

# TELE COMMUNICATIONS JOURNAL

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## COMMENT

**N**O NEW VENTURE IN THE FIELD OF TECHNICAL journalism could be embarked upon without some misgiving; without contrary hopes and fears. The *Post Office Telecommunications Journal* proved no exception. Our fears, however, are largely resolved and our hopes a long way towards realisation. We are enheartened by the wide gestures of goodwill and support which our colleagues have given to us. For over tens of thousands of them their pledge of loyalty could only have been an act of faith, bravely greeting the unseen with a cheer. It is no reflection on their enthusiasm and that of our local Correspondents and organisers that we record that the very success

of our undertaking brought embarrassment.

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CARDINAL IN OUR ENDEAVOUR TO MEET THE requirements of the wide and varied sections of our readership is the principle of including something for all. That principle must in the nature of things suffer some delay in total fulfilment whilst the present restrictions on paper last. We envisage the function of editorship as a double one of publishing authoritative information on developments (such as is only in the power of the administration to impart) and, more importantly, of finding a place in the pages of the *Journal* for discussion of the problems involved. We confess

to a bias in favour of articles on the human reactions to these developments. Again, the international circulation of the Journal compels us to find a special place for the expert. His seemingly theoretical approach to a subject may have very far-reaching and even world-wide consequences. The presentation of a balanced selection of articles is the only way to make the Journal generally acceptable.

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THIS IS NOT A PROBLEM SO SIMPLE TO SOLVE as it is to state. It was realised that within the compass of 28 pages it was well-nigh impossible of accomplishment. Our critics have voiced, effectively enough, their comments on the emasculation of articles arising from the need to be brief; none, however, more trenchantly than the Editorial Board itself. More paper is at the centre of this problem and paper is not easily come by in these days. "More paper" is written, like Calais on the heart of Mary Tudor, on the tablets of the editorial table.

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NEVERTHELESS WE HAVE NEVER ACCEPTED ANY of these difficulties as insurmountable. Our first tactic was to aim for more paper: that, we have been able to achieve, and we come before our readers with 16 extra text pages in this issue. We feel that out of this extra allocation our contributors will do themselves and their subjects fuller justice. This will be all gain. Even so, there will still be a need to prune rigorously. The plain, factual article, dealing straightforwardly with things and actualities, in words suited to our readers, free from the flaws of technical jargon, still remains the ideal. The Editorial Board has no preconception in regard to the status, rank and reputation of contributors to the Journal. It will not expect any contributor to divest himself of his rightful title to speak with authority on his subject; nor on the other hand will it suppress the contribution of anyone so long as the article itself has merit, is well based and makes an appropriate contribution to the aims of the Journal. The Board's belief is that any contributor, whoever he may be, who finds himself in print may well regard that achievement as an honour and worthy of notice.

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THE WORK OF EDITORSHIP HAS BEEN GREATLY helped by the conference of the Regional Correspondents of the Journal recently held at Headquarters. The Correspondents came armed with many data and authentic criticisms which, it can

safely be stated, will have beneficial effects on the conduct of the Journal. We had received some considerable expressions of praise (some from overseas) for the Journal and our Correspondents also brought us news of the reception of the Journal which was encouraging. Nevertheless it was agreed on all hands not to spend any time on the praise but to devote the limited time available wholly to the criticisms and to the measures which might usefully be taken to meet them. The names of these Correspondents are now indicated in the title page as Regional Representatives of the Board. We hope that our readers will feel that every possible effort is being made to produce a Journal which for make-up, character and quality is second to none throughout the world. This may be a matter of time; but so far as the Editorial Board is concerned, its whole energies will be to secure the accomplishment of this ideal at the earliest possible stage. It will, of course, take a year or two for the Journal as a quarterly to get into a real stride, and, therefore, before any adequate appreciation of its scope and character can be gained.

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WE WELCOME TO MEMBERSHIP OF the Editorial Board, Mr. A. Kemp, Deputy Controller (Telephones), London Telecommunications Region, in place of Mr. G. H. Taylor. His knowledge and experience in the field will be of decided value to his colleagues on the Board.



Mr. A. Kemp

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OUR READERS WILL NOTE THE APPEARANCE OF A second article on the Cordless Switchboard in response to a note which was sounded strongly at the Regional Correspondents' Conference. The development of the new design is one which will be closely watched by many of our colleagues. Not the least happy feature in the process of development is the co-operation which is being given by the staff and their representatives. There is much more to be done in the experimental field and it would be a mistake to think that the new switchboards are on the point of coming off the mass-production belt in quantities. Nevertheless, the indications are that we are in face of an improved feature which will revolutionise work in telephone exchange rooms, considerably for the better.



From left to right: J. P. BATTIS, Senior Sales Superintendent; W. M. COULSELL, Traffic Superintendent, Class I; J. W. K. NICHOLS, Telephone Manager; I. A. WHITE, Area Engineer; T. J. FEWSTER, Chief Clerk; I. W. TOMLINSON, Secretary

### NORWICH TELEPHONE AREA

Though covering only approximately 1,300 square miles, the Area includes the unique Norfolk Broads and several of the "stately homes" of England. It also possesses in Norwich the county town and capital of East Anglia. The City is noted for its churches and in particular, for the manufacture of ladies' shoes. The Area is predominantly agricultural, and sugar beet is an important crop. The relatively long coastline has many well-known holiday resorts, including the fishing ports of Great Yarmouth and Lowestoft. There are 107 exchanges (88 of them automatic), 24,000 exchange lines and 36,000 stations, with 234,000 miles of wire underground and 31,000 miles overhead. The total Area staff of 697 includes 478 engineering workmen.

### GLASGOW TELEPHONE AREA

The main towns are the City of Glasgow which received a Burgh of Barony in 1175 and has grown with shipping, shipbuilding and engineering; Paisley, famous for thread manufacture, and Rutherglen, a Royal Burgh since 1126. The Area is bounded to the north-west by the banks of Loch Lomond. 68 exchanges, half of which are automatic, serve 92,000 exchange lines and 145,000 stations. The trunk exchange, opened in 1940, has 362 operators' positions in one switch-room. There are 994,000 miles of wire underground and 22,500 miles overhead. The total engineering, operating and administrative staff exceeds 4,000. City Motto—"Let Glasgow Flourish." Patron Saint—St. Mungo.

From left to right: G. R. LUNN, A.M.I.E.E., J. L. ANGUS, B.Sc., A.M.I.E.E., F. J. de COURCY, B.A., B.A.L., R. MacWHIRTER, B.Sc., A.M.I.E.E., Area Engineers; W. J. BENTLETT, Telephone Manager; F. R. B. BUCKNALL, A.M.I.E.E., Assistant Telephone Manager; J. MATHESON, Chief Traffic Superintendent; J. W. M. Kennedy, Chief Clerk; G. W. COCHRAN, Acting Chief Sales Superintendent.



# THE CORDLESS TELEPHONE SWITCHBOARD



The Cordless Switchboard embodies characteristics which are in many respects a departure from those which have gone into the design and evolution of the manual switchboards, as we have known them, since the early days of telephony. In our first issue, Mr. H. C. Andrews gave some indication of the traffic problems involved in the new design. The present article presents a picture of the new designs which we have reason to believe will have an interest for all those who are intimately concerned in the telephone service in this and probably many other countries.



## Operating and technical disadvantages of existing switchboards

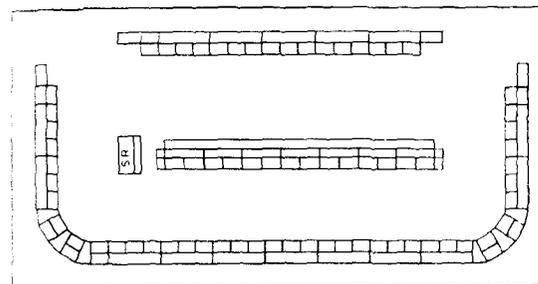
THERE ARE VERY FEW PEOPLE, EVEN AMONG those employed in the telephone service, who can visualise a telephone switchboard in any other form than that which allows telephone operators to set up connections by means of cords and plugs (a typical example is shown in figure 1, and diagrammatic illustration of the conventional design of a switchroom is shewn in

figure 2 overpage).

*The Multiple.*—This type of switchboard permits of rapid connection of calls, but the operator has to sit perpetually facing what is, in effect, a kind of wall (technically known as the multiple) in which all the circuits she may require are presented to her in such a way that she can insert a connecting plug into any one of them. These are trying working conditions and there is no doubt that if the apparatus could be so modified that she

sat at a table, instead of in front of the multiple, her work could be made more congenial, and the ventilation and general lighting of the room could be materially improved. She would then have the

Fig. 2.



SWITCHROOM 36' x 70'. CONVENTIONAL LAYOUT USING CORD POSITIONS CAPACITY 70 POSITIONS, INCLUDING 14 MONITORIAL

satisfaction of working in surroundings closely resembling those of her colleagues engaged on clerical or typing work, instead of having to sit at a board which, by its size and height, tends to dominate her.

## THE CORDLESS TELEPHONE SWITCHBOARD

*Cords.*—Cords, as a means for effecting telephone connections, suffer from two disadvantages. In the first place, the mechanical stresses to which they are subjected in use make them unreliable electrically, and, today, they are regarded as probably the most fallible components of the switchboard. (It is normal practice to fit more cord circuits on an operator's position than are actually needed, in order to facilitate replacement of defective cords at any given time). The second disadvantage is the nature of the actual physical work of making the connection, performed by the operator; in a small exchange this is not arduous, but in a large and busy exchange the process of operating over a prolonged period is undoubtedly fatiguing. The falling of the weights used to straighten out the cords when released, adds considerably to the general noise of the switchroom.

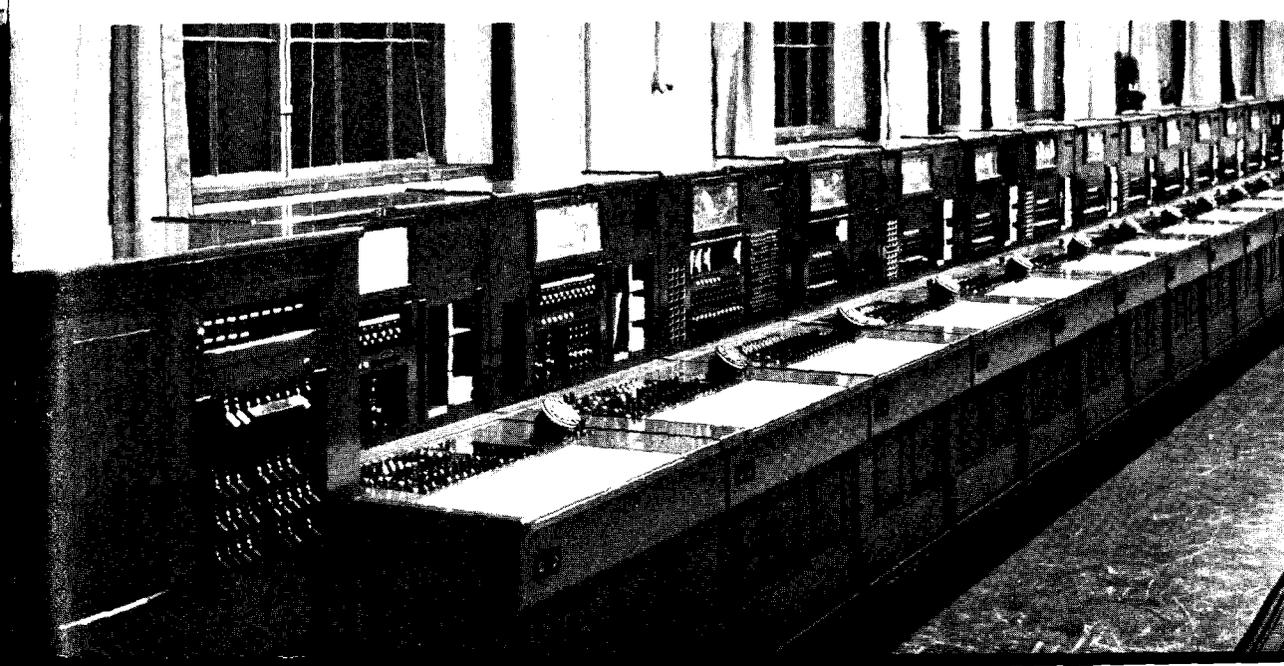
## Field for improved switchboards

In the local telephone service, the aim is to eliminate manual operation entirely by arranging for subscribers to connect their own calls mechanically (by dialling); and considerable progress has already been made in converting local exchanges to this "automatic" working. In the trunk and toll service, it is likely that calls will always, or at least for many years to come, have to be handled by an operator at a switchboard. There is, there-

Fig. 1. Demand Positions at Guildford Exchange



Fig. 3. Cordless Positions in Cape Town Exchange



fore, a wide field for improvement in this type of switchboard. In particular, the use of automatic apparatus to replace cords will relieve the operator of the physical work involved, leaving her with the comparatively light task of controlling the machine by means of the various keys and press-buttons.

#### *Development of cordless switchboards in other countries*

*Cape Town.* The development of modern cordless switchboards dates from about 1932 and has proceeded independently in different parts of the world. One of the five British telephone equipment manufacturers developed a cordless switchboard in 1932, and in 1934 installed an exchange of this type at Cape Town. This exchange is still in service and (after minor modifications) the South African Administration has been well satisfied with its performance. The Cape Town switchboard (figure 3) is very similar in general appearance to the switchboards previously in use, and is in effect a board of a standard pattern from which the cords have been removed, the cordless controls being fitted in their place. No attempt has been made to take advantage of the possibilities which the adoption of cordless working opens up so far as the shape of the positions or the general lay-out of the room is concerned.

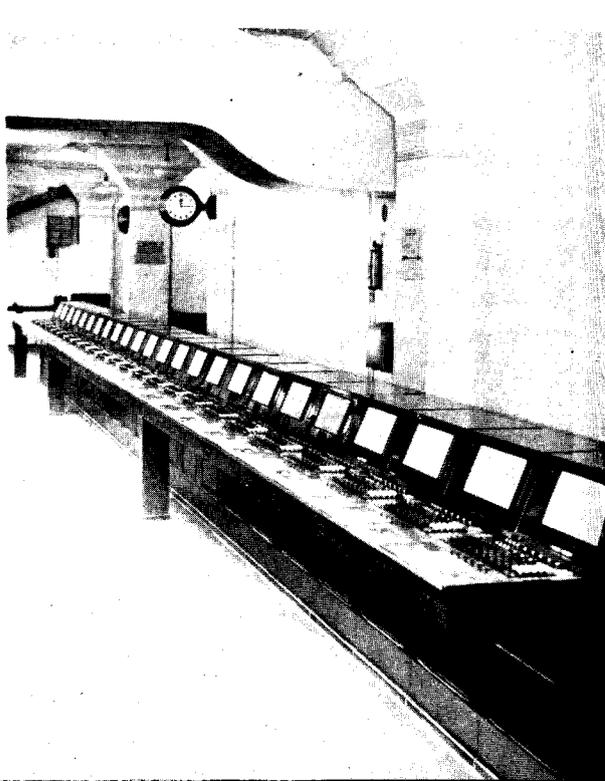
*Melbourne.* The manufacturers of the Cape Town exchange continued to develop their ideas, and in 1940 they installed an improved cordless switchboard at Melbourne, Australia. This exchange, one of the most advanced in the world is illustrated in figure 4, from which it will be seen that a very attractive lay-out of the equipment itself has been achieved. In shape, the positions still show plainly their development from conventional cord-type positions, but some attempt has been made to improve them by reducing the height, so as to give the operator a less restricted outlook. The lay-out of the positions in the switchroom is on the whole in accordance with present practice in this country, and they have been finished in mahogany and red fibre—the standard finish for telephone switchboards for the British system.

