March last, the month in which the Jubilee of Bell's telephone was celebrated, the total number of telephones in Great Britain and Northern Ireland reached a figure not far short of a million and a half. It was in fact 1 421,150. Of these, 1,390,153 belonged to the Post Office system, 11,000 to railway and other private installations enjoying the facility of communication with the national system, and about 20,000 to the systems maintained by Hull and the Channel Islands. At the present rate of development the million and a half mark should be reached by the end of October next. In the middle of 1913 the total for the country was 750,000, so that in thirteen and a half years, despite four years of war when development was at a complete standstill and two years more during which the Post Office was further handicapped by the shortage of plant and men resultant on war conditions, the number of telephones in Great Britain was doubled.

Official statistics of the early years of the telephone in this country are not obtainable. Such figures as we possess are culled from technical newspapers, and these generally express the development of the telephone—as did the earlier records of the National Telephone Company—in terms of “lines” instead of “stations.” Nevertheless, defective as they are, they provide some instructive

reading. The first telephone exchanges in this country were, as we know, opened towards the end of 1879. There were probably not 10,000 lines working before the end of 1883, nor did the total reach 30,000 before the end of 1888. This figure was doubled early in 1893 and doubled again by the end of 1898, then reaching 120,144. In the year 1899 the development of the telephone began to be reckoned by stations, and reached the figure of 170,000, which was more than doubled in the quinquennium between that year and 1904 when it totalled 367,800. This again was doubled early in 1913 (there were 729,296 stations in existence at the end of 1912) and will be doubled again in all probability by the end of the coming summer. It will be observed that, naturally enough, when the totals were small they were quickly doubled, and that this process becomes slower as the figures become greater. Far otherwise, of course, is the rapidity with which each additional hundred thousand is added as the system grows vaster. The figure of 100,000 was first reached in 1896; 200,000 in 1900; 300,000 in 1903; thenceforward increases of 40 and 50 thousand a year until the outbreak of war. After a period of stagnation development proceeded at the rate of 100,000 a year in 1923, and at the present time reaches that figure in ten months.

It is worthy of remark that in the early days of telephony the London system did not form such a large proportion of the whole as it does at present. Up to the year 1890 this proportion was round about a quarter; in 1893 it was one-sixth; in 1899 one-fifth; by 1904 it was a quarter again; but since 1912 London has contained a good third of the telephones in the United Kingdom and in some years considerably more.

How long it will be before the total of a million and a half which we expect to reach before the end of the year will be doubled, is a question which lies in the field of prophecy. Experts, after exhaustive study, plan curves of development, but the future rate of growth of a convenience like the telephone must always remain to a large extent incalculable. It is only when a town has reached that stage of development which the expert might deem “saturation point,” that the appetite of the inhabitants for the telephone becomes really whetted; for it is a commonplace of telephone experience that when nearly everyone is “on” the telephone, everyone else finds he must also have it. When this stage is reached the forecasts of the projectors of curves appear to have been inspired by a strange lack of optimism.

HIC ET UBIQUE.

THE report and balance sheet of the Guernsey States Telephone Department shows a net profit for the year ending March 1926 of £275 14s. 5d. The number of subscribers' lines and stations increased from 3,441 to 3,642 and the mileage of overhead and underground metallic circuits from 5,472 to 6,373.

We have received the first two numbers of *Voltiana*, published by the executive committee formed to celebrate the centenary of

Alessandro Volta, who died at Como in 1827. These numbers contain portraits of Volta and articles on his life and work, together with pictures and descriptive notes on Como, where an International Electricity Exhibition will be held from May to October. The subscription to the journal is 30 lire and it may be obtained from the Direction, Voltiana, Via Unione 11, Como.

Owing to the need for economy, says the *Electrical Review*, the telephone cable extension programme for 1926 of the Czecho-Slovakian Post and Telegraph Department has been materially cut down. The line between Prague and Brunn is, however, being extended to Iglau; a cable is also being laid between Prague and Aussig to provide a connexion at Dresden with the German telephone system. It is also contemplated to lay a cable between Prague and Pilsen to provide another connexion with Germany at Plauen.

Although Wick has possessed a telephone exchange since the end of last century, telephonic communication with Inverness and the south was only inaugurated in April 14 last, a trunk line of 118 miles length being formally opened on that date. Communication is, therefore, now obtainable, to the joy of all lovers of picturesque fact and phrase between John O'Groats and Lands End (or thereabouts).

We recently came across the first number of an extinct fortnightly journal, *The Telephone*, which made its appearance in 1889. A gallant attempt is made in its columns to collect the latest telephone statistics, a feat the difficulties of which the writer of these notes can well appreciate. The results offer some instructive comparisons with present-day figures. Some of the statistics are given in "stations," but the majority represent "lines." The British, American, and German figures relate to the end of 1888; the remainder, presumably, to the end of 1887. British telephones were distributed as follows:—

National Telephone Co.	9,938
Lancashire & Cheshire Co.	4,517
Western Counties Co.	2,571
South of England Co.	2,125
United Telephone Co.	6,958
	26,109

With the figures for the Northern Telephone Co. and the Telephone Co. of Ireland, the total might reach 30,000.

The principal telephone using countries were:—

	Telephones (or Lines).
United States (Bell system only) ...	158,712
Germany	31,325
Great Britain (as above)	30,000
Sweden	12,864
France	9,487
Italy	9,183
Switzerland	7,626
Russia	7,585

In those days Belgium was in advance of Holland, and Spain actually ahead of Denmark in the number of telephones they possessed. If we turn to the development of cities, some equally surprising changes of position confront us. First comes Berlin (with Potsdam) 8,981 stations; second, London with 6,958 lines; third, New York with 6,902. It should be noted that the American figures are a year older than the other two. Then come Stockholm with 5,665, Paris with 5,530, Chicago with 4,694, and Hamburg

with 3,669. Madrid had more telephones than Brussels, and Rome than Copenhagen or Christiania!

The following paragraph is going the rounds:—

Telephone subscribers in the London area will do well to study the new issue of the London Telephone Directory and particularly that page which contains instructions to telephone users. For some reason which one supposes must seem good to the officials associated with the management of the telephones, it has been decided that every call must consist of four figures, even if the first two or three seem unnecessary. Thus, if one wants the number 96 in future he must ask for 0096. This may be for the benefit of telephone operators, but where the good comes in for the caller is hard to see.

The compiler of it has read part of the preface to the directory but he has apparently carefully abstained from reading that part which explained "where the good comes in."

Occasionally we hear of a wail in the Press as to the alleged difficulties of hunting for a Jones in the trackless wilderness, so to speak, of the North Wales telephone directory. "Doctor hunts in vain for hours"—we read recently. There are 5½ columns of Joneses in the Chester and North Wales directory. Yet ten columns of Joneses appear regularly in the London directory and never cause the shadow of a difficulty. Why then these wails from Wales? We should hesitate to whisper to a Welshman that there are 82 columns of Anderssons in the Stockholm directory!

We often regret that we are not privileged to enliven our columns by the same expedients as some of our telephonic and telegraphic contemporaries. For instance, *Telegrafi e Telefoni* of Rome has a regular series of drawings in the true style of *La Vie Parisienne*, wittily illustrating electrical terms; and now a German contemporary comes out with a genuine matrimonial advertisement in which offers are sought from higher officials for a lady who is not only "very pretty," combining tallness and slenderness with a full figure, but is also Evangelical and Economical.

On April 19 the hours of the preliminary Anglo-German telephone service were extended. It is now open from 6 p.m. to 8 a.m. Mondays to Fridays, and from 3 p.m. on Saturdays to 8 Monday mornings.

According to a Reuter's telegram which has been circulated in the Press, all-day telephone communication between England and Germany will be established when the last portion of the cable connecting Domburg (Holland) with Aldeburgh (England) has been linked up with the German telephone system. The German steamer *Neptun* is now on its way to Holland from Cologne to carry out this work, which is expected to be completed by the end of April. The cable is over 100 miles long and weighs 1,700 tons.

Lloyds List, however, says more accurately that the *Neptun* is proceeding to Nordenham, to which place the cable is on its way from the manufacturers in Cöln-Mülheim. The *Neptun* will then go to Domburg to lay the cable. When, however, the cable is laid, when the special direct land lines are connected up and the repeaters installed, the work of testing through and balancing the circuits remains to be done. It would be unsafe to assume from the above-quoted telegram that a full Anglo-German service may be expected in the early summer.

INTERNAL CIRCULATION OF THE CENTRAL TELEGRAPH OFFICE.

PHONOGRAMS.*

BY MARY T. TYNAN.

(Continued from page 157.)

ONE of the most marked developments in regard to telegraph practice is the increasing use of the telephone as a means of acceptance, transmission or delivery of a telegram. In some instances the subscriber is an actual participator in the transaction, and in others the telephonic phase is intermediate and conducted by officers of the Post Office.

The word "phonogram" is a neat and happy coinage (I suppose it is what Lewis Carroll would have termed a portmanteau word) and is used to designate the former class, while the messages in which the telephone is used for purely departmental transmission are known by the rather clumsy title of Telephone-Telegrams. For general purposes, however, "phonogram" is used indiscriminately for either category, and it has been so employed in the title of this paper. Using the term then in its general sense, phonogram traffic is of four kinds:—

1. Telegrams dictated by a subscriber over his telephone circuit.
2. Telegrams dictated by any member of the public from an attended call office.
3. Telegrams dictated from the post office to the subscriber instead of being hand-delivered by messenger.
4. Telegrams accepted over the counter at a branch or sub-post office and telephoned to the handing-over office instead of being transmitted by telegraph.