*Amsterdam, Hamburg, etc.*—About 1932, when the Cape Town exchange was being developed, cordless switchboards were introduced at a number of places on the Continent, notable examples being at Amsterdam, The Hague and Hamburg. In these designs, a complete departure has been made

from previous practice as regards the shape of the positions, which are almost flat, so that the working conditions resemble those of an office table. The suites of positions are so arranged that operators can work on both sides, facing each other. At the present time, a new Continental design (figure 5) is being produced for installation at Stockholm and Rotterdam; this retains the flat, table-like effect; but the makers (L. M. Ericsson of Stockholm) have given up the use of double-sided suites and the operators will all sit facing in the same direction.

*United States.*—It is usually inadvisable to consider any development in telephony without reference to practice in America. However, it appears that very little attention has been given to the development of cordless switchboards by the American Telephone & Telegraph Company, which has no exchanges in service or in prospect comparable with those already in service in the Commonwealth and on the Continent. A switchboard of cordless type is being developed for Philadelphia, but this is intended not for the operator-control of calls, but merely for the

Fig. 4. Cordless positions in the Melbourne Trunk Exchange, Australia



through-switching of calls controlled at distant exchanges.

*United Kingdom.*—The Post Office began active research on the design for a cordless switchboard as soon as the recent war was over, and representatives were sent to examine the various types in use in South Africa, Australia, Sweden and the Netherlands. Following these visits, a Study Group (including members of the Staff Associations representing telephone operators and supervisors) examined the problem in detail and sought the advice of the Post Office Chief Medical Officer from the medical and psychological angles. He, on his part, took the opportunity of discussing the matter with his opposite number at the Hague, where the Administration has for some time been fostering a study of these aspects of the problem. The Study Group has now completed a report, as the result of which final models of a new cordless switchboard are being developed, incorporating what are considered to be the best features of all other existing designs.

#### *Proposed United Kingdom design of cordless switchboards*

The new model is illustrated in figures 6 and 7 and it will perhaps be convenient to consider it under four heads: finish, shape, switchroom lay-out and operating facilities.

*Finish.* No final conclusion is possible in this respect, since a number of new materials have recently been made available. Tests and experiments are in progress with several different finishes and materials, and attention is being given to the possibility of using plastics.

It is proposed to abandon the present standard finish of mahogany and red fibre, and to use light and cheerful colours to brighten the switchroom. A number of colour schemes are under consideration, such as beige with panels in chocolate, and light biscuit colour with panels of dark green. It is plain that individual opinion varies so much that this question will have to be the subject of trial.

Particular attention has been given to the treatment of surfaces, the major requirements being that they should be easy to keep clean, should not give rise to undesirable reflections, and should be pleasant to the touch.

*Shape.*—Continental practice is being followed in making the top of the switchboard as flat as

possible, though it has been thought desirable to place the supervisory lamp signals in a sloping panel to secure the best visibility. A great deal of attention has been given to the lay-out of the key controls and other equipment, so as to eliminate unnecessary movement, and to fit in with the normal sequence of operations. The omission of cords from the make-up of the switchboard has freed the design from a number of restrictions, and consequently it has been possible to make the convenience and comfort of the operator a first consideration. The aim has been to produce in the exchange the effect of office or clerical, rather than workroom, conditions.

*Switchroom layout.* Here again the simulation of office conditions has been a guiding principle, and much thought has been given to producing a spacious and pleasant effect. The intention is to arrange the rows of positions across the width of the switchroom, instead of along its length as at present; and to make the rows comparatively short, since the long suites installed in many exchanges today undoubtedly have a depressing effect.

The Continental practice of making the suites of positions double-sided has been rejected for technical reasons, but both on medical advice and at the suggestion of staff representatives, it has been agreed that a more companionable atmosphere will be secured if the operators face each other, and the rows of positions will accordingly be arranged back to back, but with a narrow gangway between them. The extra space provided by the gangway satisfies the medical requirement that the operators should not be so close together as to incur the risk of spreading air-borne infection. An interesting comparison of the new lay-out illustrated on page 65 (figure 8) can be made with the diagram of the existing switchroom lay-out shewn in figure 2 on page 61.

*Operating facilities.*—In general, the facilities will follow the pattern established in South Africa and Australia, as opposed to that of the Continental exchanges. This is because there are a number of fundamental differences between British and Continental operating practice.

Two methods of presenting calls to the operators are available: the first is to distribute them to the individual operators in rotation (this is known as cyclic distribution), and the second is to store them—as necessary—in the apparatus so that they are answered in the order of their arrival (queue system). With cyclic distribution, the calls are

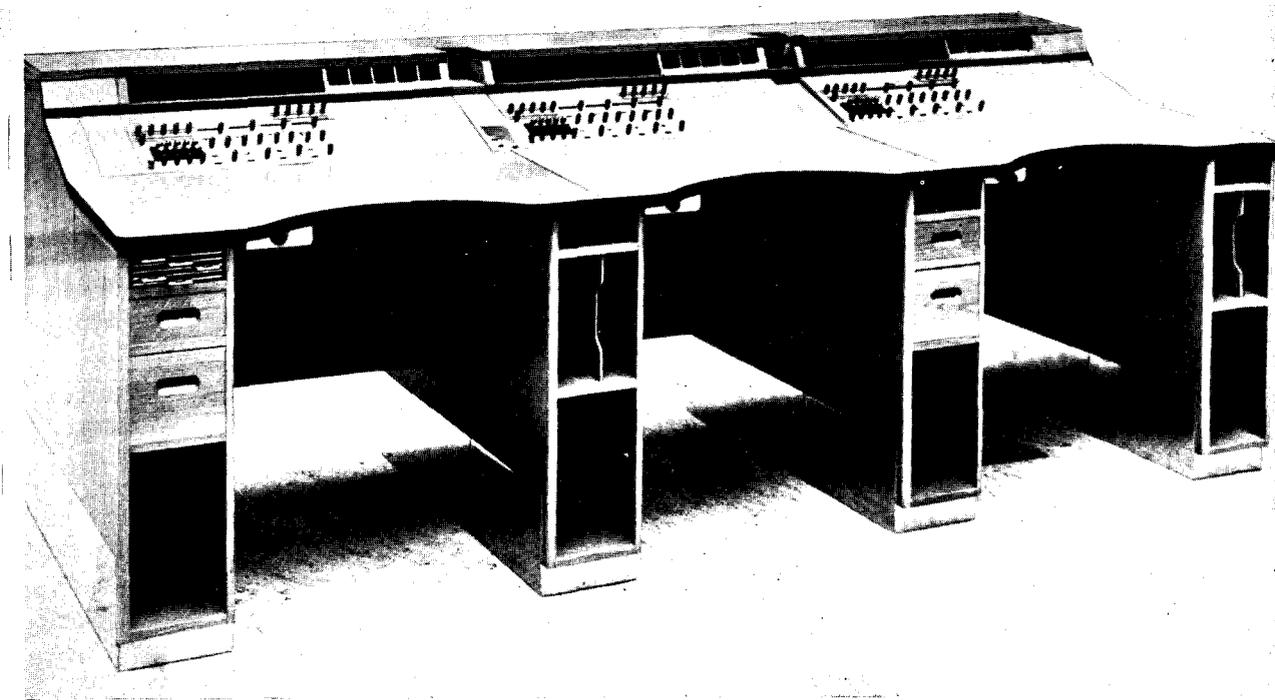


Fig. 5. Cordless positions designed for the Stockholm and Rotterdam Exchanges

connected to the operators without any action on their part, and their speed of working is determined by the flow of traffic. With the queue system, any operator may take a call from storage in the apparatus when she is ready to do so, and she is therefore able to work at her own optimum speed. It has been decided to adopt the queue system, as this is considered on psychological grounds to be better from the operator's point of view, and therefore likely to give a better and more consistent grade of service to the subscriber.

Having answered a call, the operator will connect (via the appropriate intermediate exchanges) to the required number. Switching at the intermediate exchanges will as a rule be entirely automatic, and will not require the intervention of a second operator. The controlling operator will actuate the automatic equipment both at her own and at the distant exchanges by means of a key-sender; this is a piece of apparatus which fulfils the same functions as a dial, but is simpler and more convenient to use in an exchange. In fact by means of the key-sender and other equipment on her position the controlling operator will perform all the actions necessary to route the call to its destination.

Once the call has been connected, the controlling

operator will be able to observe its progress, to give assistance if difficulty arises, and to disconnect it when the conversation is finished. In addition, she will be provided with facilities for timing and supervision, and for the collection of money from call office users, and so forth. In general, all the operating facilities at present in use will be retained on the cordless switchboard, although the equipment used by the operator will be very much simplified.

#### *First provision of new switchboard*

Although the general style and lay-out of the new switchboard has been practically settled, there still remains much development work to be done on the design of the associated electrical circuits and apparatus. This is likely to take over 12 months, and it should thus be possible to place orders for the first switchboards of the new type during 1951 and to have them in service sometime in 1953. (It is not proposed to include any very large exchange among these first installations, as unforeseen problems may arise under actual working conditions).

Acknowledgements are due to Messrs. Siemens Bros. for certain of the photographs accompanying this article.

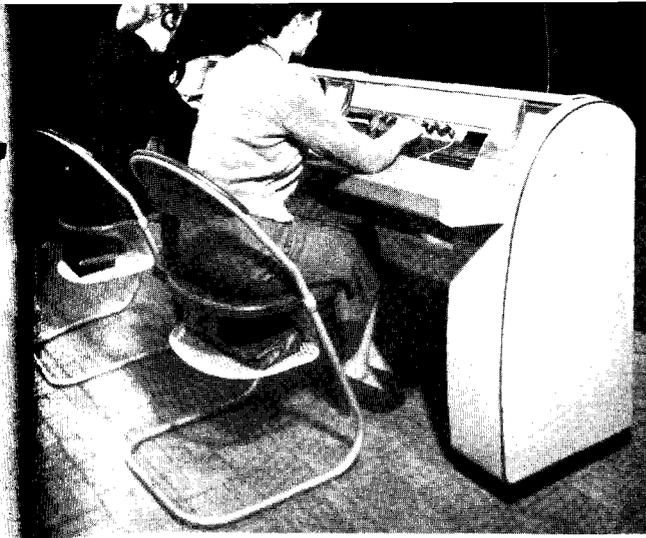


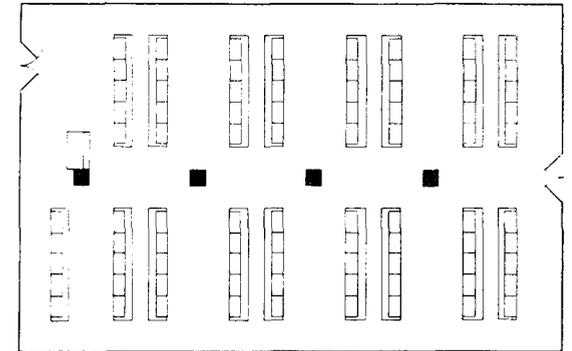
Fig. 6. Model Cordless Positions showing operators at work

## UNITED KINGDOM EXPERIMENTAL CORDLESS BOARD DESIGN

Fig. 7. Model Cordless Positions



Fig. 8. SWITCHROOM 43' 0" x 70' 0" WITH STANCHION. SUGGESTED LAYOUT FOR CORDLESS EXCHANGE



## THE HUMAN TOUCH

by W. F. Goodman

Telephone Manager's Office, Southampton

SINCE THE SERVICES BEGAN, THERE HAS BEEN a constant effort to reduce the number of manual operations in telegraphy and telephony, and to replace them by automatic apparatus. From time to time we shall doubtless have many articles describing improved apparatus, which will still further replace the human operator with the automatic switch. This is, of course, highly desirable and is on a par with what is happening in almost every other undertaking—complete mechanisation is the ideal of the moment. Every invention which enables a human being to do his or her work with less effort, or more quickly, is a step upwards. There is, however, a danger that in striving for the mechanisation of telecommunications we may overlook the fact that the human element is still vital. We can now complete local calls automatically; but it will be many years, if it is even desirable at all, before a subscriber is entrusted with control of long and expensive trunk lines. In order that these trunk lines may be used to the best advantage it is necessary for an operator to take over control of the call. What a tremendous difference it makes when that operator is helpful and sympathetic.

We are tending to be too mechanical in our mental outlook. In the old days it used to be said that an operator was not fully efficient till she had "Passed" out. She had to learn that "Politeness" came first, then "Accuracy" and finally "Speed". Nowadays we tend to alter the order so that politeness follows the other two, but in any case politeness alone is not enough; it is too "cold" a term. The best operators manage to infuse into their voices that little extra warmth which gives the subscriber the impression that they are sympathetic and personally interested in the successful outcome of the call. From the point of view of a member of the general public, that short contact with the operator makes or mars the popularity of the telephone service. Mr. and Mrs. Citizen have only a very vague idea of the complexities of the telephone system and will never fully understand the mechanical perfection of the apparatus,

but they do understand humanity. They are attracted, or rebuffed, by the tone of voice and the attitude of the operators who deal with their calls and who try to satisfy their requests for information. The operators are therefore the main ambassadors of the telephone service and they have a much more difficult job than that of ambassadors in other walks of life, who can see and impress their audience. The operators have to impress their unseen audience only by means of voice and attitude.

Recently a former telephone operator and supervisor applied for a post with a shipping company. She was not successful and was informed by the interviewing officer that Post Office operators were usually too abrupt and unsympathetic to the customers' requirements. It is not always obvious to an operator that she is being disobliging or is creating an adverse opinion of the service by her tone of voice, but it is often so. A conscious effort has to be made to maintain at all times a courteous and sympathetic tone, but how much more smoothly the wheels turn when that tone is attained and maintained. A large proportion of our operating staff have already attained and practise the "voice with a smile" but it is the unfortunate few among them who contribute to the opinion expressed above by a member of the public.

One thing which seems to be lacking today on all sides is the ability to see the other fellow's point of view. When operating a telephone switchboard you must have sympathy to do the job well. Every operator should envisage the caller and try to see his or her point of view. This is easier perhaps in the case of an emergency call. Let us imagine ourselves as operators—it is fairly simple to visualise a caller for the fire brigade standing in a burning building—the urgency of the call is obvious and our sympathy immediately goes out to the caller. Similarly a caller who dials "999" and asks for the police can be imagined as being possibly in personal danger and so he commands our immediate interest and attention. But with a little imagination every caller can be en-



visaged—every call is made for a specific purpose and it helps to try to imagine the caller in every instance. Perhaps television will come to our aid in this direction one day and then we shall be able to see what is happening at the other end of the telephone circuit. It is quite certain that no one needs to concentrate more on the job in hand than does the operator. It is impossible to obtain the correct tone and suggest the helpful atmosphere if our thoughts are allowed to wander, even for an instant in the busy period, to the dance we attended last night or the dress we hope to buy as soon as we finish work. There is not much work which is more arduous or mentally tiring than that of the operator, as continuous concentration is so necessary for success.

So much for the operator—but the operator's point of view, her happiness and therefore her ability to induce happiness and sympathy in her dealings with others are affected considerably for good or ill by the attitude of those who supervise her. Likewise the attitude of the floor supervisor to life in general and to her staff in particular is governed by the attitude of those to whom she works. The supervisor of a telephone exchange is therefore directly responsible for the kind of service that her staff gives. Note that I say the "kind" of service, which is not necessarily the speed of answer; "service with a smile" is the ideal even if the smile cannot be seen. Granted that a

kindly supervisor who does her utmost to ensure the happiness of her staff and to create the right atmosphere may be defeated by the attitude of some of her junior officers; but if the Chief Supervisor's attitude is sympathetic to the welfare of her staff then the case is prejudiced in favour of a happy staff and a good and sympathetic service.

In order to help the operating staff and their supervisors it is, of course, very desirable to give them every possible aid in order to lighten their load and make the job as pleasant as possible. The surroundings should also be as cheerful and colourful as possible and it is encouraging to know that this side of things is now being fully investigated at high levels. Some of us know that it is exceedingly difficult to maintain an enthusiastic and cheerful atmosphere in some of the drab switchrooms which still exist. A coat of paint on the switchroom walls will often work wonders and it is impossible to estimate its effect on the service given by that exchange. The operating staff of quite a number of exchanges beautify their switchrooms with vases of flowers and maintain a flower fund to which all the staff contribute. Anything which tends to promote happiness in the staff is desirable and should be fostered. Any members of the operating staff who are sufficiently interested in the premises in which they spend their working hours to contribute for flowers will find that they are also interested in

# Calculating the Cost

by W. H. T. Porter, Assistant Accountant General

*In this brief article, Mr. Porter describes the complicated and numerous factors which have to be taken into account before a tariff charge can be fixed.*

THE EASIEST WAY TO GET A CLEAR IDEA OF telephone costs and how they are taken into account in building up charges is to imagine that the telephone has just become available as a commercial proposition and that a small company has been formed to provide a local exchange service. The first task will be to assess the likely demand for service and the extent to which it is likely to grow: then to plan an exchange accordingly, to estimate the cost of the staff required to provide, maintain and operate the service; to consider the quantities and cost of stores for immediate use and for stock and to arrange the accommodation necessary for staff, equipment and stores. The probable life of the plant to be installed will have to be assessed in the light of whatever experience of similar plant may be available and the annual provision in respect of its depreciation decided upon.

The initial fixing of charges will consist of probably nothing more than a division of the estimated total annual expenditure, plus the anticipated profit, by the number of prospective customers, with some arbitrary adjustment to cater for subscribers at different distances from the exchange. Some of the estimates will, of necessity, be uncertain, and prudence will suggest the advisability of making some contingency provision in the calculations. Once the enterprise is established, however, actual costs will become increasingly available and it will be possible to review the charges and consider policy more fully.

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As growth proceeds it will be found necessary to incur expenditure on services other than those directly concerned with the actual provision, maintenance and operation of the system. Some people will be required to supervise workmen and operators; canvass for new business; others to prepare accounts, collect revenue, pay wages and bills and look after stores. The expenditure will thus quite naturally tend to fall into two classes, (i) the direct costs and (ii) the indirect costs. In a

simple local exchange system such as that envisaged the charges—at all events at the outset—will doubtless be on an equally simple basis, (e.g. the same for all classes, business, residential, etc.) and the treatment of the indirect costs will not raise any problems until such time as it is decided to depart from the original basis of charge.

The Post Office Telephone Service is, of course, in a very different position. There are large numbers of people in the Post Office who do nothing but telephone work; of these, some are entirely engaged on local telephone service and others entirely on trunk service, while some deal with both. The cost of this staff can be earmarked without difficulty. There are, however, also large numbers of Post Office people who are concerned not only with all phases of telephone work in varying degrees but also with postal and telegraph work, particularly in Headquarters Departments. Many examples of this will readily occur to mind. In these cases the value of the staff time must be apportioned on the best possible basis so that each service may receive its proper share of the cost. Similarly, accommodation services must be apportioned where they are not exclusively used.

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In considering the question of costing, the simplest course will be to see what is involved in a particular example of service, say, an ordinary exchange line. It will be evident that throughout the country the cost of an exchange line must vary quite appreciably in view of the different lengths of circuit, the different proportions of overhead and underground construction involved, the different types of exchanges to which they are connected and the varying degrees of density. By means of carefully selected samples it is possible to assemble data covering length, composition of circuit and type of equipment at subscribers' premises and at the exchange for representative lines. The application of stores and labour rates to these items produces what is known as the Direct Capital Cost of a circuit.

This cost will also include any charges made by contractors for work carried out by them.

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In order to arrive at the Total Capital Cost however, it is necessary to take into account the appropriate indirect costs. These cover the cost of departmental supervision of any work done by contractors, the cost of freight and handling of departmental stores, and the cost of a wide range of items including supervision, travelling and subsistence, training, sick and holiday pay, preliminary surveys, use of motor transport and so on. The relationship between indirect and direct costs is established by periodical comparison of the total expenditures for the service as a whole and expressed in the form of percentages. It is thus a simple matter of arithmetic to arrive at the total (or gross) capital cost by increasing the direct cost by the appropriate percentage.

One further item remains to be considered in connection with capital cost of an exchange line and that is the residual value at the end of life. Residual values have been established for many types of plant and, for practical application, are expressed as a percentage of the relative gross capital cost after allowing for the estimated cost of recovery. The deduction of the appropriate percentage for each category of plant in the make-up of an exchange line gives the Net Capital Cost. Certain types of plant have no residual value, while in some cases the cost of recovery may exceed the residual value and involve an addition to gross cost.

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Having arrived at the gross and net capital costs, the Annual Costs of an exchange line can now be assessed. The main headings are Interest, Depreciation and Maintenance. Interest is calculated at the prevailing rate on the gross capital cost while Depreciation, based on the estimated life of the plant, is calculated on the net cost. Maintenance costs, estimated in the light of experience, are shown under stores and labour headings. As in the case of direct capital costs these direct maintenance costs carry appropriate percentage additions to cover a variety of indirect costs such as administration, supervision, pensions, accommodation and so on. It will be appreciated that the addition of percentages to direct costs in the way described is merely a convenient means of bringing in the indirect costs. Annual costs of an exchange line must also take account of the charges incurred in respect of spare plant, otherwise the

total expenditure will not be fully recovered in the rates based on those costs. The addition for this purpose takes the form of a percentage increase representative of the relationship between working plant and spare plant, or an allowance to cover the interest on the value of stores held in stock. Finally, the annual costs must cover accounting, sales and publicity work. These items are costed and expressed at so much per exchange line.

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The Total Annual Cost so arrived at is the basis on which the rental of an exchange line is determined. It is, of course, essential that the cost should take account of every factor and that, as tariffs are fixed to continue unchanged for a period of years, due regard should be paid to possible changes in price levels of stores and equipment and in salary and wage rates, and to technical improvements which may be in course of development. It is perhaps in the matter of indirect costs that the implications are most likely to be overlooked by those not closely concerned with them. Training schemes, welfare work and research, for example, all have increased efficiency as their objective but the cost involved is a charge on the service and must be reflected in the rates payable by subscribers.

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The actual fixing of rates is a matter of policy. It may be decided, for instance, to offer a residence line at a lower rate than a business line, to allow free calls within a certain limit or to extend the area within which the minimum line rental applies. This involves studying the effect on revenue and the extent to which a loss in one direction can be made good in another, so that the service as a whole may be self-supporting. One important aspect of the matter must be borne in mind. The Post Office is a revenue-producing department and, as such, is subject to government policy. This can result in alterations to tariff rates on grounds other than those of cost. For example, in 1940 the Government found it necessary to raise vast sums for war purposes. The Post Office was called upon to make its contribution and telephone rates were raised. A further and much heavier increase was made in trunk call rates in 1943. It is clear from the substantial surpluses which subsequently emerged in the Commercial Accounts that these increases were not necessary on cost grounds at that time, although no doubt some measure of increase would in due course have become inevitable in the face of rising costs.

# REPEATER STATION FIRE AT SWINDON



by G. R. Tamplin, B.Sc., A.C.G.I., A.M.I.E.E.  
Area Engineer, Gloucester

**I**N NORMAL TIMES A MAJOR CATASTROPHE in the telephone service is a rare event. The virtual destruction of all main trunk outlets from Swindon in the brief space of an hour therefore, provided a considerable amount of excitement. So far as the enjoyment of fires from a spectacular angle is concerned, the writer would humbly refer to the gentle Elia, whose dissertation on the virtues of roast pig has provided our language with a classic on the more refined enjoyment of fires, which the present writer would not desire to emulate.

Swindon is usually known as the centre of railway engineering for the old Great Western system; it is also the commercial and general manufacturing centre of a considerable farming area in Wiltshire. Its Exchange is a group centre. War time expansion led to the erection of a temporary Repeater Station on the outskirts of the town to which all

trunk cables were diverted. The outlet cables are shewn in the diagram.

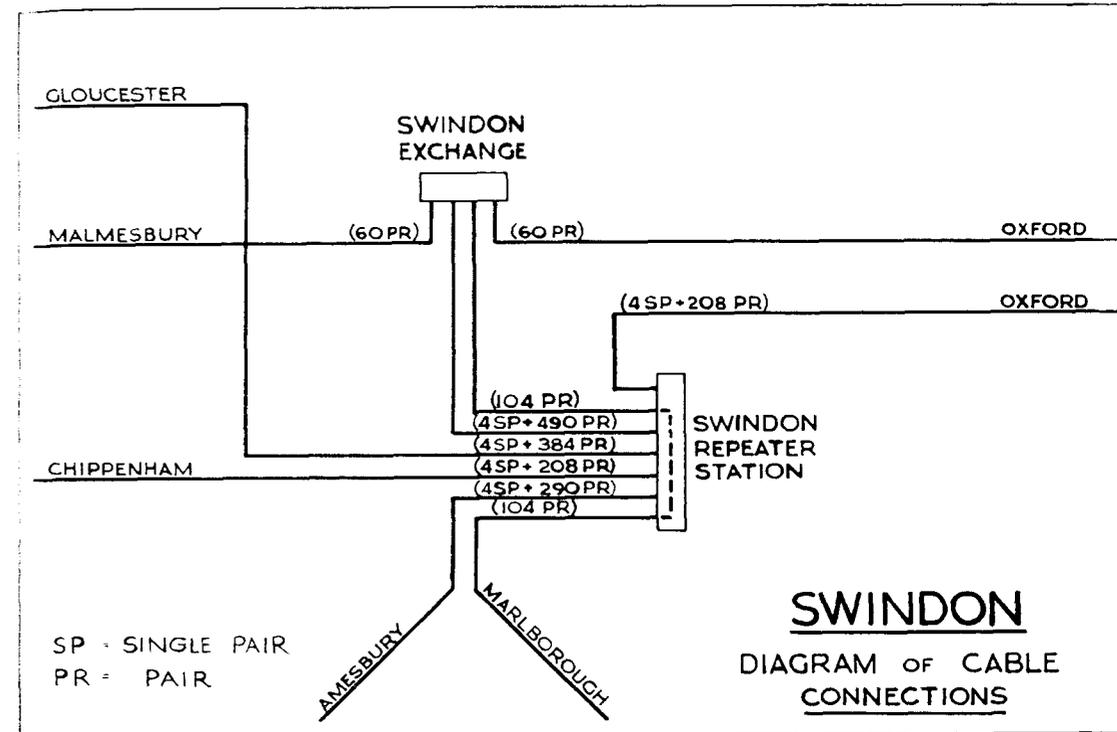
The Repeater Station was of war-time construction, housed in a steel-framed single-storey building, clad externally in asbestos cement sheeting, and lined internally with a compressed paper-type of heat insulation. A flat ceiling was provided just over rack level. The room was divided by partitions of similar lining material, forming a repeater room on the left, a power room on the right and a battery room behind.

The repeater room contained the cable entry trench and cable terminating racks, with adjoining racks of the transformer and line corrector networks. A repeater distribution frame gave jumpering facilities to the amplifiers. Adjoining this were transmission test racks, terminating units for terminated circuits and two rows of racks contained the actual amplifiers of No. 32 type with

signalling equipment. Beyond these were voice frequency telegraph racks, with a testing teleprinter. Other items in this room were a repair bench, cupboards containing spare parts and tools, writing tables, the record filing cabinets, soldering iron heaters and convector-type enclosed electric radiators.

The equipment in the power room consisted of mains supply and meters and power distribution cubicle, giving alarm and changeover facilities in

8.44 p.m., the Fire Brigade received a call from nearby householders, reporting that the building was on fire. Fire engines arrived by 8.48 p.m. and found the inside of the building an inferno. Flames were through the roof, and part of the back wall had already disappeared. The flames were extinguished with water, so minimising the damage to the power section of the building. The fire was out by 9.8 p.m. but the building was only cool enough to enter after 10.0 p.m. It was immedi-



the event of mains failure and bringing a standby Diesel engine generator set, with automatic starting facilities, into use. The battery room contained low tension and high tension batteries and a starter battery for the Diesel set.

On Thursday, February 10, the staff left the building and locked up at roughly 5.45 p.m., when everything was apparently in order. At about 8.40 p.m., the alarm in the Swindon Exchange gave warning of a power failure and at

ately evident that the apparatus was a complete loss and that the cables entering the building were severely damaged.

It will be seen from the diagram that apart from a cable to Malmesbury (then becoming faulty) and a similar small cable to Oxford, both unamplified, all other long distance communications were cut. The total number of circuits out of order was 439 (331 trunks and junctions, 8 telegraphs and 100 private wires). Calls were being obtained

through a limited number of circuits via Oxford and Bristol, which would be quite inadequate for the daytime traffic. It was obvious that Swindon might very well be without any long distance communications either by telephone or telegraph for some days, unless immediate and energetic steps were taken.

This then seemed to be a situation entirely "up the engineers' street" and drew forth an immediate response. Supervising staff resident in Swindon had arrived on the scene almost immediately, and others from Marlborough and Cirencester shortly afterwards. The Telephone Manager and staff at Gloucester had been informed and prompt steps were taken to set about providing for service on the following morning. Cable jointers had been summoned. The Fire Brigade pumped out the flooded cable trench; cables were cut and tested in the trench, but found to be wet.

The position of the entering track offered some hope of a jointing point near the Repeater Station, clear of the entry and with ample space for two or three sets of jointers to work simultaneously (far better than in the official manhole). Past experi-

ence of bomb damage encouraged the use of bold and unconventional steps, so that the happy suggestion of one of the Swindon supervising staff that the cables were likely to be dry five yards out of the building was immediately seized on, a hole opened, the duct track broken into and a cable cut. Thanks to this happy guess at an early stage, much later delay was eliminated and the work went with a swing from the outset.

The first measure was the jointing through of the 104-pair Marlborough cable during the same night giving a substantial number of circuits to Marlborough Repeater Station, which in turn had circuits to London, Bristol and elsewhere and a certain amount of spare amplifying equipment. Telegraph circuits were also extended to Marlborough, where a 4-channel voice frequency system was available. A traffic officer from

Gloucester set about diverting through traffic to other routes and setting up alternative routing. Testing staff worked throughout the night at Swindon Exchange and Marlborough Repeater Station. Drawing office and other staff at Gloucester worked through the night preparing re-routing details. Gangs were briefed for the morning and for extending local junction routes to give semi-long distance circuits. Contact was established with Regional Headquarters and the Engineer-in-Chief's Office, so that they were fully prepared for giving all necessary assistance. So effective was the work done during that night that, although



Restoration work in progress Burnt building on the right.

the press had been warned of serious delays for some days, and a two-hour delay was quoted, in fact most calls on the day following the fire were being completed within an hour.