Counterfoils bearing the subscriber's telephone particulars and the charges involved, are prepared in every case of reception from a subscriber, and these are passed to the London Telephone Service daily for debit of the fee to the telephone accounts.

Fees involved in phonograms sent from call offices are paid to the attendant at the time of transaction.

A fifth category has been lately introduced in some towns, where telegrams may be sent from any call office, the necessary coins for payment being inserted in the coin box one by one and checked by the operator before dictation of the telegram.

In return for the personal share he takes in transmission or reception of a phonogram, the subscriber enjoys many advantages. Time and trouble involved in a visit to the Post Office is saved, telegrams may be dictated and received at any hour of the day or night outside the usual hours of telegraph business, a certain amount of delay is prevented by the elimination of one office handling, and in the case of delivered telegrams the recipient is in possession of the contents of his telegram almost as soon as it reaches the last office of treatment within 20 miles of his residence.

The official advantages are of a more subtle character as regards the acceptance stage, as branch and sub-office staffs cannot be reduced to any very appreciable extent to compensate for the large staff which must be maintained at the phonogram office, but the facilities offered to the subscriber and the ready accessibility of the service, may be regarded as lures to induce the growth of the telegram habit. Delivery by telephone effects a decided saving in messenger force, and the resulting addition to the mail bag by the posting of confirmatory copies is not sufficiently heavy to be very appreciable on the postal side.

The use of the telephone for the transmission of telegrams between office and office effects a saving in lines, as this class of transmission is generally governed by the output per day and is sent over the general service lines, and it is obviously expensive to maintain telegraph lines and personnel for a very small daily output.

The history of the phonogram in the Central Telegraph Office goes back to the early days of telephony, when the Post Office trunk lines were led to a tiny room, where some private telephone circuits also were accommodated for the receipt of telegrams. As the service developed its location was changed from time to time until the transfer of the National Telephone Company and the development of phonogram traffic on more general lines,

when a more permanent home was secured on the ground floor. This, again, proved inadequate, and in 1922 a spacious gallery on the first floor was cleared and equipped with the view of accommodating the growing service, but in the following year still further expansion was necessary, and a large area was added to the original plans.

The work of this further enlargement has been somewhat retarded by the extensive alterations now in progress on the structure of the whole building, and is still proceeding.

The present phonogram room as opened in 1923 provided accommodation for 168 operators actually engaged in the work of receiving or dictating telegrams, and as this proved inadequate, temporary arrangements were made for the transfer, during times of pressure, of certain exchange junctions to ancillary switchboards in another part of the building, where a necessary number of operators' positions were also provided. The extension, when completed, will give 72 additional positions, making a total of 240.

The new phonogram room was planned to include the newest devices, and presented many novelties, the most striking being the arrangement of the tables. The four long lines traversing the entire length of the gallery with only one break, for the accommodation of the circulation unit, was a new departure in instrument room lay-out, and excited much comment (more or less adverse). The length of each table was 50 feet, and the reason for this unbroken span was the introduction of endless band conveyors to carry the telegrams to and from the operators and the vicinity of the circulation table.

The new extension (Fig. 2) has doubled the length of four of these tables, giving the exceptional line of 100 feet per table. As these are not yet completely equipped, the effect cannot be fully gauged, and it remains to be seen whether such a lay-out can be considered ideal. Personal access in any but a very limited sense—so often necessary and invaluable to the super-vision—is practically precluded, and although point-to-point telephones have been installed for communication with different parts of the room, they do not fully meet the requirements, and it may be found necessary at some future date to build escalators and bridges to assist the supervision to exercise the function of super-vising.

The concentrator board is placed at the southern end of the room, rather unhappily distant from the majority of the incoming sets with which it is associated, which are located to the north of the central break. It is arranged with four operator positions which can be concentrated during the slacker periods of the day, and accommodates 312 incoming junctions from 63 exchanges and 88 outgoing junctions to Central, Toll, and Trunks.

Of the four tables which lead to the concentrator, one is reserved for Outer London Post Office traffic, that is, telephone-telegrams, in both directions. These offices call the exchange for "messages," and the connexion is made via Central on special junctions to allow of the segregation of this traffic in the phonogram room. Two of the tables are used for outgoing traffic to subscribers, and the fourth for incoming work, eight of the positions being specially marked for reservations for foreign telegrams for which a distinctive call has been passed by the subscriber. The circulation table, with incoming and outgoing tubes, and the enquiry and listening-in desks are situated between the two ranges of tables, and the remaining tables are all designed for incoming positions.

The calls are pegged through in order of receipt when this is possible, but in times of pressure it is necessary to adopt a system of rotation to ensure that no call shall be overlooked. Resort is then made to a system called panelling, or taking the calls in order of their position, strip by strip, and panel by panel. The time taken to clear each panel is recorded and represents the maximum delay which might have accrued on any one call. The time elapsing between the receipt of the call from the exchange and the time the operator answers averages about 20 seconds. The majority of the calls are answered without delay, but pressure peaks occur consequent upon co-incident demand from subscribers, and although generally of very short duration, sometimes enhance the delay to one or two minutes (or even more) as the necessary staff has to be obtained from distant telegraph divisions, and this has an adverse effect on the general average recorded.

The incoming sets are each furnished with two keys, coloured respectively red and black. The black key is used for the ordinary purposes of answering, speaking, and clearing, and the red as an order wire to the concentrator, or as a transmitter cut-out in order to improve reception. The order wire enables the set to be used for outgoing work, the concentrator operator being asked to connect to an outgoing "Central" junction, and is used for the purpose of advising the concentrator of the opening or closing of the position, or to request transfer of call to enquiries or supervisor in case of difficulty. When an incoming set is used for outgoing calls it is necessary to use the order wire and request the concentrator verbally to "Clear Central." This procedure is followed on the Post Office table, and presents a loophole for failures of clearance arising from habitual use of the clearing key.

A lamp indicator fitted in front of the operator glows when a call is connected to the position, and darkens as soon as the key is thrown to answer. On completion of the transcription of the telegrams the "clear" is given to the distant exchange by pulling the key forward, the concentrator still remaining in circuit until the key is restored to the normal position. In the ordinary course of things the interval between these two transactions should be very short; just enough to enter the charge on the counterfoil, as all other

* Paper read at a meeting of the Telegraph & Telephone Society.

necessary details of counting and checking destination, &c., should be decided with the subscriber. In actual practice, however, it is found that, in some cases, the interval is unaccountably prolonged.

Until quite recently there was no visual indication to the supervisor of the stage of working reached by the operator, and this fact hampers effective supervision. A very cleverly devised system of lamp signalling is being introduced which will show every phase of the transaction by means of coloured lamp opals. A small upright standard at each position carries three lamps coloured white, green, and red respectively. A call is indicated by a white glow, which is replaced by a green light as soon as the operator answers, and when the distant exchange is cleared a red lamp glows both at the position and at the concentrator. This acts as a "guard" against further use of the set until the key is restored to normal. This system, which is being installed at the present time, will afford much assistance to supervisor and staff alike, and will remove the necessity of verbal enquiry or parallel listening-in to ascertain the availability or otherwise of any operator.

One of the most important problems in a phonogram room is the attainment of comparative quiet, and every means which contributes to this end is a distinct boon to operators and subscribers alike. The passage of collectors and distributors inevitably introduces an element of noise and distraction, and the endless band conveyors effectively replace the human element for this work. These are arranged to run below the level of the table, the messages being posted through a slot and conveyed to the table end, where they are dropped into a receptacle placed beneath the rollers. These boxes are kept constantly cleared by girl probationers who pass the contents over to the sorting table for treatment, after the extraction of docketed items which are handed to the supervisor. There can be no doubt of the benefits gained by

is desired to supervise, and in another part of the room an observation circuit for the purpose of statistical record, is regularly staffed.

A complete installation of Dudley tubes conveys the traffic to and from the Phonogram Room, and in this connexion considerable difficulty was at first experienced on account of the noise made by the ejection of incoming carriers. It was found necessary to build an enclosure round the incoming plant and arrange for the carriers to fall into a chute lined with sound-absorbing material.

On reception at the circulation table the "A" forms, that is telegrams dictated by subscribers, are passed through a numbering and dating machine the counterfoils detached and retained. Foreign telegrams are segregated for scrutiny of destination and comparison of same with the Berne List. A machine for simultaneous numbering and date stamping and cutting and storing counterfoils was installed with the new equipment in 1923, but has been out of action for some time. The noise inevitable with hand stamping is decidedly detrimental to telephonic reception in the neighbourhood of the circulation table, and the return of the Bunt machine in a perfected state will be very welcome.

Prior to the war, the Telephone Room in the Central Telegraph Office was staffed entirely by telegraphists drawn from the telegraph galleries some on permanent duties and some under a system of rotation. Temporary assistants were trained and utilised throughout the war period, and these were later replaced by established officers of the London Telephone Service, who were transferred for a period of two years and then returned to their respective exchanges. This system was not satisfactory as it entailed a change of half the personnel each year, and gave too large a proportion of

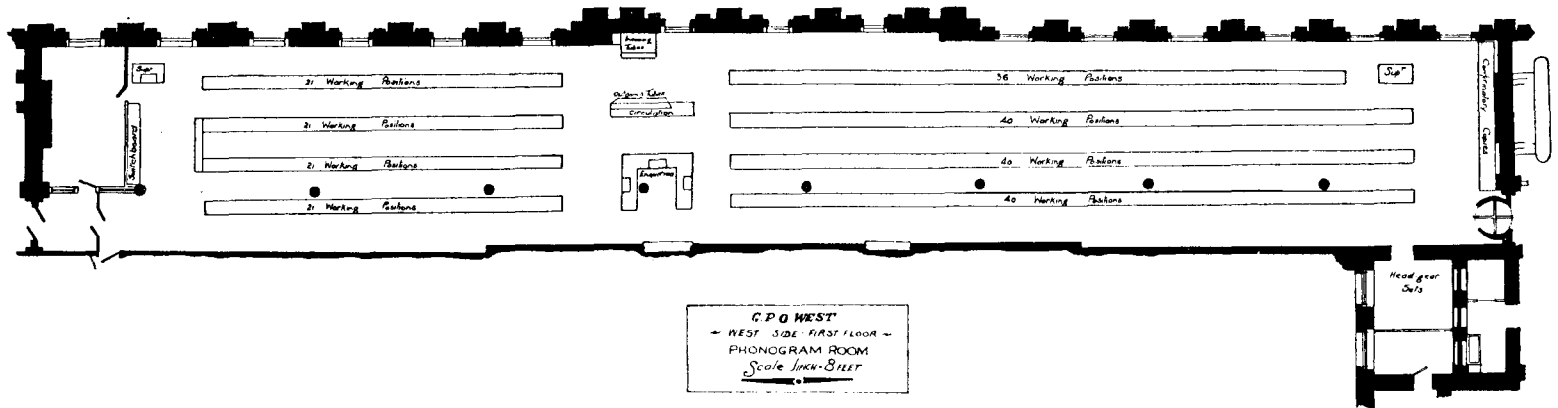


FIG. 2.—G.P.O. WEST PHONOGRAM ROOM.

this mode of transit, but it must be admitted, that, like all means of mechanical conveyance, it is not without flaws.

The outgoing positions are fitted as direct circuits to Central Exchange, and do not, therefore, pass through the concentrator. The telegrams, after being marked with the relative telephone particulars, are distributed to the operators by an open running band which passes along level with the table. Any disengaged operator picks off a message as it passes in front of her. The two tables are linked at one end, and messages which may have traversed both tables unappropriated, are sent round a second time by the supervisor to whom it is immediately evident if the feed of traffic is in excess of staff capacity, and while extra assistance is being sought, it is sometimes necessary to hold up or modify the flow along the bands. In the busy season the automatic feed is entirely suspended during the peak hours, as it is found necessary to regulate the feed more exactly than the bands allow. Some of the outgoing positions are reserved for the telephoning of certain continental telegrams before despatch by messenger, and these are not fed along the bands.

Subscribers or exchanges wishing to make enquiries are routed through enquiry junctions from "Central" to an enquiry desk, which is fitted with five working positions. Operators on incoming sets can also transfer a call to enquiries, through enquiry junctions on the concentrator. The intimation in the *Telephone Directory* that "Telegram Enquiries" may be called—for any information respecting telegrams—is very widely interpreted; in some cases the bureau being regarded as a species of "Enquire within upon everything." Advice and guidance is sought in all manner of social and domestic complications: in the selection of suitable houses and hotels at home and abroad, on the care of pets, and a thousand and one irrelevant matters, the irresponsible persons who make these enquiries being generally more than a little hurt when they are gently but firmly side-tracked to a telephone number which might give the desired result. It is rather curious that there seems to be a general idea among subscribers that "telegram enquiries" should be able to furnish full particulars of trains to anywhere.

At a table adjacent to the enquiry desk, listening-in positions are fitted to allow the supervisor to go in circuit with any operator whose working it

inexperienced officers, and a new staff of telephonist grade to be permanently attached to the C.T.O. is now in course of establishment.

The duties of a phonogram operator are many and varied. For the actual reception of telegrams she must be conversant with many elements of counter practice and must learn all the rules governing acceptance and charging of inland telegrams, multiple rates, boatage and portage fees, free-pass telegrams, re-directions, amended addresses, as well as the reception of telegrams from attended call offices. She must also determine the acceptability of provincial destinations by the use of the *Post Office Guide*, and know the inland and foreign special services available, such as telegraph and express letters, all the cheap rate foreign services to different countries, radio-telegrams, in short, all the work of telegraph acceptance except foreign charging and destination, and be always alert, courteous, and capable with subscribers of varying degrees of tone and temper. Other duties which are performed by the operators and which furnish a welcome relief from the lines include concentrator operating, examination and disposal of finished forwarded traffic, despatch of confirmation copies, daily examination of counterfoils, and the filing of "A" forms which are returned from the transmitting divisions after signalling.

The circulation of traffic going out of the Phonogram Room is performed by telegraph circulation staff from the Central Hall, and certain other duties of a responsible nature are in the hands of telegraphists of some experience. These include the enquiry positions, charging of foreign telegrams, and the despatch of counterfoils and finished "A" forms to their respective destinations.

The total staff strength is 220, 14 of which number are telegraphists, and in addition to this, many telegraph staff hours are loaned to provide for busy-hour requirements and for sick and holiday-leave absences.

As already indicated, the rise in London phonogram traffic has been somewhat remarkable, and no doubt corresponds with general experience throughout the country. It is, of course, partly explained by the growing use of the telephone by the British public, but it must not be supposed that

all the increase is attributable to calls made by subscribers. The substitution of the telephone for official transmission and for delivery is a very big contributory cause, and shows the greatest increase.

The three curves shown in Fig. 3 give the comparative rise of the different classes of phonogram traffic during the last five years. The lower curve shows the incoming telegrams from subscribers, the middle gives the total incoming from subscribers and post offices, and the top line represents the total traffic. The rise is steady, the most marked increase being that of forwarded telegrams (indicated by the space between the top and middle curves) and this includes those telephoned to post offices for onward delivery by hand, as well as those voiced direct to the subscriber. Of the latter category the majority are sent to holders of registered addresses, of whom 3,000 have agreed to this method of delivery.

The average number of monthly transactions in 1921 was 227,000, and this has risen to a monthly average of 327,000 in 1925, the peak having been achieved in July with a total of 329,000. The daily load averages about 12,000. On Christmas Eve last the record daily figure of 19,000 was reached. At first glance it would appear that the 1925 traffic has hardly exceeded that of 1924, and that matters may be regarded as having reached a standstill, but this is not so in actual fact. Prior to 1925 the Savings Bank Telegraph Withdrawal work was effected by telephone and the figures were included in the phonogram totals. This traffic has now reverted to telegraph working, and its extent has been shown by the dotted line (in the graph) for the purpose of comparison. The total traffic in 1924 less the Savings Bank withdrawals was 3,750,000, against 3,920,000 in 1925, giving a general increase in phonograms and telephone-telegrams of roughly 5%.

GRAPH SHOWING GROWTH OF PHONOGRAM TRAFFIC 1921-1925

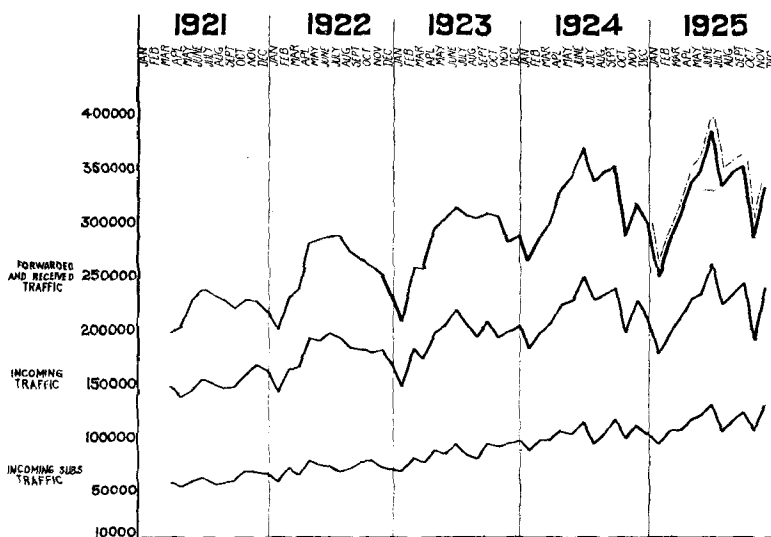


FIG. 3.

One great disadvantage in the reception of telegrams by telephone is the time taken per message. The operation is necessarily much slower than telegraph reception, the phonetic similarity of certain sounds being liable to cause many errors unless carefully and laboriously checked. This is done by spelling out letter-by-letter any words which seem to require it, and even this is not enough, as so many consonants carry the same sound. To obviate this difficulty resort is made to the analogy system, or as a subscriber tersely described it, "The 'expletive' T for Tommy business." That even this is not always successful in precluding error was instanced by a telegram the text of which containing inverted commas was written down interspersed with double invocations to the veteran comedian, Arthur Roberts—R for Robert. (Users of quotation commas beware!) Every telegram must be repeated to the sender after transmission to ensure its accuracy, but it does sometimes happen that the subscriber is caught napping and sanctions a reading which he little suspected, as in the case of a draper who unwittingly ordered a taxi to convey "sheep and cows to the station," when he desired the transport of his "sheets and towels," and the army order to the police for the arrest of an absentee which read, "Arrest Private 12345, have some tea and report."

It is found that the average time per message taken for the whole transaction is $3\frac{1}{2}$ minutes. Allowing an occupied time of 45 minutes per hour, this gives an average output of 12.5 telegrams per operator hour. The actually occupied time varies at different periods of the day, and a higher average is naturally attained during the peak hours which compensates for the slacker periods.