On the Friday morning, it was decided to leave the present site clear for a permanent rebuilding, and with this in view, space in a field adjoining was acquired for the parking of mobile repeater station vans. Three fully equipped vans with amplifiers of the type 34 with direct mains supply requiring no battery, were fortunately stationed near London, and were made available through the good offices of the Engineer-in-Chief's Office. An empty mobile unit automatic exchange van which had been despatched from Gloucester was set up in a position adjoining the temporary manhole and distribution frame sections were installed. This van arrived about 2.0 p.m. on the Friday

and the distribution frame was ready for cable terminations by 9.15 a.m. on the Saturday morning. A power cable was brought into this van for re-distribution to the amplifier vans which arrived by noon on the Saturday and were got into position by 6.0 p.m. that evening. Operations were hampered by heavy rain in the morning, causing bogging. These vans were under overhaul after recent return from Germany, so that exceptional testing and a certain amount of re-wiring was necessary. A portable generator set was brought on the site for use in the case of mains failure.

A control was set up in the adjoining mess room and circuit data got together from salvaged records and copies from Gloucester. Continuous staffing was arranged for this control, and also for technicians engaged on installations and lining-up work. This room had all the flavour of a war time Air Raid Precautions Control and recalled the hectic activities of those days, with rapidly installed telephones and a quickly mobilised organisation. Thus each officer had his section of responsibility and work went on continuously without any hold up for instructions.

By 2.0 p.m. on the following Tuesday, all cables had been terminated and tapped out in the termination van; one amplifier van had been completely cabled and six amplifier bays were working. By the Wednesday all vans had been cabled and terminated and one-third of the circuits were working. All circuits were completed by 10 p.m. on February 21.

So effective has been this semi-permanent restoration that it has been decided to leave it in situ long enough to cover the period of erection and equip-

ment of a permanent repeater station. An automatic standby generator will be temporarily installed in a separate hut. Only one further diversion of the cables will be required and a fully satisfactory service will be maintained in the meantime.

Speculations as to the cause of the fire were many and varied. A telegram had been despatched through the station only two minutes before the outbreak was reported. One possibility is that a smouldering fire had been in existence for some time in the combustible wall lining which had thoroughly warmed up the whole of the inside of the building and apparatus without affecting its operation. The occurrence of an electrical short circuit would then quickly ignite the inflammable compounds in the transformer and condenser cases, etc., and cause a very quick spread of intense heat. Suspicion was also thrown on a 17-cycle ringing generator, a photograph of which is shown, which had been subject to extreme heat, the metal covers being entirely burned away. This had been the machine actually running and the spare machine at the back of the rack was comparatively unaffected. The evidence was hardly conclusive and the symptoms were mainly indicative of this being one of the hottest points of the fire.

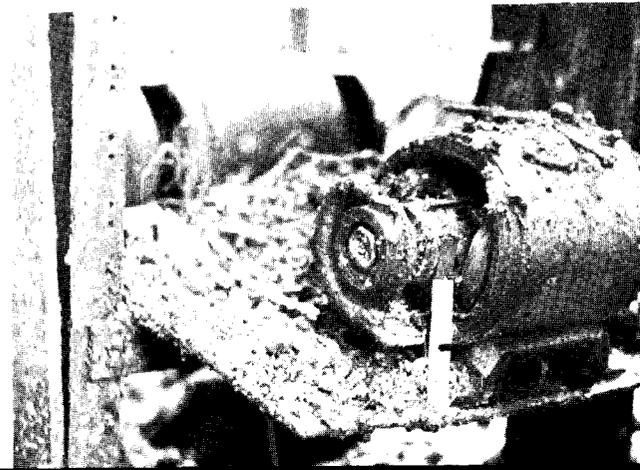
A number of freak effects were observed. The glass envelopes of valves had been softened and had collapsed around the electrodes without actually breaking. Tag blocks presented a spectacular appearance, with the bundles of tags still held in position by the wires of the cables, but with the wood and ebonite blocks entirely consumed. Jack

### FREAK EFFECTS OF THE FIRE

Test Jack Panel



Ringling Machine



strips appeared as rows of jacks with the insulating surroundings entirely burned away. Slabs of lead melted from the cable sheaths were spread on the floor, and had run out into the surrounding yard. The metal uprights were twisted and distorted. Glass fronts of instruments were fused. A number of brass fittings had fused and brass screws had melted, letting panels fall off. Protruding ebonite knobs of power switches had softened and sagged forward, reminding us of the pathetic appearance of wax candles in hot summer days. Surprisingly little damage was done to the wood block floor, reminding the writer of advice given by National Fire Service instructors that cool air can always be found near the floor of a burning building. The asbestos outside walls and roofing had broken up into fragments, flying for some distance and making a noise like fireworks. The internal lining had disappeared in the repeater room and in the central partition. In the remaining sections of the building this had only been scorched. The material does not burst into flames easily, but is capable of smouldering indefinitely, and the writer's opinion is that this material had a lot to do with the spread of the fire from whatever cause it may have started.

The Gloucester Area and Swindon staff in particular, are to be congratulated on having carried out a first class emergency restoration with good judgement and enthusiasm. As an instance, the jointers who came on duty shortly after 10.0 p.m.

after a full day's work, were told that they could go home at 3.0 a.m., but they refused and worked continuously till the following evening. The same men and others cheerfully gave up tickets for a particularly attractive game between Swindon Town and Arsenal on that Saturday and worked till 8.0 p.m. This spirit permeated the whole of the staff.

Employees of the Electricity Board also responded magnificently. An emergency seems to call forth all the best that is in mankind, and this was no exception. A first-class team of experts and workers were available on the spot; they were given their heads and a sound job resulted. Fires and suchlike catastrophes are not a welcome feature of life at the best of times and are a serious drain on our manpower resources, but the knowledge that we can get such a magnificent response from our colleagues has been the outstanding feature of the whole affair.

If the writer may end on one querulous note it is that Post Office chairs as a temporary bed for a few hours' sleep are not ideal—particularly if one's companion enjoys their comfort sufficiently to enable him to snore!

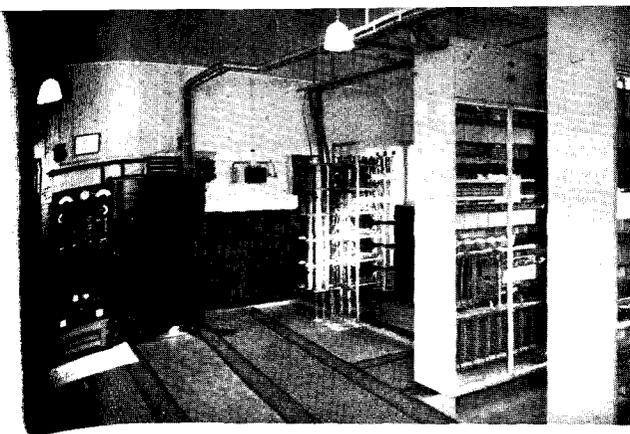
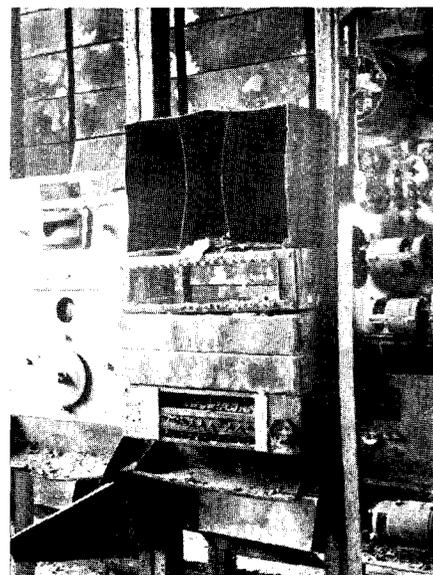
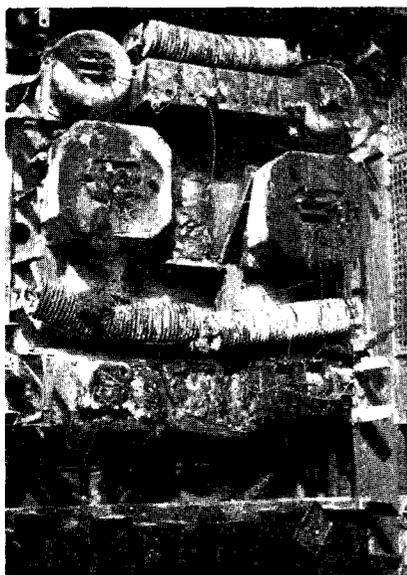
Acknowledgement is gratefully offered to Mr. H. B. Day of the Post Office engineering staff for photographs of the damaged apparatus; to Mr. J. Liddington for a photograph of the actual fire, and to those colleagues who have helped with criticisms and suggestions.

### MORE FREAK EFFECTS OF THE FIRE

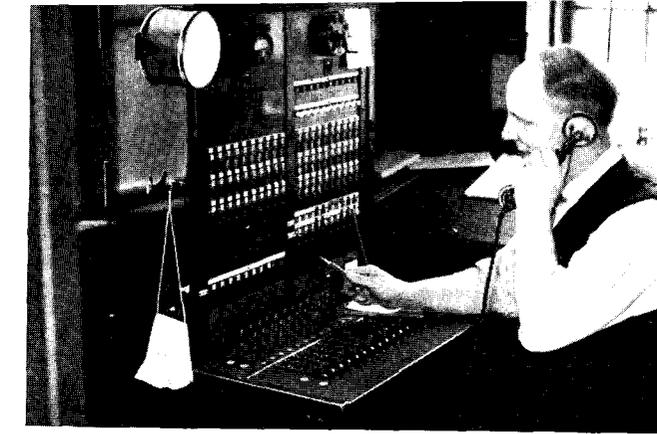
Power Supply Panel

Transmission Testing Equipment

Rear of Cable Test Rack



Unit Automatic Exchange



Rural Manual Exchange

## Looking Backward

by Miss M. C. Eve, Plymouth Telephone Area

\* \* \*

*Miss Eve has had nearly 30 years' experience in the telephone world and has recently compiled a paper which we have much pleasure in reproducing. Although she was doubtful about its suitability for the Journal, we feel it will be of interest to many of our readers.*

\* \* \*

SOME OF US RECALL THE EXTRAORDINARILY fascinating book bearing the above title (written by the late Edward Bellamy from a socialistic point of view) which took us in fancy to the year 2000 A.D., whence we looked back to present-day conditions, all of which had improved beyond recognition. Having had a long experience in the telephone world I want to try to recall some of the old methods of working as contrasted with present-day conditions, although I am not at all inclined to say that there has always been improvement.

#### Manual versus Automatic Working

When I commenced my service as a telephonist, all exchanges in this area were manual, and it has been interesting to see them one by one converted to automatic working. One recalls the violent antipathy shewn by a lot of the rural subscribers to automatic working and their insistence that they

should continue on the old system. Although from the point of view of the business man the secrecy and quicker contact provided by automatic working has proved beneficial, I believe that the majority of residential and call-office users prefer the services of the operator, and certainly from the telephonist's point of view the passing of the old manual switchboard has meant a loss of personal contacts: the exchanging of the warm, human element (where we knew all the subscribers and their intonations of voice; where they called on the home section, etc.), for the cold impersonality of automatic working.

#### Kiosks and Call Offices

What a change has been wrought here! One remembers the very few unattended kiosks where only pennies might be inserted (56 of them for a call to London by day-rate!) and the confusion and irritation caused to caller and telephonist alike

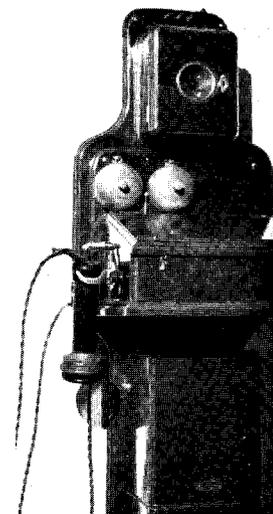
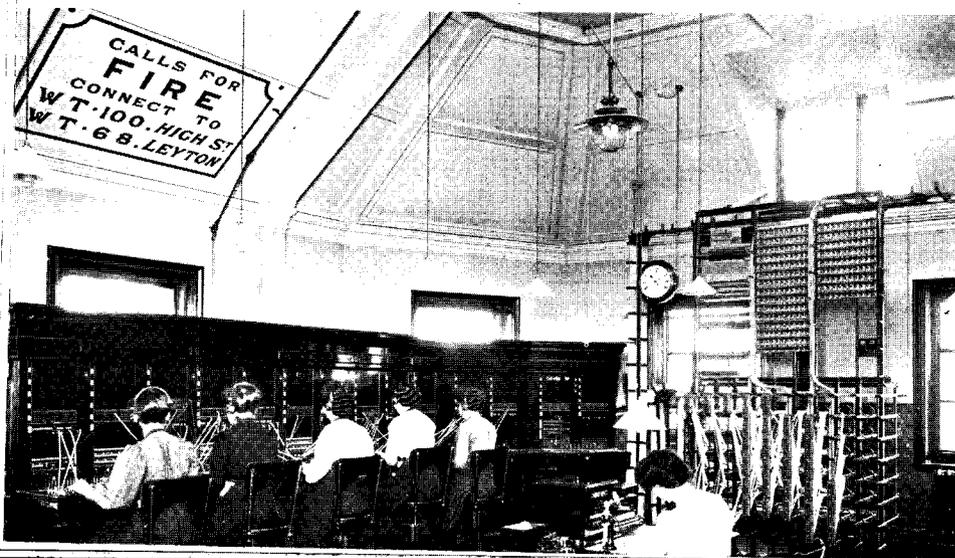


## Looking Backward

*Miss Eve's story of the changes she has seen is illustrated by these pictures*

She describes the operation of the telephone instrument and coin box shown below. The present day counterpart is illustrated above.

*Top left and centre.* Changes in kiosk design. Note the decorative (!) iron work and finial.  
*Left below.* A typical exchange at the time Miss Eve entered the service.



Operator's Training School, Temple Bar Exchange Building



Telephone Training Class, Kensington Exchange



when the twentieth penny was left continuously buzzing; the shouting by the operator "Turn the handle at the side of the box"—unheard by the caller who was deafened by the buzz of the coin. The introduction of the multi-coin box is certainly an improvement, as is also the erection of so many kiosks compared with the old days when one had to knock up the Sub-Postmaster in order to make a call.

### Party Lines

The present shared service, which is subject to much criticism, has little or no relation to the old rural party-line working. What a mine of information was the subscriber on the rural party line! He could tell you who was hiring a car, consulting a doctor, having visitors and all general history, and was it always a genuine mistake that made him answer however many rings were given? Definitely, the subscriber sharing with one other today has an advantage over the old rural party-line user who was sharing a circuit with seven or eight other subscribers and who, in addition to having to take his chance of finding the line disengaged, was further disturbed by other people's code ringing being heard. The advantages he did have were that he was able to break in and tell the other user to make it snappy and that he was waiting to make a call, also that he was not required to have a day of reckoning to apportion the charges for local calls. What fun that would have been on a party line with eight subscribers!