These notes would be incomplete without a word about the subscriber, whose contact with the operator contains so much more of the personal element than in ordinary exchange working. The short, crisp phrases which constitute the standard expressions of the exchange telephonist, and are designed to meet every possible requirement, would obviously be of little use here, and the nature of the mutual intercourse is necessarily more conversational and human. The subscribers of the registered address class, who habitually uses the phonogram service, give, on the whole, little trouble. They soon learn to comply with the desired practice, and in many cases employ expert operators. During the peak hours, the work for the bigger users is bulked and forwarded from reserved positions so as to assure continuity of connexion, and the work is disposed of very rapidly. Troubles, however, are not unknown, and mainly arise from the occasional user, who having but the faintest idea of the necessary procedure, wastes much time with unnecessary conversation, tries the patience of the operator, refuses to accede to the requests for necessary particulars, and then, one may suppose, becoming annoyed with his (or her) own incompetence, vents impatience on the luckless operator, who is then accused of incivility. One especially difficult type is the social or domestic despot. Accustomed to the deferential attitude exacted of all those surrounding them, these people expect to be greeted across the telephone in tones which indicate the conscious humility of the operator. To these "the voice with the smile" is an offence, and the raised inflection an outrage, and the demand for a "No, Sir" and "Yes, Madam" reply to every word of a repetition and every question asked, is an absolute fact.

The rule which provides that all subscribers on the London system shall be plugged to the Central Telegraph Office direct for "Telegrams" has aroused a certain amount of opposition in the more or less rural areas comprised in this zone. Subscribers of some local importance had become used to the flattery of some degree of deference on the part of local officials, and personal acquaintanceship might also enter largely into the despatch of telegrams. The feeling of pique which arose from the loss of these little amenities did not tend to soften the new relations with the Central Office with its relatively cold official manner, and the residents of these districts generally demanded restoration of the old order; but it is generally found that, as in everything else, experience is a great teacher, and in a short time the quasi-rural subscribers bow to the ruling of the director of communications.

The work of the phonogram sectional supervisor is mainly advisory in the incoming sections. The problems of acceptance and treatment which are continually arising are verbally referred to her in many cases, for the necessary advice which will save a transference of the subscriber to the enquiry point. She can, by means of a portable watch receiver set, enter the circuit in parallel with the operator in cases of difficulty with subscribers. It is her task to see that the operators give ready answer and clearance to all calls, and in this she is at present, until the full installation of the new three-lamp signal circuits, hampered by the position of obscurity in which she is placed as to the stage of working reached by the operator. A green light is switched on from the concentrator to several prominent positions in the room whenever conditions preclude the immediate answer of calls, as a signal to the supervisors in the distant sections that it is a case of "All hands on deck." The duties of supervision in the forwarding and telephone-telegram sections are very much the same as in telegraph divisions in the Metropolitan Gallery.

It is hoped that these somewhat disjointed notes will have served to show the extent and scope of that portion of the work of the Central Telegraph Office which has been placed under women's control. The measure of success which the innovation has achieved is undoubtedly due to the qualities of wisdom and long vision of the lady so excellently chosen to be the pioneer, Miss Wallis, who wields her sway under the official title of "Chief Supervisor, Circulation."

WANDERING WAVES.

The following letter appeared recently in the columns of one of our contemporaries:—

Sir,—The other night, just after ten o'clock, my left ear seemed to be struck with something red hot.

There was an inrush of music as from a band, which gradually became clearer until I could distinctly hear the announcer's voice, the rhythm of the dancers' feet, and the clapping of hands.

I listened intently at the window to see if it came from a loud-speaker, but everywhere was silent. I could only hear the music with my ear in one position, and think I was in the direct line of a sound wave. I have not worn earphones for over four months.

We have all been told at various times of such occurrences, and usually advice is given that the sufferer should either consult a doctor without delay, or take more water with it.

PROGRESS OF THE TELEPHONE SYSTEM.

The increase in the Telephone system for the month of February amounted to 10,602 stations, the net result of 18,883 new stations and 8,281 cessations. The total number of stations, 1,377,164, includes 1,310,516 subscribers' exchange telephones, the remainder representing call offices, service and private wire stations.

The monthly analysis of telephone stations is as follows:—

Telephone Stations—	London.	Provinces.
Total at end of Feb.	484,012	893,152
Net increase	3,873	6,729
Residence Rate Installations—		
Total	96,198	160,970
Net increase	1,534	2,213
Exchanges —		
Total	107	3,883
Net increase		7
Call Office Stations		
Total	4,409	15,758
Net increase	25	96
Kiosks—		
Total	236	1,632
Net increase	12	56
New Exchanges opened under Rural Development Scheme of 1922—		
Total	—	855
Net increase	—	11
Rural Party Line Stations —		
Total	—	9,809
Net increase	—	36
Rural Railway Stations connected with Exchange System		
Total	—	679
Net increase	—	1

The inland trunk traffic during December was heavy, 7,383,041 calls being recorded. The average number of calls per working day, 289,531, was the best result on record.

The number of inland trunk calls made during the year ended Dec. 31, 1925, was 83,813,868, an increase of 7,311,186 (9.6%) over the total for the previous year.

The Anglo-Continental traffic for December was not so heavy as for the three preceding months, 17,948 outgoing calls, or 925 more than in December last year, being recorded.

The calls coming into this country numbered 20,714 representing 54% of the both-way traffic.

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

PROVINCES—Ipswich (Automatic), Whitchurch (Glam.).

and among the more important exchanges extended were:—

LONDON—Brixton, Grangewood, Kingston-on-Thames, Purley.

PROVINCES—Bexhill-on-Sea, Farnworth, Maidstone, Henley-on-Thames, Newbury, Preston (Brighton).

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

Gosforth—Morpeth,
 Guildford—Leatherhead,
 Bristol—Taunton (Section of Bristol—Plymouth cable),
 Lowestoft—Great Yarmouth,

Kirkcaldy—Dundee,
 Cambridge—Newmarket,
 Nottingham—Kimberley (Section of Nottingham—Langley-Mill cable),

while 98 new overhead trunk circuits were completed, and 103 additional circuits were provided by means of spare wires in underground cables.

REVIEW.

“Broadcast Reception in Theory and Practice.” By J. Laurence Pritchard, F.R.Ac.S. (Published by Chapman & Hall, Ltd. ix × 259 pp. Price 8s. 6d.)

This is a book which has been written to help the wireless amateur who constructs his own sets to obtain a better idea of the fundamental principles by which they operate, and so to carry out the work in a more intelligent manner than would be possible merely by following blindly a set of working instructions.

It takes its place between the ordinary popular wireless books and periodicals and the more advanced treatises intended for professional wireless men. Mathematical formulæ are given when these are necessary for the explanation of phenomena or for use in design, but without proof. No mathematics beyond a knowledge of the ordinary symbols of elementary algebra is required by the reader.

Chapter I deals briefly with fundamental principles, and describes, from the point of view of the user, some modern receiving sets. The next two chapters deal with the materials and processes used in construction. Chapters IV, V, and VI, deal with capacity, inductance, and resistance, their effects in wireless reception, and the construction of condensers and coils. Chapter VII is devoted to aeriels and earth, while in Chapter VIII miscellaneous parts such as switches, rheostats, potentiometers, plugs, and jacks, telephones, &c., are described.

Chapter IX deals with primary and secondary batteries, and Chapter X with the use of crystals and valves for the rectification and amplification of wireless signals. Chapter XI describes the usual circuit arrangements used for reception, with the exception of the super-regenerative and super-heterodyne circuits, which are dealt with in Chapter XII. Chapter XIII deals with valves. A useful table is given showing the working details of 41 different modern types of valve. Four sets of characteristic curves for different types of valve are also given, but in only one case has the name of the valve to which they refer been inserted. This omission is unfortunate.

In Chapter XIV some useful instructions are given for tracing faults in receiving sets, and Chapter XV deals with constructional details and also with short-wave working.

In conclusion, a series of useful tables is provided.

The book fills a gap in amateur wireless literature, and should prove useful for the class of reader for which it is intended.

THE LATEST EXCUSE.

MISTRESS (to new maid): “How is it, Mary, you have not swept the cobwebs off the corners of the ceiling?”

MAID: “Why, mum, I thought they belonged to the wireless.”

—Telegraph & Telephone Age.

TYPING FROM SOUNDER.

TWENTY years ago, in a certain Cable Company, two telegraphists, who were on the permanent night staff, exclusively performed direct reception from Morse sounder by typewriter for the whole period of their duty, 11 p.m. to 7 a.m.

To-day, in the same Company, every message is sent out typewritten, being directly transcribed from Syphon Recorder Slip or dictated from Morse sounder, and a telegraphist of this Company is not considered efficient until he is capable of performing this duty.

A large-type machine is used (I think it is an Oliver), and unlike the present set of machines used for copying in the C.T.O., there is very little likelihood of illegibility through blurred and indistinct letters. In consultation one day with a controlling officer on the subject, he remarked that this latter possibility formed part of the objection to encouraging the system in T.S., especially where code and cipher was concerned, but we all know that the percentage of coded traffic on Cables, even in these days of L.C.O., &c., is greatly in excess of that transmitted over the Inland Telegraphs.

At the period of which I speak in the first paragraph, the typing was done at a standard sounder box. No specially constructed box was provided, as in the C.T.O. just prior to the late war, when the system was tried and apparently found wanting, but it must be admitted that the close juxtaposition, and comparatively greater number of circuits, in the latter building put the Cable Company's operator in a distinctly more advantageous position, for his main-line circuits only numbered four and were approximately as far apart as 6 to 8 ft.

However, in view of the rapid growth of machine telegraphs and consequent concentration of "Morse" lines, I submit that one set (or more, if eventually required) be attached to each concentrator for exclusive reception by typewriter, and provided a good class of large-type machine is used, there would, in a small way, be a contribution towards minimising delay, producing an unquestionably legible copy, and even assisting to solve that prevailing and burning question, "Economy." For instance, stations offering messages in duplicate, or press items, could be transferred to this particular set, and in many instances a "visit" to the copying tables would be saved. A few weeks ago I was offered fifteen pages of Press by a certain station, but with a typewriter I succeeded in completing the item on seven pages, and upon asking for the whereabouts of the remainder, was informed that I got so much on one page. That is actual economy, if it is only 8 sp. sheets.

A further instance of demonstrating the value of typing from sound was brought home very forcibly to me in the C.T.O. during the early days of the war. Messages of naval interest to multiple addresses (all for delivery), and varying in length from two to three thousand words, were offered by stations every night—situated perhaps on the north coast of Scotland—and plugged "DF" to TS. In this case there was, of course, no alternative and the advantage of the system is perfectly obvious.

However, on other occasions, these messages would probably reach Glasgow, where they were "punched up" for transmission by Wheatstone. It was often found that no Creeds or "blues" were available, but on one occasion the overseer on duty suggested that I might try my hand at taking the message, run on the Wheatstone transmitted at the distant station at readable speed. "GW" started rather slow, but finding things were going well, put the speed up so that the last few pages were being transmitted at something midway between 40 and 50 words per minute. No copying was necessary, and I produced four clear, uniform, and neat copies for delivery, with approximately five hundred words on each (SP) sheet, direct from the sounder.

Had the message been taken by Creed it would have necessitated the use of at least two or more of the printers, even after reception on the reperforator.

I was naturally anxious to see how a similar message would fare if taken on the "blue" and written up—I had not long to wait; a few evenings after my first experiment (if it could be called such), I was requested to write up a portion of slip consisting of about one hundred words, and which, on completion, I recognised as being part of a similar message to that which I had previously received from sounder. I found that portions had been handed out all over the office to be written up, producing a message consisting of pages of various handwritings, and at 7 a.m. these were still being collected from writers. The message in question was approximately the same length, and transmission commenced about the same time as the one with which I experimented (?); but at five a.m. the latter was lying in the rack complete and ready for delivery.

One night I "hit" Stornoway offering a naval message consisting of 4 addresses and about two thousand five hundred words, on the completion of which the transmitting clerk asked for my name and address, as he wanted to send me a box of kippers! What happened to them I should like to know—probably torpedoed in the Little or Great Minch. I never received them.

There are not many telegraphists in the C.T.O. who are capable of typing from sound, as far as I am aware, but surely it would be worth while training a certain number of the staff in this direction, and more particularly so the staff attached to smaller offices, where the number of Morse circuits are limited and a large percentage of their received traffic is for delivery.

W. T. L.

REVIEW.

"La Conférence Télégraphique Internationale de Paris (1925)," by Th. Le Danic, Editor-in-Chief of the Central Administration of the French Posts and Telegraphs, Paris.

To those who were not actively employed either in the preparation or consideration of the thousand-and-one propositions laid before this much belated conference or who were not among those who passed through the throes of the six weeks' debates and deliberations of last year's historic gathering in Paris, this book may not exactly prove a real necessity, although it should provide a compact *résumé* of the salient matters dealt with by that assembly and a useful volume of general reference.

To those, however, who have not had the experiences mentioned above but who are, nevertheless, directly concerned with the administration of world-wide telegraphy and telephony matters, and whether such are connected, be it with private or Government-owned organisations, the work of M. Le Danic is likely to prove of great utility to have at hand in library, study, or office.

The work is prefaced by a succinct history of telegraphy, land, submarine, wireless and telephony, this being followed by a chronology of the preceding conferences.

The constitution and work of the committees of the conference is dealt with, and the outstanding features are appropriately brought under notice.

Then follows a copy of the new convention, the whole being condensed between the two covers of just over two hundred pages.

The book may be obtained of the author, 10 Rue de la Sablière, Paris, but unfortunately no price is quoted.

J. J. T.

OPENING OF THE TRUNK EXTENSION TO WICK.

THE provision of this new trunk necessitated the erection of approximately 2,800 poles and 1,500 stays. Fully 29 tons of copper wire were utilised. Rock holes blasted numbered about 400, and this required the use of 250 lb. of gelignite. A special boring machine was introduced for this work and it gave splendid service. Over 100 men were employed on the work and fully £7,000 was paid in wages. The length of the extension is 118 miles open and $\frac{3}{4}$ of a mile covered. A cable has, however, since been laid across the Kessock Ferry, at Inverness, shortening the route by about eight miles.

We quote the comments of *John O'Groat Journal* (published at Wick) which we take to be one of the most northerly of our contemporaries, at any rate as regards the mainland, on the opening of this important extension :—

THE TRUNK TELEPHONE.

At last the trunk telephone extension northwards to Wick has been completed, and communication with southern centres is now available. Before the summer is over, by which time it is expected the necessary amplifying apparatus will be installed, it will be possible to communicate regularly with London, &c., and indeed literally between John O'Groats and Land's End. This is a boon for the business community which can hardly fail to be appreciated. It has long been desiderated and agitated for, and now that it is at the service of the public in general, it should find gradual development to the benefit of our commercial interests. To the fishing industry in particular it should prove of much practical advantage, for eventually it will no doubt be found possible to communicate by telephone not only to the English markets but also to the Continent. Such are the possibilities of modern progress through an invention which has already proved of marvellous utility to mankind. We earnestly trust that a gratifying and increasing measure of success will attend this new extension linking us up with the South. Having regard to the cost of laying the trunk line over so long a distance, the scale of charges for calls seems a reasonable one to begin with. Increased use of the service with, it is hoped, constant additions to the number of subscribers in the northern area, would no doubt ultimately result in a reduction of charges and thus operate to the general public benefit.

The proceedings at the opening ceremonies on Wednesday were of a very cordial character both at Wick and Thurso. Provost Green and Provost Anderson alike felicitously voiced the sentiments appropriate to the occasion in sending through the calls to the south ; while Thurso had an additional distinction—the Convener of the County being privileged to put through the first call to London, and that, very appropriately, to the Member for the constituency. The community in general will join in the good hopes and wishes so fittingly expressed, and all will feel gratified if the future finds the new facility being taken advantage of to a satisfactory extent. If this proves to be the case, the local bodies, which have in a public-spirited way provided the necessary minimum guarantee, will be spared the necessity of imposing any obligation upon the rate-payers in general for the extension now provided. A word of thanks and appreciation is also cordially due to the various officials for the excellence and completeness of the arrangements which they made in connexion with the inauguration of the new circuit. To Mr. Edmond, the District Manager of Telephones ; to Mr. Smith, Postmaster, Wick ; to Mr. Reid, Postmaster, Thurso, and indeed to all the others, by whom every courtesy was shown to the Press, we are much indebted for the information so readily supplied and for the free opportunity of speaking south over the telephone line for the first time in the history of the town. It was an occasion which on that account will not soon be forgotten, and on which all concerned can be very heartily congratulated.

DEATH OF MR. J. W. SWITHINBANK.

IT is with very much regret that we have to record the death of Mr. J. W. Swithinbank, A.M.I.E.E., M.I.Mech.E., late District Manager, Sheffield Telephone District, which occurred on March 26 last after an operation.

Mr. Swithinbank entered the service of the Ex-National Telephone Co., Ltd., at Leeds on Aug. 15, 1881, was appointed District Manager at Middlesbrough in December 1898, and after a period at Hull, came to Sheffield on Aug. 16, 1914, where he completed his 42 years of service as telephone engineer and manager.

Mr. Swithinbank only ceased active duty on July 31, 1923, and did not enjoy the best of health during the intervening period. His years of retirement consequently lacked that quiet peacefulness which so long a period of service merited.

One of his chief hobbies was exploring pot holes, caves, and underground water-courses. He was a successful curio-hunter, and could lecture on his explorations and discoveries in an interesting manner.

RETIREMENT OF MR. J. S. BROWN.

MR. JAMES S. BROWN, M.I.E.E., Sectional Engineer, at Southampton, of the Post Office Telegraphs and Telephones, entered upon a well-earned retirement in March last, after nearly 45 years' service. Mr. Brown came to Southampton in 1909. At that time there were only two telephone exchanges in the Forest area, at Totton and Lymington, and it may be mentioned as evidence of the subsequent growth of the telephone service, exchanges now exist at Ower, Cadnam, Hythe, Sway, New Milton, Milford-on-Sea, Lyndhurst, Beaulieu and Fawley. Automatic exchanges have been installed at Portsmouth, Southampton, Gosport, and Hayling Island.

During the War, with the aid of the local staff, Mr. Brown carried out numerous submarine cable works, which normally are executed by a staff of specialists from Woolwich. He was also technical adviser to the Southern Command and the Admiralty throughout the War.

In connexion with the retirement a large and representative gathering of the staff of the Post Office Engineering Department, to the number of upwards of one hundred, met at the Telephone Exchange, Ogle Road, recently. In addition to representatives from all grades employed in the department locally, there were also present Mr. J. E. Taylor, M.I.E.E. (Superintending Engineer, South Midland District), Mr. F. H. Gibson (Postmaster of Southampton), Mr. O. G. Lee (District Manager Post Office Telephones, Southampton), and others who had been actively identified with Mr. J. S. Brown throughout the course of his official career.

Mr. J. E. Taylor, who presided, paid tribute to the services rendered to the department by Mr. Brown throughout his long service. Mr. Brown, he said, had always been recognised as an officer of outstanding ability, and, above all, a man of great energy. During his career he had served a long period at headquarters in London, and was one of the pioneers in connexion with the development of the trunk telephone system. Mr. Brown was certainly a live wire, even to the last days of his service and he sincerely hoped that he, with Mrs. Brown, would be spared to enjoy many years in his retirement.