### Trunk Calls

I remember when anyone making a trunk call had to book a call and wait to be recalled later. I also

LOOKING BACKWARD

remember the indignation of some of the subscribers when demand working was introduced and they were told to hold the line, a process which they regarded as wasting their time. Will any telephonist ever forget the first Christmas Day on which cheap trunk rates were introduced? At 1.0 p.m., when the cheap rates ended, nearly all exchanges had two or three hours' delay on every trunk route and the staff due off at 2.0 p.m. ate their Christmas dinner at six o'clock!

### Training

My contemporaries and I learned in the hard school of experience where no allowance was made for training, and one just learned by one's mistakes. No doubt the elaborate system of training now in force is more desirable, although I am going to say that a lot of the self-trained operators of the old days possessed a larger share of initiative, energy and knowledge of instructions than do a lot of the mass-trained entrants of to-day. There was, too, a very wide variety of duties: one could be on local operating, trunk operating and order-wires (how many remember the order-wires of yesterday? A telephonist who could successfully work one could certainly have been said to have passed an endurance test). One might be manning the monitor's desk and at the same time dealing with advice notes and the charging of tickets. One also went relieving to small exchanges, each of which was different working. The motto of the telephonist in those days might well have been "hic et ubique!" Time passes, and with it brings many changes and innovations, but to me, anyhow those were the days.

# The Telecommunications Industry and the Export Drive (I)

by J. A. Mason, A.M.I.E.E., M.I.I.A.

We have much pleasure in printing the following article which contains the substance of an address delivered by Mr. Mason of the Automatic Telephone and Electric Company, Liverpool, to the Post Office Telephone and Telegraph Society of London, at the Electrical Engineers' Institution, Victoria Embankment, London, W.C.2, on 17 January, 1949.

## 1. THE NATIONAL NEED

SINCE THE EARLIEST DAYS OF THE TELECOMMUNICATION industry in this country, exports have played an important part in its programme. After the depression of the early 1930's, exports rose until they represented approximately one third of the total output of the industry in the three or four years before the war, but the outbreak of war naturally brought in its train an immediate reduction in this category of business, due to the vital national need for concentration on war products. The position at the end of the war was that, due to lack of supplies to the operating administrations and the material destruction in the theatres of war, the industry found itself in a seller's market, which it set out to exploit within the limits of the materials and resources then available.

It was in that atmosphere, after two years of post-war effort, that representatives of the industry attended the meeting convened by Sir Stafford Cripps, at which he addressed Industrialists and Trade Union representatives, in the Central Hall, Westminster, on Friday, September 12, 1947, on the need for a maximum export policy.

Sir Stafford Cripps inaugurated the export drive by reviewing our economic position, vis-à-vis this country and the rest of the world, with particular reference to the sterling area and the dollar countries. The immediate national need was to export some £31 million worth of goods a month in addition to what we had up to that time been supplying, for the immediate short-term period, i.e. the next eighteen months, until mid-1949.

## 2. THE TARGETS

The method selected to put the Government's policy into practice was by the setting of a specific task or "target" for each industry.

Emphasis was laid on hard currency markets, especially those in the western hemisphere, and manufacturers were urged, not only to produce more goods, but also to endeavour to sell them in hard currency countries. The selling side, therefore, became as important as that of production. Prices were also a vital matter, because the goods were to be sold in competitive markets and industry was encouraged to use every device of efficiency to reduce costs. The home market would have to suffer many shortages to permit manufacturers to obtain maximum exports, though it was hoped that this would eventually be relieved by increased output based on a higher efficiency of production. It was also stressed that, where there is a choice, it would be preferable to export those manufactured articles which use a relatively small amount of raw material in relation to the labour and technique represented by the final product. The products of the telecommunication industry very definitely fall into this category.

Turning to the targets in a little more detail, it was realised that it would take some time, especially after the war effort, for industry to be geared up to the new levels of production, and figures were expressed for each industry in terms of the monthly rates required by mid-1948 and end-1948, based on the prices ruling in the fourth quarter of 1946. The telecommunication industry is included as a sub-division under "Electrical Apparatus" and, to

give perspective, the relevant values are shown below.

| Industry                               | £ Million per month |          |          |
|--|---------------------|----------|----------|
|  | Actual              | Targets  |          |
|  |                     | End 1946 | Mid 1948 |
| Total Exports ... ..                   | 88.74               | 114.34   | 131.65   |
| Electrical Apparatus ...               | 3.82                | 4.2      | 4.3      |
| Telephone & Telegraph Apparatus ... .. | 0.46                | 0.60     | 0.65     |

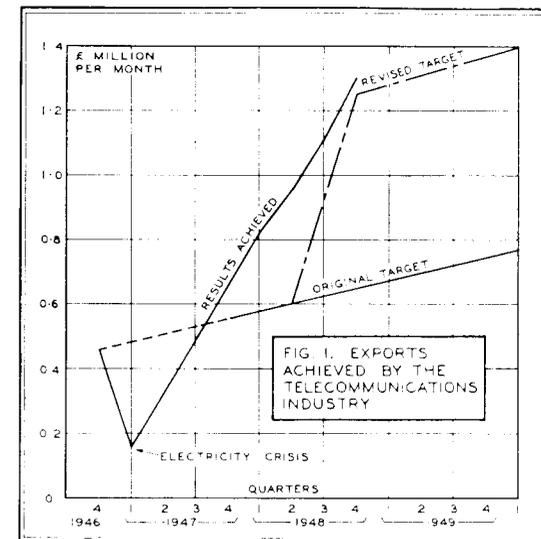
In October, 1948, the Board of Trade published revised target figures based on the progress already made and the higher price levels then prevailing as compared with end 1946.

These are given below and the progressive figures for the telecommunication industry shown graphically in figure 1.

| Industry                               | £ Million per month |          |
|--|---------------------|----------|
|  | Targets             |          |
|  | End 1948            | End 1949 |
| Total Exports ... ..                   | 150.50              | 159.40   |
| Electrical Apparatus ...               | 7.07                | 7.55     |
| Telephone & Telegraph Apparatus ... .. | 1.25                | 1.37     |

## 3. JOINT APPROACH TO THE PROBLEM BY THE TELECOMMUNICATION INDUSTRY AND THE POST OFFICE

The next step was that the Post Office called a meeting on October 9, 1947, with Mr. B. L. Barnett, the Director of Inland Telecommunications, in the chair, at which representatives of the Post Office, Ministry of Supply, Export Promotion Department of the Board of Trade and the telephone apparatus and equipment manufacturers were present. At this meeting the Post Office representatives emphasized that they would make their contribution towards the export drive by drastically reducing the current home demands for telecommunication apparatus and equipment. It was estimated that the total productive capacity for exchange equipment in 1947 was of the order



of £13 million, but that, owing to the effect of the fuel and electricity crises, this had been reduced to about £10 million for that year. Provided plant, labour and materials were available, it was further estimated that the total production would be at the rate of £18 million a year at the end of 1948 and £22 million by mid-1949. Based on these figures the Post Office proposed to reduce its intake of exchange equipment in 1947 and 1948 to approximately £5 million, increasing it to £6 million in 1949 and keeping it at that figure during 1950.

The definition of telecommunication equipment, for the purpose of the target, was agreed as comprising telegraph equipment; telephone exchange equipment and subscribers' apparatus; line transmission and signalling equipment for long distance communications. It does not include radio equipment or telegraph and telephone wires and cables, for which separate targets were set.

In this definition of the industry's main products, telephone exchange equipment, particularly that for automatic exchanges, is the largest single entity and will therefore constitute the main focus of this article. It will, however, be realised that, in most of the points made, similar remarks apply to the other products of the industry.

## 4. POST-WAR RECONVERSION

To give perspective, perhaps, it would not be out of place to review the position of the industry and its problems, as they were when Sir Stafford

Cripps made his appeal for exports in September, 1947.

During the war the telecommunication factories had been engaged on the design, development and production of goods that had, in the main, little or no relation to their normal peacetime activities. Moreover, man power had been reduced to a minimum to meet the needs of the fighting services and woman power expanded to the maximum by directing women up to the age of 50 to meet industrial needs. Following the cessation of hostilities, there was an enormous turnover of labour caused by the release of the directed women and the influx of men demobilised from the forces. This, in turn, presented a very big problem of training, not only of manufacturing, but also of technical staffs to re-establish the industry on a peacetime basis.

Apart from labour problems, the plant itself had to be re-organised to suit the flow production of telecommunication equipment, and machine tools, manufacturing tools, etc., many of them worn out after six years of continuous day and night use, had to be replaced. The problem of replacing such items was no small matter and a period of 18/24 months was not excessive for this purpose, bearing in mind the international demands for machine tools and similar equipment.

5. THE MATERIALS

The next factor was the shortage of materials on a national and international basis, because the basic industries also were called upon to reorganise their plants and products to suit normal peacetime demands. The material shortage in turn gave rise to what was known as the Prime Minister's List of Priorities. This list, originally published in May, 1947, covered the following:—

1. Electrical Generating Equipment.
2. Coal Mining Machinery.
3. Gas Equipment.
4. Coal to Oil Conversion.
5. Railway Freight Traffic.
6. Atomic Energy.

The list had a very serious effect on the telecommunication industry, because it was not included in the groups of priorities, which meant, in practice, that when the needs of the above six had been met, there was little of the short-supply items left for the other industries.

The materials used by the industry fall into the following categories:—

5.1. *Raw Materials.*—What the industry regards

as raw materials, viz., metal rods, bars, sheets, etc., are, in fact, the final products of the basic industries.

By comparison with other industries, telecommunication equipment uses relatively small amounts of such materials, but what is used covers a wide range of sizes, and much of it is to more stringent specifications and closer limits than are commercially accepted as standard. For these reasons it was extremely difficult to interest new suppliers in laying down plant and tools for the materials required.

Nickel silver telephone strip, for example, caused particular anxiety at one period of 1947 when the supply was threatened with a drastic reduction at the very time that the industry's demands for it were rapidly increasing.

Generally speaking, in September, 1947, when we were asked to concentrate on increased export business, most materials were taking from six to twelve months to obtain after placing the order—for many of them the period had been, or subsequently became, as much as eighteen months.

5.2. *Semi-Processed Materials.*—This category includes such items as fine insulated wires for electro-magnets, resistance wires for hand-made cable forms, plastic mouldings, diecastings, etc. These items also represent the end product of the supplier, which means that the industry is in direct competition with other industries for any of them in short supply.

5.3. *Complete Products.* Perhaps the most spectacular in this group are items such as motor generators and ringing machines, because these, more than any other single factor, control the pace at which it is possible to supply complete telephone exchanges.

The increasing volume of work required by our industry and the influence of the Prime Minister's List caused the machine manufacturers during 1947 to extend their delivery promises up to two and a half years from date of order. Conditions have since improved to the point where one and a half years' delivery can be obtained, although some of the essential materials are still in short supply. It would be unfair to leave the question of material difficulties without paying some tribute to the Post Office principal priority officer and his assistants. A great deal could be written of the difficulties experienced and of their valuable help in overcoming them.

6. COMPARATIVE PRE-WAR POSITION

Following the depression in the early 1930's, the telecommunication industry was by 1938 in a healthy economic position based on a substantial and expanding home market, which, taken together with the influence of the export market, then absorbing approximately one-third of the industry's total capacity, had the effect of reducing selling prices to the lowest international levels. This point is illustrated graphically in figure 2 which shows the trends as between home and

7. THE RESOURCES OF THE INDUSTRY

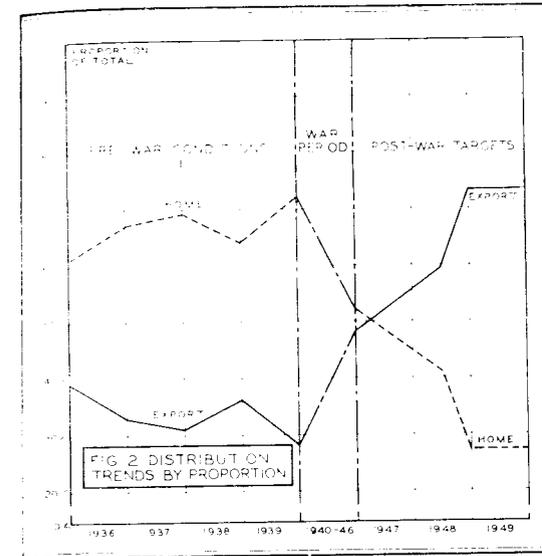
The firms manufacturing telephone exchange equipment and a full range of telecommunication apparatus are:—

- Automatic Telephone & Electric Co. Ltd., Liverpool.
  - Ericsson Telephones Ltd., Nottingham.
  - General Electric Co. Ltd., Coventry.
  - Siemens Brothers & Co. Ltd., London.
  - Standard Telephones & Cables Ltd., London.
- In addition there are three others who concentrate on telephone apparatus and one specialising in telegraph apparatus, comprising:—
- Phoenix Telephone & Electric Works, London.
  - Plessey Company Ltd., London.
  - Telephone Manufacturing Co. Ltd., London.
  - Creed & Co. Ltd., London.

These nine firms may be regarded as the total resources of the industry for the purpose of this article and the statistics quoted. Naturally these resources have tended to develop by keeping in step with the broad progress of the telecommunication art as it has evolved in this country.

In connection with automatic telephony, various systems have been designed and tried in this and other countries, but the standardisation by the Post Office of the Strowger or Step-by-Step System in 1922 has influenced British manufacturing development to the point where the five major contractors provide standardised and interchangeable components. As a result, all manufacturers have tended to concentrate on the production of Step-by-Step equipment, because the greatest pre-war demand was to meet the needs of the home market.

How does this equip the industry for implementing the Government policy on exports? Although there are about two dozen different systems of automatic telephony, these may in practice be narrowed down to the five most prevalent, viz., Step-by-Step, American Telephone & Telegraph Company's Panel, International Telephone & Telegraph Corporation's Rotary, L. M. Ericsson's Rotary and American Telephone and Telegraph Company's Crossbar, in that order based on the relative number of automatic telephones in operation throughout the world. Further, two out of every three of the world's automatic telephones operate on the Step-by-Step principle. This fact gives the system an advantage, further enhanced by its carrying the hallmark of the Post Office with the reflected prestige that that implies.



export business in the pre-war days, compared with present-day targets, and illustrates very clearly the complete reversal of policy.

As far as the home market was concerned, all of the public exchange business conformed to Post Office standards, which had been fairly definitely established by that time. On the other hand, ventures into the export field usually involved keen international competition, which, in many cases, demanded not only price sacrifices, but also the most economical engineering solution that would fit the system exactly to the requirements of the prospective customer.

It will be readily appreciated then, that the reversal of the composition of the industry's total business means a very much greater effort in terms of selling, engineering, planning and even in manufacturing procedure than the proportional increase due to a generally bigger programme.

8. THE COMPETITION

The main foreign competitors for overseas business are:—

**8.1. International Telephone and Telegraph Corporation of U.S.A.** This organisation operates on a wide-scale basis, with its main manufacturing units in Belgium and the U.S.A., and local manufacturing units, primarily for the home market, in many other countries of the world. Apart from manufacture, it also operates telephone concessions in a number of countries and, in the case of Spain and Argentina, where these operating concessions have recently been taken over by the Governments, it has been compensated by long term supply agreements.