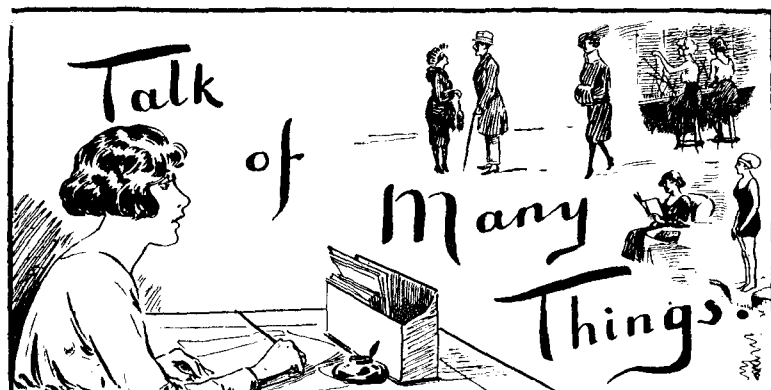
The speaker added that he understood that even in his retirement, Mr. Brown was not to be idle, but intended to continue his research work in the field of wireless telegraphy and telephony.

He thought that the very representative character of the gathering was a tribute to Mr. Brown, and on behalf of the staff he asked him to accept a presentation, which, at the recipient's desire, took the somewhat unusual form of a sectional motor garage, together with an illuminated autograph album.

PRESENTATION TO MR. W. H. OLIVER.

A PRESENTATION of a semi-hunter gold watch was made on Thursday, before Easter, to Mr. W. H. Oliver, Clerical Officer, North Midland Telephone District, Nottingham, upon his transfer to the District Manager's Office, Birmingham. Mr. A. C. Haley, District Manager, who was supported by Mr. W. H. Meaking, Staff Officer, handed over the gift in a short speech expressing good-will to the recipient in his new sphere of activities, and at the same time regretting his departure from Nottingham.

WE TELEPHONISTS



A Case for Prosecution.

WHEN tramping over hills and through woods, across fields and along footpaths, a sense of freedom seems gradually to possess us. The quiet noise of the country, the sweetness of the air, the softness of the colouring, the unexpectedness and beauty of the views, and the music of the trees and birds bring with them a delightful peace. The loneliness is crowded with the greatness of nature and we realise that we have scarce understood the nature of greatness. We feel that the city is an artificiality, an excrescence, which obscures beauty and perverts truth. The city gives us dusty sky-lights for clear open sky, arc-lamps for moonlight, dull lazy smoke for fleecy fleeting cloud, stale fan-driven air for scented wanton breezes, hard paving edged with gross buildings for soft grass lined with graceful trees, drab brick walls for bright leafy hedges, and discordant noise for musical silence. The call of the country becomes a challenge to the cog in the city. And so we wander and wonder now with light thought, now with philosophic musing, now in revolt, and now in fearful surrender. Then, banishing dull care and anxious thought, we swing again into joyful stride, and we vault a gate in exuberance of spirit—only to be confronted with a notice—"Trespassers will be prosecuted. By order." Here we pause and experience a variety of emotions and conflicting desires. Frankly, it is a shock, and for a time the wide vista narrows to a focus. The light song leaves our lips—and (if we are a man) it is replaced by an unprintable monosyllable. We endeavour—without success—to recall the laws of trespass and then we debate in self-defence. After all, the barred path is muddy, uninteresting, and indirect, and of all days to-day is the day when for a number of special and peculiar reasons we cannot take that route. Normally, of course, we should have had no hesitation in utterly disregarding the notice, but to-day—well, then we either trespass or we don't. It is a degrading feeling to be beaten by a notice-board.

Somewhat in like manner I have come to realise that I am a trespasser. It might be supposed, since I appear in this column with such distressing regularity, that I am a telephonist, for according to the heading it is "We Telephonists" who "Talk of many Things." But I am not—no, not even a redundant telephonist. I am here by stealth, and no doubt I ought, long ago, to have been prosecuted. I have long admired this sylvan retreat, however, and since telephonists so rarely appear, I have boldly continued to trespass. It is, of course, your special preserve, and although I might ask to be allowed to share it with you, I fear that once you saw me you would point sternly to the forbidding notice. It remains, therefore, for you telephonists to enter this column regularly and refreshingly. Surely you do talk of many things—I am credibly informed that such is the case—and if so, why not here? It is so fearfully easy to write.

O, what's a table richly spread
Without a woman at its head?

and likewise, what's a telephonists' column?

Charge your pens, therefore, and flood the columns of your page—thus shall you gladden the heart of the Editress, and be rid of that impudent trespasser

PERCY FLAGE.

To my Colleagues.

What will your recollections be when you have retired from the Service upon reaching the age limit? Have you ever tried to picture yourselves in the glory of a well-earned idleness, thinking of the happy days you have spent in the London Telephone Service? I wonder if your memories will be anything like these—

I remember, I remember, the draughts there used to be
In winter, summer, autumn, spring, round the Sydenham "I.D."
I remember, I remember, the Exchange Clerks, brave and bold,
Who never murmured day by day, though winds were blowing cold.

I remember, I remember, the "Stile Strip Method" new,
Which was condemned by many, and loved by just a few.
I remember, I remember, the strife it used to cause
If we pronounced four figures without a little pause.

I remember, I remember, how often we would look
For information on a point in the "Green" Instruction Book.
I remember, I remember, how we, if sore perplexed,
Looked up a rule, 'twas—"Cancelled, amendment issued next."

I remember, I remember, the voice which called so gay,
"Come into the garden, girls, it is the month of May.
Get your shoes and racquets out,
Come and knock some balls about,
Come into the garden, girls, it is the month of May."

I remember, I remember, the friendships which I made,
Each day brought its toil and fun, the sunshine and the shade.
The years went swiftly, quickly by, and now my service past,
I'll remember, I'll remember, my friends until the last.

GERTRUDE M. TURNER,
Sydenham Exchange.

An Avenue Nightmare.

After two portions of ginger and cream,
I drifted away in a beautiful dream.
I thought I was walking (my fancy this tickles),
Down a lane of cold beef, with hedgerows of pickles.

A seat by the wayside impelled me to stop,
And I sat down to rest on a nicely grilled chop.
'Twas cunningly placed in the shade of some trees,
From which fell at intervals showers of green peas.

I gazed o'er the landscape, bewild'ringly new,
And saw poached eggs swimming on lakelets of stew.
The lambs in the meadow were gambolling there,
And the scent of fresh mint sauce was borne on the air.

Thought I, "How delightful to lie on the grass;"
But just at that moment, up came my First Class.
Her appearance was odd, and made me feel flustered,
For she wore a confection of stewed prunes and custard.

While as for her hat, it was simply a scream—
A broad-brimmed pineapple—trimmed with fresh cream.
Quoth she: "You have really a most detached air;"
"Return to your duty—your Section's just there."

I stammered, "Where am I?" (The dream held me still.)
Said she, "You've been transferred—you're at Primrose Hill!"
I tried to frame a coherent reply,
And leaned for support on a gooseberry pie.

Then the crust gave way beneath my weight—
And I fell out of bed as the clock struck eight!
I reached the exchange—the margin fine,
And just "scraped" in as the clock struck nine!

C. A. S.

East Exchange.

A few weeks ago, the staff of East Exchange held a very successful bazaar in aid of the East London Hospital for Children, Shadwell; £128 13s. 6d. being raised by their efforts.

All the staff worked enthusiastically; the whole of the organisation and preparation being carried out in six weeks.

The stalls were varied and well stocked, and dainty teas were served during the afternoon.

Valuable assistance was given by members of the Engineering Staff, who helped in the decoration of the main office where the Bazaar was held.

The matron of the Hospital, Miss Coulston, made a short but interesting speech on the work of the Hospital, and declared the Bazaar open.

An Interlude.

Once more Easter has come and gone—gone in fact, but not in memory! Four days of glorious sunshine, and four days of freedom in which to enjoy it. To some it brought visions of spring flowers and wooded country: to some the bracing sea breezes with which to fill one's vitiated lungs. Oh, the joy of taking in deep, long, breaths of pure, clean air. The relief of gazing across the wide open spaces, instead of the restricted vision which is the lot of the city dwellers.

This is the first real taste of spring, and it is but a forerunner of further joy, for are we not on this side of the summer vacation, and while we may find it tedious to be back at work again, we can spend many delightful minutes planning and thinking about our holidays.

So let us put our hands to the plough, and when we have finished the furrows and planted the seed, presently the harvest will come, our harvest, and with that once more the refreshing breezes, the blue sky overhead, the singing of the birds, the flowers, and the welcome which nature is ever ready to afford to those who seek her gentle embraces.

L. R.

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

PRESENTATION TO MR. A. L. MAY.

A MEETING of the Gloucester Telephone Staff was held on April 14 to bid farewell to Mr. A. L. May, Traffic Superintendent, on the occasion of his departure to take up a similar appointment at Southampton.

The District Manager, Mr. John H. Storrie, on behalf of the staff, presented Mr. May with a gold watch, suitably inscribed, and before doing so, referred to the good work accomplished in the Traffic Department during the sixteen months Mr. May had spent in the district. The most cordial relationships had continued between Mr. May and the whole of the staff, and Mr. Storrie added they were all glad that their departing colleague's health had been restored since his arrival at Gloucester at the end of 1924. They all wished him every happiness and good health in his new district.