**8.2. Other American Manufacturers.** One of the main exporters from the U.S.A. in pre-war days was the Automatic Electric Company of Chicago, the company responsible for the initial development of A. B. Strowger's invention, in 1889, of the Step-by-Step system. Unlike the International Telephone & Telegraph Corporation and Automatic Electric Company, other American manufacturers, including the Western Electric Company of Hawthorne, Chicago, which manufactures for the Bell operating companies in the U.S.A., concentrate on the American home market; but with any recession of trade they are all potential competitors to British industry.

**8.3. L. M. Ericsson of Sweden.**—This important organisation has its main manufacturing unit in Sweden, with subsidiary factories and operating concessions in several other countries.

**8.4. Siemens and Halske of Germany.**—Before the war this company had its main manufacturing unit in Germany, with several smaller factories mainly in Central Europe and it was a formidable competitor in international markets. To-day, of course, its activities have been limited by the Control Commission, but when it is agreed to restore German economy by the encouragement of exports, its competition is one that British industry will have to face. In fact, there are already signs that Germany is seeking to recapture former markets. Meanwhile, extensions to existing Siemens & Halske exchanges outside Germany have been met from former Siemens & Halske local factories or from the United Kingdom. Apart from the main Siemens & Halske factory,

there exist several other small telephone factories in Germany, and between them they can easily meet the needs of the German home market, provided the necessary materials are made available to them.

**8.5. Albiwerk Zurich of Switzerland.**—This former Siemens & Halske factory has, within the last ten years, expanded its manufacturing facilities to function as an independent unit, initially for the Swiss home market. With the decline of the parent company since the war, it has recently appeared as a serious competitor, particularly for the extension of existing Siemens & Halske telephone exchanges and areas.

**8.6. Other European Manufacturers.**—Various other factories in Europe, whose activities have been mainly restricted to domestic markets, may, due to political or economic considerations, become competitors in the international field.

9. THE MARKET

The competition described above; the existing automatic systems which may need expansion; and the new areas still to be developed, taken together, are factors which lead to a consideration of the world's existing markets, and thanks are due to the American Telephone & Telegraph Company for the statistics forming the basis of the next three illustrations.

The first, figure 3, shows an analysis of the total telephones of the world in countries, to which have been added indications of the predominating and other automatic systems in each country. In addition, the asterisks show those countries where manufacturing facilities exist. Competition will obviously be keener in the countries with their own manufacturing facilities and will practically predominate in those where the facilities cater for the export as well as for the local market. Figure 4 shows the telephone development of the world's larger cities. Apart from being an interesting corollary to the previous statistics, it does show how, in some countries, such a large part of the total telephone development is concentrated in the capital city, or perhaps one or two cities only, leaving the rest of the country very much in need of development.

Figure 5 shows the relative telephone densities of a number of countries and cities, giving an immediate indication of where markets can be fostered by the creation of a heavier demand.

(to be continued)

TELEPHONES IN COUNTRIES OF THE WORLD  
JANUARY 1, 1948

| Country                     | Total Telephones |                          |                    | Ownership  |            | Automatic (Dial) |                          | Automatic Systems |        |
|-----------------------------|------------------|--------------------------|--------------------|------------|------------|------------------|--------------------------|-------------------|--------|
|                             | Number           | Per Cent. of Total World | Per 100 Population | Government | Private    | Number           | Per Cent. of Total Tels. | Predominating     | Others |
| <b>NORTH AMERICA:</b>       |                  |                          |                    |            |            |                  |                          |                   |        |
| *United States ...          | 34,866,758       | 57.5                     | 24.2               | —          | 34,866,758 | 20,850,000       | 59.8                     | S.                | P.C.R. |
| *Canada ...                 | 2,213,400        | 3.7                      | 17.4               | 283,500    | 1,929,900  | 1,254,400        | 56.7                     | S.                | R.     |
| Central America ...         | 53,300           | †                        | 0.5                | 29,000     | 24,300     | 20,700           | 38.8                     | S.                | R.     |
| Cuba ...                    | 91,800           | 0.2                      | 1.8                | 578        | 91,222     | 75,850           | 82.6                     | S.                | —      |
| Jamaica ...                 | 9,701            | †                        | 0.7                | —          | 9,701      | 8,875            | 91.5                     | S.                | —      |
| Mexico ...                  | 237,000          | 0.4                      | 1.0                | 3,000      | 234,000    | 160,846          | 67.9                     | E.R.              | S.     |
| Newfoundland & Labrador ... | 14,760           | †                        | 4.6                | 1,690      | 13,070     | 90               | 0.6                      | S.                | —      |
| Puerto Rico ...             | 31,988           | †                        | 1.5                | 1,514      | 30,474     | 15,825           | 49.5                     | R.                | —      |
| Trinidad & Tobago ...       | 11,027           | †                        | 1.9                | —          | 11,027     | 6,617            | 60.0                     | S.                | —      |
| Other Places ...            | 54,300           | †                        | 0.7                | 14,300     | 40,000     | 16,700           | 30.8                     | S.R.              | E.     |
| <b>SOUTH AMERICA:</b>       |                  |                          |                    |            |            |                  |                          |                   |        |
| *Argentina ...              | 651,082          | 1.1                      | 4.0                | 572,582    | 78,500     | 470,000          | 72.2                     | S.                | R.E.   |
| Bolivia ...                 | 7,800            | †                        | 0.2                | —          | 7,800      | 6,050            | 77.6                     | E.                | S.     |
| *Brazil ...                 | 468,500          | 0.8                      | 1.0                | 1,500      | 467,000    | 340,000          | 72.6                     | R.                | S.E.   |
| Chile ...                   | 119,500          | 0.2                      | 2.1                | —          | 119,500    | 78,604           | 65.8                     | S.                | —      |
| Colombia ...                | 57,300           | †                        | 0.5                | 36,000     | 21,300     | 19,500           | 34.0                     | E.                | S.     |
| Ecuador ...                 | 10,000           | †                        | 0.3                | 4,600      | 5,400      | 1,200            | 12.0                     | S.                | —      |
| Paraguay ...                | 4,900            | †                        | 0.4                | 4,900      | —          | 4,200            | 85.7                     | R.                | —      |
| Peru ...                    | 43,000           | †                        | 0.5                | —          | 43,000     | 31,845           | 74.1                     | S.                | —      |
| Uruguay ...                 | 73,367           | 0.1                      | 3.2                | 71,732     | 1,635      | 53,014           | 72.3                     | S.                | —      |
| Venezuela ...               | 48,800           | †                        | 1.1                | 1,200      | 47,600     | 43,062           | 88.2                     | S.                | —      |
| Other Places ...            | 4,744            | †                        | 0.8                | 4,744      | —          | 128              | 2.7                      | R.                | —      |
| <b>EUROPE:</b>              |                  |                          |                    |            |            |                  |                          |                   |        |
| *Austria ...                | 305,311          | 0.5                      | 4.4                | 305,311    | —          | 230,227          | 75.4                     | S.                | R.     |
| *Belgium ...                | 534,780          | 0.9                      | 6.3                | 534,780    | —          | 388,997          | 72.7                     | R.                | S.     |
| Bulgaria ...                | 54,347           | †                        | 0.8                | —          | 54,347     | 23,000           | 42.3                     | S.                | —      |
| *Czechoslovakia ...         | 350,708          | 0.6                      | 2.9                | 350,708    | —          | 208,319          | 59.4                     | R.                | R.E.   |
| *Denmark ...                | 617,586          | 1.0                      | 14.8               | 30,948     | 586,638    | 250,277          | 40.5                     | S.                | —      |
| Eire ...                    | 59,753           | †                        | 2.0                | 59,753     | —          | 34,247           | 57.3                     | S.                | —      |
| *Finland ...                | 281,013          | 0.5                      | 6.9                | 28,136     | 252,877    | 145,703          | 51.8                     | S.                | E.     |
| *France ...                 | 2,108,140        | 3.5                      | 5.2                | 2,108,140  | —          | 1,263,331        | 59.9                     | R.                | S.E.   |
| *Germany ... (2)            | 1,753,000        | 2.9                      | 3.3                | 1,753,000  | —          | 960,000          | 54.8                     | S.                | —      |
| Greece ...                  | 62,900           | 0.1                      | 0.8                | 1,000      | 61,900     | 61,600           | 97.9                     | S.                | —      |
| *Hungary ...                | 106,768          | 0.2                      | 1.2                | 106,768    | —          | 77,492           | 72.6                     | R.                | E.     |
| *Iceland ...                | 15,696           | †                        | 11.8               | 15,696     | —          | 9,596            | 61.1                     | E.                | —      |
| *Italy ...                  | 958,813          | 1.6                      | 2.1                | —          | 958,813    | 857,612          | 89.4                     | S.                | E.R.   |
| Luxembourg ...              | 19,654           | †                        | 6.8                | 19,654     | —          | 14,312           | 72.8                     | R.                | —      |
| *Netherlands ...            | 575,995          | 1.0                      | 5.9                | 575,995    | —          | 507,151          | 88.0                     | S.                | R.E.   |
| *Norway ... (3)             | 376,503          | 0.6                      | 12.0               | 310,192    | 66,311     | 218,420          | 58.0                     | R.                | E.S.   |
| *Poland ...                 | 192,156          | 0.3                      | 0.8                | 192,156    | —          | 127,500          | 66.4                     | E.                | S.R.   |
| *Portugal ...               | 114,818          | 0.2                      | 1.4                | 34,272     | 80,546     | 54,988           | 47.9                     | S.                | —      |
| *Roumania ... (4)           | 127,153          | 0.2                      | 0.8                | 1,022      | 126,131    | 96,402           | 75.8                     | R.                | —      |
| *Spain ...                  | 509,993          | 0.8                      | 1.8                | —          | 509,993    | 367,576          | 72.1                     | R.                | E.     |
| **Sweden ...                | 1,450,478        | 2.4                      | 21.2               | 1,448,470  | 2,008      | 853,665          | 58.9                     | E.                | R.     |
| **Switzerland ...           | 744,997          | 1.2                      | 16.3               | 744,997    | —          | 692,542          | 93.0                     | R.S.              | —      |
| **United Kingdom ... (1)    | 4,654,500        | 7.7                      | 9.3                | 4,654,500  | —          | 3,202,500        | 68.8                     | S.                | —      |
| *Other Places ...           | 1,800,000        | 3.0                      | 0.7                | 1,800,000  | —          | 555,000          | 30.8                     | S.E.              | R.     |
| <b>ASIA:</b>                |                  |                          |                    |            |            |                  |                          |                   |        |
| *China ...                  | 244,028          | 0.4                      | †                  | 84,028     | 160,000    | 178,000          | 72.9                     | S.                | R.E.   |
| *Japan ... (1)              | 1,195,238        | 2.0                      | 1.5                | 1,195,238  | —          | 366,221          | 30.6                     | S.                | R.     |
| Korea ... (4)               | 75,134           | 0.1                      | 0.3                | 75,134     | —          | 24,871           | 33.1                     | S.                | R.     |
| Turkey ...                  | 43,114           | †                        | 0.2                | 43,114     | —          | 36,000           | 83.5                     | R.E.              | —      |
| *Other Places ...           | 290,000          | 0.5                      | †                  | 240,000    | 50,000     | 150,000          | 51.7                     | S.E.              | R.     |
| <b>AFRICA:</b>              |                  |                          |                    |            |            |                  |                          |                   |        |
| Algeria ...                 | 75,670           | 0.1                      | 0.9                | 75,670     | —          | 49,634           | 65.6                     | R.                | S.     |
| Egypt ... (4)               | 99,814           | 0.2                      | 0.4                | 99,814     | —          | 66,009           | 66.1                     | R.                | S.     |
| Morocco ...                 | 45,153           | †                        | 0.5                | 36,553     | 8,600      | 28,800           | 63.8                     | R.                | R.E.   |
| Tunisia ...                 | 19,729           | †                        | 0.6                | 19,729     | —          | 12,296           | 62.3                     | S.                | —      |
| Union of South Africa ...   | 335,000          | 0.6                      | 2.9                | 335,000    | —          | 245,000          | 73.1                     | S.                | —      |
| Other Places ...            | 80,700           | 0.1                      | †                  | 80,400     | 300        | 31,400           | 38.9                     | —                 | S.R.E. |
| <b>OCEANIA:</b>             |                  |                          |                    |            |            |                  |                          |                   |        |
| *Australia ... (3)          | 905,017          | 1.5                      | 11.9               | 905,017    | —          | 538,438          | 59.5                     | S.                | —      |
| Hawaii ...                  | 92,076           | 0.2                      | 17.5               | —          | 92,076     | 84,730           | 92.0                     | S.                | —      |
| New Zealand ... (1)         | 300,552          | 0.5                      | 16.5               | 300,552    | —          | 172,830          | 57.5                     | R.                | S.E.   |
| Philippine Republic ...     | 6,917            | †                        | †                  | —          | 6,917      | 5,419            | 78.3                     | S.                | —      |
| Other Places ...            | 34,000           | †                        | †                  | 34,000     | —          | 3,900            | 11.5                     | S.                | E.     |

NOTES:—

- \* Local Manufacturing Facilities for Home Market.
- \*\* Local Manufacturing Facilities for Home & Export Market.
- † Less than 0.1.
- S—Strowger or Step-by-Step.
- P—Panel (A. T. & T.)
- R—Rotary (I. T. & T.)
- E—L. M. Ericsson
- C—Crossbar (A. T. & T.)
- (1) March 31, 1948.
- (2) Excluding the Russian Zone of Occupation.
- (3) June 30, 1947.
- (4) January 1, 1947.

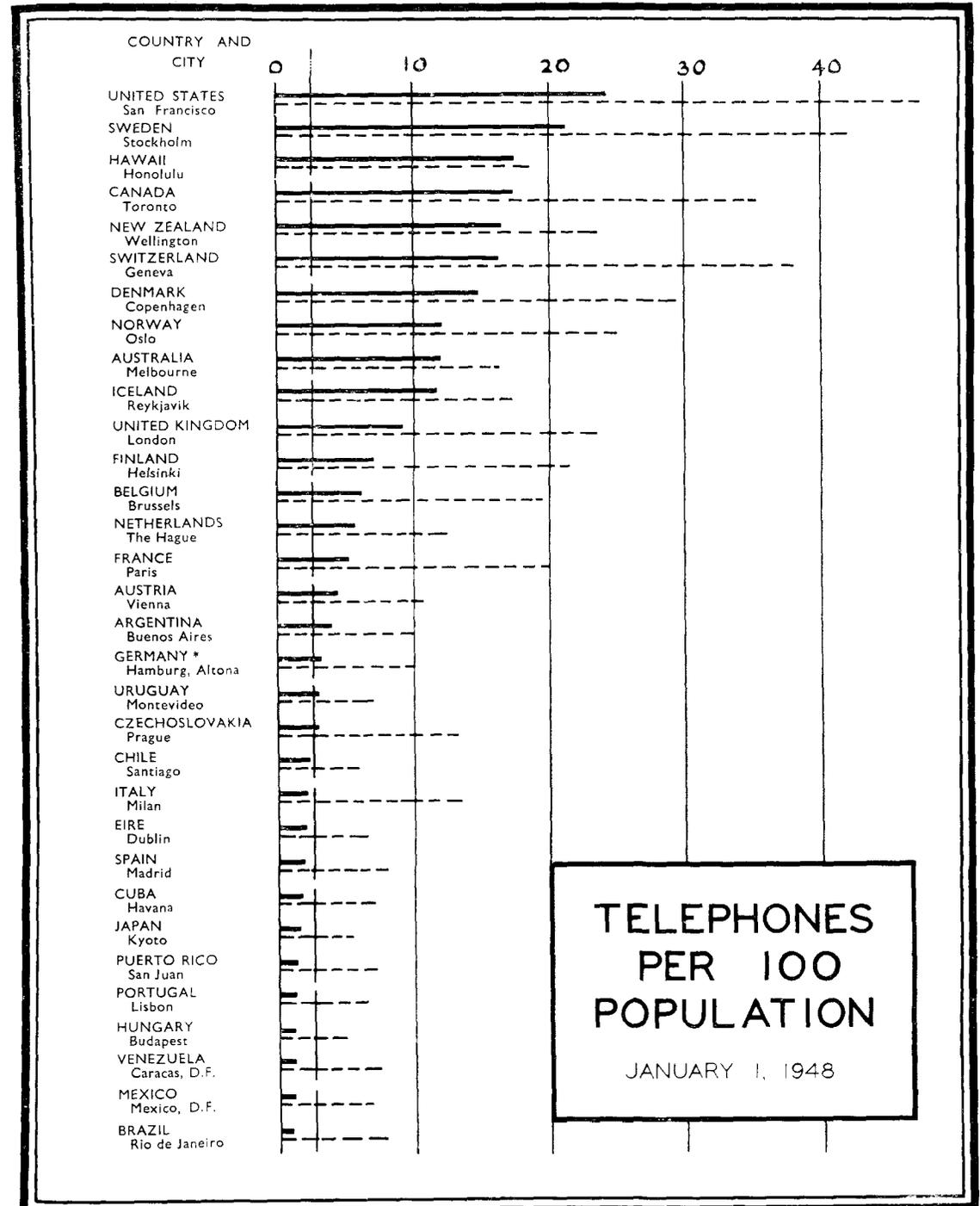
**TELEPHONE DEVELOPMENT OF LARGE CITIES OF THE WORLD**  
**JANUARY 1, 1948**

| Country and City<br>(or Exchange Area) | Estimated<br>Population<br>(in<br>Thousands) | Number<br>of<br>Telephones | Telephones<br>per 100<br>Population | Country and City<br>(or Exchange Area)                                      | Estimated<br>Population<br>(in<br>Thousands) | Number<br>of<br>Telephones | Telephones<br>per 100<br>Population |
|--|--|----------------------------|-------------------------------------|---|--|----------------------------|-------------------------------------|
| <b>ALGERIA:</b>                        |  |                            |                                     | <b>NETHERLANDS:</b>   |  |                            |                                     |
| Algiers ... ..                         | 361  | 25,802                     | 7.1                                 | Amsterdam ... ..  | 814  | 83,592                     | 10.3                                |
| <b>ARGENTINA:</b>                      |  |                            |                                     | Haarlem ... ..  | 201  | 17,298                     | 8.6                                 |
| Buenos Aires ... ..                    | 4,065  | 406,228                    | 10.0                                | The Hague ... ..  | 600  | 74,566                     | 12.4                                |
| <b>AUSTRALIA:</b>                      |  |                            |                                     | Rotterdam ... ..  | 723  | 56,747                     | 7.8                                 |
| Adelaide ... ..                        | 383  | 51,000                     | 13.3                                | Utrecht ... ..  | 205  | 18,510                     | 9.0                                 |
| Brisbane ... ..                        | 402  | 56,840                     | 14.1                                | <b>NEW ZEALAND: (a)</b>   |  |                            |                                     |
| Melbourne ... ..                       | 1,227  | 204,039                    | 16.6                                | Auckland ... ..   | 275  | 42,979                     | 15.6                                |
| Sydney ... ..                          | 1,484  | 238,983                    | 16.1                                | Wellington ... ..   | 185  | 43,391                     | 23.5                                |
| <b>AUSTRIA:</b>                        |  |                            |                                     | <b>NORWAY: (c)</b>  |  |                            |                                     |
| Vienna ... ..                          | 1,550  | 163,117                    | 10.5                                | Oslo ... ..   | 424  | 105,422                    | 24.9                                |
| <b>BELGIUM:</b>                        |  |                            |                                     | <b>PORTUGAL:</b>  |  |                            |                                     |
| Antwerp ... ..                         | 573  | 57,669                     | 10.1                                | Lisbon ... ..   | 794  | 52,123                     | 6.6                                 |
| Brussels ... ..                        | 930  | 183,905                    | 19.8                                | Oporto ... ..   | 324  | 17,664                     | 5.5                                 |
| Liege ... ..                           | 363  | 31,387                     | 8.6                                 | <b>PUERTO RICO:</b>   |  |                            |                                     |
| <b>BRAZIL:</b>                         |  |                            |                                     | San Juan ... ..   | 220  | 15,924                     | 7.2                                 |
| Rio de Janeiro ... ..                  | 2,160  | 172,874                    | 8.0                                 | <b>SPAIN:</b>   |  |                            |                                     |
| Sao Paulo ... ..                       | 1,720  | 93,369                     | 5.4                                 | Barcelona ... ..  | 1,225  | 79,581                     | 6.5                                 |
| <b>CANADA:</b>                         |  |                            |                                     | Madrid ... ..   | 1,276  | 104,300                    | 8.2                                 |
| Montreal ... ..                        | 1,219  | 293,253                    | 24.1                                | Seville ... ..  | 375  | 15,174                     | 4.0                                 |
| Ottawa ... ..                          | 255  | 71,651                     | 28.1                                | Valencia ... ..   | 520  | 17,132                     | 3.3                                 |
| Toronto ... ..                         | 911  | 322,980                    | 35.4                                | <b>SWEDEN:</b>  |  |                            |                                     |
| Vancouver ... ..                       | 391  | 113,278                    | 29.0                                | Göteborg ... ..   | 337  | 103,858                    | 30.8                                |
| Winnipeg ... ..                        | 352  | 76,136                     | 21.6                                | Malmö ... ..  | 181  | 48,462                     | 26.8                                |
| <b>CHILE:</b>                          |  |                            |                                     | Stockholm ... ..  | 889  | 371,399                    | 41.8                                |
| Santiago ... ..                        | 1,104  | 64,553                     | 5.8                                 | <b>SWITZERLAND:</b>   |  |                            |                                     |
| <b>CHINA:</b>                          |  |                            |                                     | Basle ... ..  | 172  | 61,107                     | 35.5                                |
| Shanghai ... ..                        | 4,494  | 94,945                     | 2.1                                 | Berne ... ..  | 144  | 53,952                     | 37.5                                |
| <b>CUBA:</b>                           |  |                            |                                     | Geneva ... ..   | 126  | 48,032                     | 38.1                                |
| Havana ... ..                          | 900  | 64,195                     | 7.1                                 | Zurich ... ..   | 405  | 116,946                    | 28.9                                |
| <b>CZECHOSLOVAKIA:</b>                 |  |                            |                                     | <b>UNITED KINGDOM: (a)</b>  |  |                            |                                     |
| Prague ... ..                          | 921  | 122,273                    | 13.3                                | Belfast ... ..  | 453  | 32,720                     | 7.2                                 |
| <b>DENMARK:</b>                        |  |                            |                                     | Birmingham ... ..   | 1,290  | 107,260                    | 8.3                                 |
| Copenhagen ... ..                      | 973  | 288,214                    | 29.6                                | Edinburgh ... ..  | 488  | 68,320                     | 14.0                                |
| <b>EIRE:</b>                           |  |                            |                                     | Glasgow ... ..  | 1,202  | 103,570                    | 8.6                                 |
| Dublin ... ..                          | 513  | 34,247                     | 6.7                                 | Kingston-upon-Hull ... ..   | 346  | 25,302                     | 7.3                                 |
| <b>FINLAND:</b>                        |  |                            |                                     | Liverpool ... ..  | 1,427  | 105,720                    | 7.4                                 |
| Helsinki ... ..                        | 380  | 83,898                     | 22.1                                | London (City and County<br>of) ... ..                                       | 3,391  | 788,870                    | 23.3                                |
| <b>FRANCE:</b>                         |  |                            |                                     | Manchester ... ..   | 1,200  | 120,800                    | 10.1                                |
| Bordeaux ... ..                        | 254  | 31,314                     | 12.3                                | Newcastle-on-Tyne ... ..  | 492  | 40,080                     | 8.1                                 |
| Lille ... ..                           | 210  | 22,494                     | 10.7                                | Sheffield ... ..  | 508  | 39,730                     | 7.8                                 |
| Lyon ... ..                            | 545  | 60,502                     | 11.1                                | <b>URUGUAY:</b>   |  |                            |                                     |
| Marseille ... ..                       | 636  | 53,247                     | 8.4                                 | Montevideo ... ..   | 730  | 53,014                     | 7.3                                 |
| Paris ... ..                           | 2,734  | 545,000                    | 19.9                                | <b>VENEZUELA:</b>   |  |                            |                                     |
| <b>GERMANY:</b>                        |  |                            |                                     | Caracas, D.F. ... ..  | 450  | 34,739                     | 7.7                                 |
| Berlin ... ..                          | 3,253  | 86,684                     | 2.7                                 | <b>UNITED STATES:</b>   |  |                            |                                     |
| Bremen ... ..                          | 405  | 29,188                     | 7.2                                 | New York ... ..   | 7,888  | 2,458,102                  | 31.2                                |
| Frankfurt-on-Main ... ..               | 535  | 42,495                     | 7.9                                 | Chicago ... ..  | 3,700  | 1,396,387                  | 37.7                                |
| Hamburg-Altona ... ..                  | 1,469  | 145,450                    | 9.9                                 | Los Angeles ... ..  | 1,950  | 740,943                    | 38.0                                |
| Munich ... ..                          | 842  | 38,110                     | 4.5                                 | Cleveland ... ..  | 1,313  | 458,380                    | 34.9                                |
| <b>HAWAII:</b>                         |  |                            |                                     | Pittsburgh ... ..   | 1,035  | 346,836                    | 33.5                                |
| Honolulu ... ..                        | 268  | 50,607                     | 18.9                                | Total 9 exchange areas<br>with more than one<br>million population ... ..   | 22,355                                       | 7,342,777                  | 32.8                                |
| <b>HONG KONG (b)</b>                   | 1,500  | 19,974                     | 1.3                                 | Washington, D.C. ... ..   | 942  | 410,072                    | 43.5                                |
| <b>HUNGARY:</b>                        |  |                            |                                     | San Francisco ... ..  | 836  | 398,712                    | 47.7                                |
| Budapest ... ..                        | 1,500  | 72,031                     | 4.8                                 | Boston ... ..   | 738  | 275,121                    | 37.3                                |
| <b>ITALY:</b>                          |  |                            |                                     | Minneapolis ... ..  | 600  | 237,810                    | 39.6                                |
| Florence ... ..                        | 371  | 36,022                     | 9.7                                 | Seattle ... ..  | 570  | 235,646                    | 41.3                                |
| Milan ... ..                           | 1,267  | 173,850                    | 13.7                                | Total 16 exchange areas<br>with 500,000 to one<br>million population ... .. | 10,651                                       | 3,753,022                  | 35.2                                |
| Naples ... ..                          | 1,020  | 25,327                     | 2.5                                 | Portland (Oregon) ... ..  | 472  | 167,674                    | 35.5                                |
| Rome ... ..                            | 1,600  | 203,083                    | 12.7                                | Denver ... ..   | 410  | 164,259                    | 40.1                                |
| Venice ... ..                          | 303  | 16,680                     | 5.5                                 | St. Paul ... ..   | 358  | 132,184                    | 36.9                                |
| <b>JAPAN: (a)</b>                      |  |                            |                                     | Hartford ... ..   | 274  | 111,265                    | 40.6                                |
| Kobe ... ..                            | 664  | 22,130                     | 3.3                                 | Oklahoma City ... ..  | 272  | 97,314                     | 35.8                                |
| Kyoto ... ..                           | 1,029  | 55,669                     | 5.4                                 | Total 37 exchange areas<br>with 200,000 to 500,000<br>population ... ..     | 11,701                                       | 3,546,457                  | 30.3                                |
| Nagoya ... ..                          | 899  | 25,938                     | 2.9                                 | Total 62 exchange areas<br>with more than<br>200,000 population ... ..      | 44,707                                       | 14,642,256                 | 32.8                                |
| Osaka ... ..                           | 1,652  | 70,060                     | 4.2                                 |   |  |                            |                                     |
| Tokio ... ..                           | 4,385  | 153,547                    | 3.5                                 |   |  |                            |                                     |
| <b>MEXICO:</b>                         |  |                            |                                     |   |  |                            |                                     |
| Mexico, D.F. ... ..                    | 1,830  | 126,340                    | 6.9                                 |   |  |                            |                                     |

NOTE: There are shown, for purposes of comparison with cities in other countries, the total development of all cities in the United States in certain population groups, and the development of certain representative cities within each of such groups.  
 (a) March 31, 1948. (b) September 30, 1947. (c) June 30, 1947.

FIG. 4

THE TELECOMMUNICATIONS INDUSTRY AND THE EXPORT DRIVE (1)



**TELEPHONES  
 PER 100  
 POPULATION**  
 JANUARY 1, 1948

Vertical broken line indicates the world average.  
 \* Excluding the Russian Zone of Occupation.

FIG. 5

# The 999 Emergency Service

by S. W. Dabbs, Inland Telecommunications Department

**H**ARDLY A DAY PASSES WITHOUT SOME reference in the Press to the 999 emergency service. 999 has, in fact, become a household word. Children shout it in the streets. Radio comedians make capital out of it. And what is more to the point, that mystical figure the Man in the Street has managed to memorise it. As to what happens after 999 has been dialled, the general public can be forgiven perhaps if their knowledge is a trifle hazy, but all telecommunications staff may wish to know a little more about the subject, if only to answer sly questions put by acquaintances, or to maintain prestige in the eyes of the family. This article will, we hope, assist.

## Start of the Scheme

The service was first introduced experimentally in London in 1937 in order to enable a subscriber or call-office user, served by an automatic exchange,

to obtain a speedy reply from the operator when calling the Police, Fire Brigade or Ambulance service in an emergency. When 999 is dialled, a calling signal lights at a special operating position at the auto-manual switchboard; a large coloured lamp fitted on the top of the position also lights up, and a loud buzzer is sounded. By these means the operator is made aware that an emergency call is wanted and is able to answer the call before others. The large red lamp warns the supervisor in charge of that part of the exchange to hold herself in readiness in case her assistance is needed. All the caller needs to ask for is "Police", "Fire", "Ambulance", etc. -he need not trouble about finding the proper telephone number. The operator has full information as to the telephone numbers of the emergency services and in many towns has direct lines to those services, thus permitting connection with the least possible delay. A caller can dial 999 in any street kiosk without

Telephone Exchange Switchboard positions. Note the lamp which shows a red light when an emergency call is wanted



Police Telephone Switchboard at St. Albans

inserting coins in the box, the dial mechanism having been modified for this purpose.

## Extension

The 999 scheme proved a complete success in London and in 1938 it was extended to Glasgow. Further progress was prevented by the war, but in 1946 the service was operating in Belfast, Birmingham, Bristol, Edinburgh, Liverpool, Manchester and Newcastle, and by March, 1948, all the larger towns in the country served by automatic exchanges had 999 service. At the present time, the service is available at more than 600 large exchanges, and will be made available as soon as the labour can be spared at approximately 1,300 smaller exchanges, the total covering 91.3 per cent. of all subscribers on automatic exchanges. The question of extending the service to the remaining towns and villages where there are auto-

matic exchanges is being considered, but major technical difficulties are involved in these cases. And whereas 999 service can be made available in the large towns at relatively little cost, its provision in small towns and villages may be a very expensive item, out of all proportion to the use made of it.