Further wishes for Mr. May's good health and prosperity were expressed by Messrs. Carroll and Raymond, on behalf of the Traffic Office staff, Miss Thomas for the Travelling Supervisors, Messrs. Jack and Brodie for the Accounts and Contract Departments respectively.

Mr. May, in reply, expressed to all his gratitude for their present, the kindly feelings which prompted their gift, and the good wishes voiced by the Chairman. It had been a pleasure, Mr. May said, to have served under Mr. Storrie, whose support and encouragement he had received at all times, and he warmly acknowledged the spirit of co-operation and fellowship which animated the whole of the Gloucester staff.

AN EARLY TELEPHONE.

A correspondent at Plymouth has forwarded to us an extract from a recent issue of the *Western Morning News and Mercury* regarding a telephone which is preserved in Plymouth Museum and which is believed to be the first telephone in use in England. It seems that the instrument was brought over from the United States by Mr. Graham Bell not long after the invention of the telephone and that he personally supervised its erection at the residence of the Bayly family at Torr near Plymouth, the house being connected with the gardener's lodge.

Our correspondent says that wooden cases, of approximately the same shape as a modern table set receiver, but about twice the size, enclose the effective parts of the receivers, the diaphragms of which are kept close to the magnets by a wooden disc. This disc is adjustable by means of four ordinary brass screws. Instead of the usual stranded flexible cord the receivers are directly connected with the copper-lined wires which approximate in thickness to those of a present-day exchange line. Near the receivers the wire is insulated with what appears to be wax and this in turn is covered by a thick layer of well-made cotton insulation.

MORKRUM-KLEINSCHMIDT AGENCY.

On the retirement of Mr. Donald Murray from business, the agency for the Morkrum-Kleinschmidt Corporation of Chicago has been taken over by Standard Telephones & Cables Limited (formerly Western Electric Co., Ltd.) of Connaught House, Aldwych, W.C.2.

Standard Telephones & Cables, Limited, has already had considerable experience on printing telegraph apparatus, principally in connexion with the Western Electric Multiplex System, and the addition of the Morkrum-Kleinschmidt apparatus, including the popular "Teletype" will materially increase the activities of this Company in the Telegraph field.

It is contemplated that, with the development of their factories which is now taking place, the Standard Company will commence manufacturing Teletype apparatus in England.

"TILLY OF BLOOMSBURY."

AN intelligent community, numbering several thousands, should naturally contain the necessary intellectual and physical potentialities for effectively producing almost any musical and dramatic work worthy of production. The "Centels" O.D. and Orchestral Club had already demonstrated that out of the four thousand odd inhabitants of the Central Telegraph Office, no difficulty had been experienced in proving this capacity as regards the musical section by their very successful presentation of "The Gondoliers" at Cripplegate Institute.

There were folks, however, who had just a wee fear that comedy would prove too severe a test for a C.T.O. caste, and besides which there would be difficulty in obtaining sufficient supporters.

Both fears proved to be groundless, for a hall crowded to its capacity when the curtain went up upon "Tilly of Bloomsbury" at King George's Hall, at one breath dispelled any doubt as to the latter, and long before the end of the first Act it was evident that the entire stage had gripped its audience.

Where every character was acted to the life there is some risk of being misunderstood by the special mention of any particular person, but it must be admitted that Miss Isabel Hood became "Mrs. Welwyn." It is doubtful if the character has ever been better personated. Miss Marion Giblett was a very natural "Tilly," and Miss Beatrice Head fitted well into her part as Tilly's sister.

Miss Mathieson reached to a high point of dramatic technique in Act II, where as Lady Mainwaring she stood for a few seconds half-hesitant as whether to leave the house or show some more tender regard for Tilly, yet with bowed head makes her exit. "Richard" and "Percy" were rompingly played by Mr. Percy Loeber and Mr. Bert Eagland respectively, while the versatility of the impersonator of Stillbottle is proverbial in the C.T.O.

All that remains to be said is that if our London readers do not wish to be disappointed they should book Oct. 18 and/or 19 for the next operatic performance and Dec. 6 for the dramatic. Dates for 1927 could be given but enough said for the moment.

J. J. T.

WHERE TO STAY.

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

BEAUTIFUL BUTTERMERE.—Near Honister Pass, Great Gable, Red Pike and many easier climbs. VICTORIA FAMILY HOTEL (R.A.C. & A.A.) Inclusive tariff £3 3s. May/June, £4 4s. July/August. Take taxi from Cocker-mouth. Write for card of particulars.

DEAN FOREST.—SEVERN-WYE VALLEYS. Beautiful Holiday Home (600 ft. up). 70 rooms, extensive grounds, motors, golf, billiards, tennis, bowls, croquet, dancing. Electric light. Boarders 47s. 6d. to 65s.—Prospectus: Littledean House, Littledean, Glos.

EASTBOURNE.—"Lilburn Private Hotel," Marine Parade; sea front opposite pier, separate tables, excellent cuisine; electric light, every comfort; new management.—Write proprietress: Mrs. McFarland.

HOLIDAY CAMPING BUNGALOWS to let furnished, near Bournemouth. View over New Forest, fine moorland air, pretty walks, good golf course.—Mr. Aldridge, Ferndown, Wimborne, Dorset.

SANDOWN.—"Seacroft," Private Hotel. Comfortable Board-Residence on cliff facing sea. Large grounds, Croquet, Putting free. Electric Light, Separate Tables.—L. & E. Woodford.

SHANKLIN.—"Summerhill," en Pension. On cliff, 2 minutes sea. Separate tables. First class chef. Reduced terms, early holidays. Phone 184.

LONDON TELEPHONE SERVICE NOTES.

Telephone Directory.

The new April issue of the *London Telephone Directory* has, as usual, a new feature. This time it is the cipher prefixes to what were two and three figure numbers in exchanges within a ten-mile radius of Oxford Circus. It is, of course, a further step in preparation for machine switching, or, for short, automatics. The next important step will be the capitalisation, if it may be put that way, of the first three letters of exchange names.

Subscribers have responded well to the repetition of numbers in the new form. In fact, the response has been too good in some instances where two ciphers have been tacked on to every number by some callers.

The *Directory* increases in size with each issue, and the current issue has sixty-four pages more than its predecessor.

Four new exchange names are announced. They are, Metropolitan, Reliance, Rodney, and Waterloo. The second-named seems to have a ready-made reputation.

* * * *

Exit Bank.

By the time these notes are read, Bank Exchange will be only a name. Its life has been threatened for many years. The writer remembers taking active part in preparing for its closing in 1911, but following the tradition of old soldiers, it refused to die and has simply faded away.

Those who have not seen the Bank switchboard would be inclined to repeat the observation of the rustic who saw a giraffe for the first time. "I don't believe it," he said. There is the same reluctance to believe Bank.

A brief description of the switchboard might be of interest. The most striking feature is its flat multiple. It is about the height of a shop counter and about as wide. The telephonists sit in rows facing each other across the multiple. It follows that to one set of telephonists finds the multiple up-side-down.

It is not so many years ago that telephonists in "B" positions had to work on the topsy-turvy side of the multiple. The plugs were pulled down from an overhead canopy and were held fast in the jacks by means of springs projecting from the sides of the plugs.

Well, farewell Bank, you have had your day and a very good day, too.

* * * *

London Telephonists' Society.

A very enjoyable Whist Drive was held under the auspices of The London Telephonists' Society at Caxton House Restaurant, Tothill Street, S.W., on Friday, March 26, 1926, when 156 members and friends attended.

The Committee responsible for the arrangements well maintained the standard always associated with the Society's social gatherings. Everything went with a swing from beginning to end and all present appeared to thoroughly enjoy themselves.

There was a goodly array of prizes, and at the end of the games, Mrs. Pink—whom all were especially glad to welcome—very kindly presented these to the fortunate winners. The evening closed with a very hearty vote of thanks being accorded to Mrs. Pink.

* * * *

Impressions.

There are things which are essentially marvellous, but to which one becomes so soon accustomed that all wonder ceases. Having accepted them as facts and not fantastic imaginings, we tend mentally to class them with all other facts, even those of the most commonplace description; indeed, when the glamour of the unexpected has once faded, it is extremely difficult for ordinary minds to revive early impressions and again measure the extent of achievement. Such a fact, one may say, is a modern telephone exchange.

It symbolises in the plainest form the ingenuity of man, and yet many of my readers come and go, in all probability, with scarcely a stir of their thoughts, certainly without a flutter of excitement or an awe-struck pause for admiration. The whole machinery, and its comfortable arrangements are, to use a common phrase, taken for granted. It is no longer thought about, but used. Only an imaginative person can strip away the outer coverings of habit or familiarity and still see the leaping progress of mankind, that in truth it represents.

But suppose that one hundred years ago someone had been taken to a spot where a large exchange stands to-day and had seen all that exists there now. What questions he must have asked in his surprise and perplexity? How immensely wide of the mark would have been his conjectures! Seeing the large airy room, the massive switchboard with its many appliances, a general hum as of a busy hive, the click of plugs and cords on keyshelf, the whole an atmosphere of concentration and energy. And as he drew nearer—to

see lamps flashing in and out, plugs being inserted and withdrawn from jacks, the sound of many voices—the clear intonation and the roll of the "R"—seeing and hearing all this would he not have asked "What is it?" "What are they doing?" "What in the name of reason is it all about?"

Then imagine his catch of the breath, his thrill of admiration, his almost fainting wonder, if he really understood the answer. Somebody standing near touches his arm and points to a small light glowing, a plug is inserted in a jack immediately above it, the lamp goes out. A voice says, "Number, please!" He gazes blankly before him. "What is it?" he asks.

It is a telephone subscriber asking to be connected to another subscriber, perhaps hundreds of miles away. Can the feelings of that visitor be imagined? I will leave you to fathom them.

Yet, I say again, we of the Telephone Service to-day have become so accustomed to it all, that we no longer marvel at this most wonderful system, in fact we scarcely appreciate it, so thoroughly used are we to seeing it.

But what do you think would be the effect on a subscriber who knows nothing of what goes on "behind the scenes?" Have you ever noticed the effect on such a visitor when he sees the interior of a switchroom for the first time?

Watch closely next time, dear reader, note well how, on being conducted up the stairs, he loudly deplors the waste of Government Departments, and the excessive salaries of its officials. Do not interrupt but gently lead him forward until you reach the centre of the switchroom, and then see the man—stripped of his self-confidence and censoriousness, his eyes will reflect his utter bewilderment. Now is the time to press home your case, whatever it may be, for, in the words of our immortal poet, "You have him on the hip."

And so to each and everyone I say, if you have an "impossible" subscriber to deal with and all else fails—get him to the exchange. Then shall you realise even as he will, what a wonderful achievement of man is the lay-out and design of a Modern Telephone Exchange.

Contributed by E. H. B.

THE ANNUAL REPORT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

SOME EXTRACTS.

THE American Telephone & Telegraph Co., the parent company of the Bell System, owns, directly or indirectly, in most cases all, in some cases the majority, and in two cases the minority, of the voting stock of twenty-five associated telephone companies. These operating companies with their connexions, cover the entire United States. They have been organised under state laws and operate under state and federal regulation, and they are responsible for handling the telephone business within their respective territories.

If any one wishes to talk from San Francisco to New York, for instance, it is obviously necessary that he talk through the territory of several of these operating companies. This necessitates his talk being handled by one organisation which can co-ordinate both the plant and the operating. The American Telephone & Telegraph Company therefore, owns directly and constructs, maintains, and operates the long-distance lines. These lines interconnect the operating company territories.

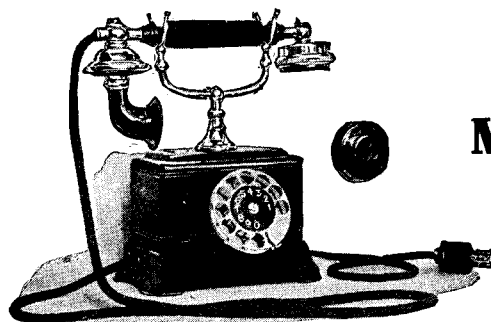
In the telephone business the apparatus used is of a highly intricate, technical, and complicated character. Therefore, to make possible satisfactory communication between individuals in the same town or city, or between individuals located in places either near or far apart, it is necessary that the apparatus at both ends and throughout the length of the lines be of certain standards and of the highest quality. In order to insure such standards and quality of apparatus, and also to make sure of apparatus at reasonable prices, the American Telephone & Telegraph Company owns practically all of the capital stock of the Western Electric Company, Inc., which manufactures telephone apparatus and equipment for the Bell System.

The American Telephone & Telegraph Company maintains at headquarters, including the forces of the Bell Telephone Laboratories, over 5,000 people whose task it is to invent, to develop and

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CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATIONS: Male Assistant Superintendent of Traffic (Class II) in the London Telephone Service and Male Assistant Traffic Superintendent in the Provinces, General Post Office (18-23); regulations and particulars are obtainable from The Secretary, Civil Service Commission, Burlington Gardens, London, W.1, together with the form on which application must be made. The latest date for the receipt of application forms is **2nd June.**

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improve telephone service and make it more economical. It is largely because of this fact, namely, that such a large force of people is engaged in scientific research and in the development of better operating methods, better accounting methods and all the other things that go to make up improved and more economical service, that telephone service to-day in this country costs relatively so little, and is at such a high standard, and that we can confidently look forward to continued progress.

The Bell System is a large modern business enterprise. Notwithstanding its size, however, and notwithstanding the fact that it is steadily growing larger, it is probable that although more complicated it is less hazardous to manage than ever before.

BELL SYSTEM STATISTICS.

	Dec. 31, 1915.	Dec. 31, 1925.	Increase During 1925.
Number of telephones	9,172,495	16,720,224	813,674
Number of central offices	5,300	6,017	39
Number of connecting companies	8,735	9,227	25
Number of connecting rural lines	19,579	28,861	802
Miles of pole lines	330,602	386,064	3,872
Miles of exchange wire... ..	16,052,062	39,840,840	5,027,819
Miles of Toll Wire	2,453,483	5,632,700	552,102
Total miles of wire	18,505,545	45,473,540	5,579,921
Average daily telephone conversations... ..	26,002,829	48,800,470	2,984,018
Number of employees	156,294	293,095	13,436

SERVICE IMPROVEMENTS.

During the past year, we have continued to direct our attention toward furnishing telephone service that will, at all times, meet the requirements of the users. We are meeting with success in increasing the area in which the subscriber may be connected in much the same way as he would be connected with some one located in the same exchange. It is now possible to complete a very large percentage of toll connexions while the calling subscriber remains at the telephone.

The speed of service on toll calls has, on the average, been materially increased. The dependability of long-distance service is being further insured by the introduction of long cables in the place of open wires. During the past year the cable between New York and Chicago was completed, and further extensions of toll cable plant are under way. During 1925 one of our trans-Continental lines, which extends from Denver to El Paso and thence to Los Angeles, was continued eastward from El Paso to Dallas and thence to New Orleans; thus giving the southeasterly section of the country a more direct route to the Pacific Coast, and providing further insurance against storm damage. Work has been started on a third trans-Continental line, extending west from Minneapolis to Portland and Seattle. With this line completed, there will be three entirely independent trans-Continental routes—one extending through the northerly part of the country, one through the middle of the country, and the third along the southern border.

The installation of machine switchboards continues in those situations where additional switchboard equipment is needed and conditions indicate their use. At the end of 1924, the number of machine-switching telephones was 969,000, or 8.7% of the total Bell telephones. At the end of 1925, 1,496,000 telephones were operated on the machine basis, or 12½% of the total. The results of machine switching are satisfactory from the standpoint both of operation and of service to the users.

From our research and development have come such noteworthy achievements as trans-Continental telephony, the extension of telephone service to great distances in storm-proof cable, the multitude of intricate mechanisms which have made possible the rapid interconnexion of millions of telephones, and the scientific work which has resulted in the beginnings of trans-Oceanic radio telephony.

While these and other noteworthy accomplishments have made possible the tremendous expansion of telephony, they are

but a fraction of the total research and development results which your company is continuously contributing toward a better, a greater, and a more economical telephone service.

The past year has seen active continuation of experiments on trans-Oceanic telephony. This work, which commenced by the first experimental one-way transmission of speech from New York to Paris in 1915, has been continued with successful tests of one-way talks from New York to London. It is now being extended in an effort to solve the extremely difficult problem of two-way conversation. In co-operation with the British Post Office and the Radio Corporation of America, arrangements are nearing completion for comprehensive tests of two-way trans-Atlantic telephony making use of the regular telephone plant of the two countries.

PERSONALIA.

LONDON TELEPHONE STAFF.

Resignations on account of marriage:—

- Miss L. E. TWISELTON, Telephonist, of the Trunk Exchange.
- Miss I. V. MILLER, Telephonist, of the Trunk Exchange.
- Miss J. WEBB, Telephonist, of the Trunk Exchange.
- Miss D. M. BYRON-BROWN, Telephonist, of the Trunk Exchange.
- Miss D. W. ATTREE, Telephonist, of the Victoria Exchange.
- Miss H. BROWN, Telephonist, of the Victoria Exchange.
- Miss M. W. HENNESSY, Telephonist, of the Victoria Exchange.
- Miss H. M. WILLOUGHBY, Telephonist, of the Mountview Exchange.

Promotions to Assistant Supervisor, Class II:—

- Miss A. D. HALL, of Central Exchange.
- Miss I. M. PAINTER, of Central Exchange.
- Miss T. C. H. SHINGLER, of Clerkenwell School.
- Miss D. E. LANKSHEAR, of Museum Exchange.
- Miss U. K. TRIM, of Museum Exchange.
- Miss R. E. COOK, of Gerrard Exchange.
- Miss E. A. DONOVAN, of Paddington Exchange.
- Miss H. B. STOWARD, of Victoria Exchange.
- Miss D. H. HOLMES, of Lee Green Exchange.
- Miss E. J. DAVIES, of Southall Exchange.
- Miss M. D. M. WEBSTER, of Avenue Exchange.
- Miss MABEL E. GARDNER, of Central Exchange.
- Miss D. SARGENT, of Hampstead Exchange.
- Miss A. H. FIELD, of Gerrard Exchange.
- Miss H. H. GOULD, of Paddington Exchange.
- Miss H. J. RUSSELL, of Langham Exchange.
- Miss W. A. H. FENN, of Kensington Exchange.
- Miss G. E. E. TOOLEY, of Regent Exchange.
- Miss M. A. DOWNEY, of Victoria Exchange.
- Miss E. Pownceby, of City Exchange.
- Miss J. K. HAY, of Park Exchange.
- Miss A. M. HARDING, of Victoria Exchange.
- Miss EDITH M. JONES, of Croydon Exchange.
- Miss D. E. CRESSEY, of Clerkenwell School.
- Miss F. A. SPRAY, of Richmond Exchange.
- Miss L. H. E. TENNISON, of Central Exchange.
- Miss L. CAMERON, of Trunk Exchange.

The Secretary has approved the following appointment:—

- Mr. R. V. POOR, Acting Executive Officer to be Executive Officer.