## Where 999 is not Available

Public knowledge of the 999 service, however, is now so widespread that there is a risk of callers dialling that code at places where the service is not and cannot be made available. To guard against the delay and confusion which might arise in such cases if 999 were dialled in error—this would normally produce no signal at all at the operators' switchboard—arrangements are being made, wherever practicable, to connect the "9 outlet" to the "O outlet". Thus, if 999 is dialled

it has the same effect as dialling "O" and gives a signal to the operator, although she has no indication that the call is urgent. In such cases a caller dialling 999 cannot be distinguished by the operator from any other caller dialling "O", but at any rate he will receive an answer from the operator, whereas without the special arrangement referred to he might go on dialling 999 without anybody being able to know that he was calling. The modified form of 999 service just described will cover 8.5 per cent. of all subscribers connected to automatic exchanges.

There will remain a number of small exchanges, covering 0.2 per cent. of all automatic subscribers, at which the dialling of 999 cannot be made to give any access to an operator. At these exchanges, arrangements are being made for a caller dialling 999 to receive the "number unobtainable" tone indicating that his call cannot be answered; he should then dial "O", in accordance with the instructions printed on the dial centre label. Callers have, on occasion, asked for 999 at a manual exchange and where this is a working subscriber's number there is a risk that the calls may be connected to it. It seems that difficulty from this cause can be avoided only by ensuring that the number 999 is not allocated to subscribers.

#### Reception by the Public

From its inception the 999 service has been given a great deal of publicity. It has not merely been accepted by the public and the Press; it has been received with enthusiasm. There has been very little criticism, and evidently the service meets a real public need. The Police, Fire, Ambulance, Colliery Rescue and Coastguard Services have all co-operated in making it a success and the Home Office has given the scheme its wholehearted support.

#### Staff Response

No scheme of this sort could be successful without full co-operation from the exchange staffs and there is no doubt that this has been given in full measure. Telephonists and supervisors have a deservedly high reputation for helping callers in distress. Those of us who have had occasion to dial 999 have been astonished at the speed with which the transaction is carried through.

#### Traffic Volume

To give some idea of the use made by the public of this service, in the London area alone (comprising

roughly a 12½ mile circle from Oxford Circus) about 3,000 calls to 999 are handled every week. In provincial towns, considerable use is also made of the facility, typical figures being:

|            |       |    |       |     |      |
|------------|-------|----|-------|-----|------|
| Liverpool  | .. .. | 90 | calls | per | week |
| Portsmouth | .. .. | 75 | "     | "   | "    |
| Edinburgh  | .. .. | 70 | "     | "   | "    |
| Cambridge  | .. .. | 25 | "     | "   | "    |

Although the figures may not seem very much, it is interesting to note that the incidence of 999 calls averages out at about one per subscriber's line every four or five years.

There is little doubt that the 999 service has been an important factor in combating the post-war tendency for crime to increase.

#### Popular Misconception

Most of the 999 calls are for the Police and recent publicity given to Police methods of preventing crime has constantly stressed the use of the 999 service, with the result that many people are under the impression that dialling 999 gives direct connection to Police headquarters. The wording of newspaper articles frequently lends support to this impression. But this is not so; dialling 999 gives access to the exchange operator and ensures an immediate answer on her part; she ascertains which emergency service is required and then connects the caller. An interesting example of this public misconception of the 999 service is a suggestion, which recently appeared in the Press, that there should be a special emergency code 333 to be dialled by anyone reporting suspected pilfering from the railways in London. One of the principal objects of 999 is to avoid the necessity for the public having to remember different telephone numbers for different emergency services. Moreover, the code 333 could not be dialled from a call office without first inserting 2d. in the box, whereas 999 can. For these reasons adoption of the 333 suggestion—or any others on similar lines—could not be entertained.

In view of the vital importance of ensuring that the public is fully aware of the fact that 999 is the code to be dialled for any emergency service, publicity is being directed to this end, with the co-operation of the Home Office and the Police and Fire authorities. The need for this has received added importance recently in London, where the Fire authorities are considering proposals to withdraw all street fire alarm posts and to rely solely on the 999 service; apparently the London street fire alarm post, with its invitation to "break the glass

and pull the lever", gives an irresistible attraction to people to make false calls!

#### Distribution of Calls

Experience in London so far shows that about 60 per cent. of all emergency calls are for the Police, 30 per cent. for the Ambulance service, and the remainder for Fire. In the provinces, the percentage of Police calls is somewhat higher than in London, while that for the Ambulance service is rather lower.

#### Misuse

As might be expected from the amount of publicity received, the 999 facility is sometimes used for calls which are not essentially urgent, such as tracing lost dogs, but recent records taken in London show that some 80 per cent. of the calls are genuinely for emergency services. There are very few malicious or bogus calls. The scheme was not intended to include calls for doctors, though the exchange staff do their best to assist should such calls be received.

999, like any other telephone number, receives wrong numbers at times. Callers unaccustomed to using kiosks, who dial a number containing 9's without first putting twopence in the box may be startled to find themselves connected to the emergency service operator, and there are other types of misoperation which can produce the same result.

#### Choice of Code

Suggestions have been made from time to time that some number other than 999, say III, should be used for the emergency service. This matter was exhaustively considered before 999 was adopted, and although "O" was regarded as perhaps the easiest number on the dial to find in the dark or in smoke, it had already been allocated for calling the operator for every day purposes and its use for emergency calls accordingly had to be ruled out. Next to 9, 1 is perhaps the easiest number to find, but unfortunately many fleeting faults associated with telephone lines (such as would be caused by overhead wires blown together by the wind) have the same effect as dialling 1, and many false emergency calls would be received if III had been adopted as the emergency code. This, for all practical purposes, eliminated III, but there was the further over-riding factor that it was essential to ensure that kiosk users could dial the emergency code without inserting any coins. The necessary modification to kiosk dials



Fireman receiving an emergency call at his station.

(already made in respect of "O") could readily be extended to the digit 9 but not to any other digit. All the reasons set out above led to the inevitable conclusion that 999 was the best code for emergency services and it was accordingly adopted.

#### Dialling in the Dark

Suggestions have also been made that the figure 9 should be made luminous so that it can be easily recognised in the dark. The Post Office has for some time had this possibility in mind, but so far no luminous paint is available which will remain luminous for a considerable time and also stand up to extremely hard wear from scratching resulting from repeated use of the dial. As the cost of replacing the luminous paint would largely consist of that of the manpower incurred, it is of the greatest importance that the paint should be durable both in itself and in its luminosity. Recently, however, samples of luminous vitreous enamel have been examined, and these appear to offer a solution to most of the former difficulties. Whether treatment of dials with this preparation would be satisfactory from all angles could, however, only be established by a field trial.



## BOOK REVIEWS

### THE LIFE AND WORKS OF A. K. ERLANG

ERLANG'S NAME IS PROVERBIAL TO THOSE who have had occasion to study telephone traffic problems. Indeed, the C.C.I.F. (le comité consultatif international des communications téléphoniques à grande distance) at its plenary meeting at Montreux in 1946 decided that the International Unit of Telephone Traffic should be known as the 'Erlang'. He first became known in this country by an article he specially contributed to the *Post Office Electrical Engineers' Journal* in 1917, in which he amended some conclusions that Mr. W. H. Grinstead had published two years before on the application of probability theories to automatic exchange traffic. Erlang's own conclusions were accepted by the Post Office and applied to exchange design.

As a memorial to Agner Krarup Erlang, and to make more of his important mathematical work widely known, the Copenhagen Telephone Company has published an elegant translation of a volume by three members of the Company which first appeared as a transaction of the Danish Academy of Technical Sciences. A copy of this book has recently been presented to the Post Office Library. It includes a brief sketch of his life, illustrated with photographs of the growing lad and the bearded young man of thirty, which tells us that he, the son of a village schoolmaster, was born at Lenborg, Jutland, 1878. He lived in very modest circumstances with a brother two years older and two sisters. We are told how, having to share a book with his brother, he would sit opposite him at the table and read it upside down.

He had spent two years as an assistant master at his father's school when a relation's generosity made it possible for him to attend Copenhagen

University. Later, when a teacher, he came in contact with Dr. Jensen, Chief Engineer, Copenhagen Telephone Company, at meetings by the Mathematicians' Association. When the Company set up a research establishment in 1908, they put Erlang at its head.

The next year he published his first paper on probabilities and telephone traffic.

Dr. Thornton C. Fry of the Bell Telephone Laboratories, U.S.A., regarded Erlang's studies as of such importance that he taught himself Danish in order to read them. The book we are reviewing makes it no longer necessary for anyone to follow Dr. Fry's example, comprising as it does a detailed study of his statistical works and a survey of what he has done on mathematics and electrotechnics. Eleven of his most important works on telephone traffic are reproduced in their entirety.

As for Erlang himself, his erudite researches did not make him a man apart from his fellows. We learn that his interests were wide; that he was an assiduous user of libraries; that he assisted many who had fallen on bad times. After 20 years' service without a day's sickness he died, after a short illness, at the early age of 51. His end was tragically untimely.

E. C. BAKER

TRAFFIC AND TRUNKING PRINCIPLES IN AUTOMATIC TELEPHONY. G. S. Berkeley, M.I.E.E. (Ernest Benn Ltd., 21 -)

IF CIRCUIT DESIGN IS THE ARITHMETIC OF telephony, and lines transmission is its algebra, then traffic theory and practice form a kind of geometry of the subject. This is an aspect of telephony which has received much less than its due share of attention in the literature of the art, and Mr. Berkeley's book has stood for 15 years as

(continued on page 94)

## Financially

## Speaking

£1 of income for the year produced the following figures:—

|  | General<br>s. d. | Postal<br>s. d. | Telegraph<br>s. d. | Telephone<br>s. d. |
|--|------------------|-----------------|--------------------|--------------------|
| Administrative and Operating Staff Costs (including Pensions) .. | 9 10             | 12 11           | 18 8               | 5 3                |
| Conveyance of Mails (including Post Office (London) Railway) ..  | 1 5              | 2 9             |                    |                    |
| Maintenance of Plant ..  | 1 11             |                 | 2 3                | 4 2                |
| Accommodation Costs ..   | 11               | 9               | 1 11               | 1 1                |
| Depreciation Provision ..  | 1 9              |                 | 8                  | 3 11               |
| Miscellaneous Expenses ..  | 1 1              | 1 2             | 3 3                | 10                 |
| Interest on Capital ..   | 11               |                 | 6                  | 2 1                |
| Total Expenditure ..   | 17 10            | 17 7            | 27 3               | 17 4               |
| Surplus or Deficit ..  | 2 2              | 2 5             | 7 3                | 2 8                |
| Total Income ..  | 20 0             | 20 0            | 20 0               | 20 0               |

Capital expenditure on the development of Telegraph and Telephone Services respectively was £150,851, and £20,379,578 out of a total for the Post Office of £21,638,841.

The Report on Post Office services shews that there was a drop of 10 per cent. in the number of telegrams sent compared with the year 1946-47, the total being 46,405,000. Social traffic which during the war rose from one-third to two-thirds, has since declined considerably, and business traffic has not yet regained its pre-war level. Inland press telegrams now represent less than one per cent. of the total inland traffic. Acceleration in service and savings in operating cost were achieved by manual through-switching. Difficulties in the delivery service continued owing to the serious shortage of messengers. Overseas telegrams numbered the same as in 1946-47, substantially higher than pre-war. Telex service overseas with five European countries was introduced.

On the telephone side, the total number of telephones connected to the public system rose to 4,605,898, a net increase of 330,000 on the year 1946-47. Outstanding applications increased during the year by 58,000 to 444,612. Shared service installations rose spectacularly by 48,000 to 62,978. Some 1,400 kiosks were brought into use, of which about 800 replaced call offices inside Post Offices. Local call traffic increased by 7 per cent. Trunk traffic increased by 6 per cent., rising to nearly 100 per cent. over pre-war. The higher trunk traffic necessitated the provision of a considerable number of additional trunk circuits. In March, 1939, there were 6,770 trunk circuits of over 25 miles' length; in March, 1947, 13,333 and by March, 1948, 14,528.

THE COMMERCIAL ACCOUNTS FOR THE POST Office for the year 1947-48 have recently been published by the Stationery Office at 9d. a copy. The Accounts give an admirable conspectus of the activities of the Post Office as a whole, and will well repay study.

A brief resumé of the Telecommunications Accounts is given below. Seen against the total Post Office picture, these services are revealed as nearly measuring up in terms of income and operating expenditure, to the Postal Services. The working of the Post Office resulted in a surplus—after charging interest on Capital—of £19,555,089 made out as follows:—

|                             | General<br>Account<br>£ | Postal<br>Account<br>£ | Telegraph<br>Account<br>£ | Telephone<br>Account<br>£ |
|-----------------------------|-------------------------|------------------------|---------------------------|---------------------------|
| Income ..                   | 182,284,540             | 96,360,922             | 6,853,955                 | 79,655,671                |
| Operating Expenditure ..    | 154,050,937             | 84,854,649             | 9,176,456                 | 60,605,840                |
| Operating Profit or Loss .. | 28,233,603              | 11,506,273             | 2,322,501                 | 19,049,831                |
| Surplus or Deficit*         | 19,555,089              | 11,506,273             | 2,496,113                 | 10,544,929                |

\*After charging interest on the capital liability in respect of plant and stores.

Post Office Income from all sources, including credits taken for services rendered without payment to other Government Departments, exceeded £182,000,000. An analysis of the disposal of each

The international services continued post-war expansion with the introduction of new services and the re-introduction of services interrupted by the war. Services were provided for other countries via London by means of radiotelephone links and by circuits in the Continental cables.

The extension of reduced rates for Sunday calls between North and Central American countries and the United Kingdom was the only important change of tariff during the year. For many overseas services, the normal rates are substantially below the pre-war level.

The short-range radiotelephone service with coastal ships was extended to additional radio stations and a small expansion of traffic on this service was noticeable. The service was further extended to provide a link with deep-sea ships so long as they are within the normal range—i.e. 150 miles, calls being restricted to conversation on ships' business matters.

Private wire services, which expanded rapidly during the war years, owing to the demands of the Service Departments, showed a decline in rental value in 1947-48 compared with 1946-47, although the total number of circuits actually increased. This was due to the fact that some long distance Government circuits had been relinquished while there was an increase in the number of short distance commercial circuits.

It is interesting to note that out of the total income of £79,655,971, £28½ millions came from rental of exchange lines by subscribers and Government Departments; trunk calls accounted for some £31 millions, local calls for £15½ millions. Included in these latter figures was the value of calls from call offices; nearly £2 million for trunk calls and nearly £3 million for local calls. The operating profit was £19,049,831, which after allowance for interest on capital (telephone plant) of £8½ million produced a surplus of something over £10½ million.

### THE HUMAN TOUCH

the reputation of the exchange, and the standard of the service given to the public will rise accordingly. Nothing helps more towards creating an atmosphere of the right kind than a tidy exchange where everything is in its correct place. Tidiness is an attitude of mind which should be cultivated by all supervisors. A pleasant and tidy exchange and a cheerful and sympathetic supervising staff will tend to create that attitude to the public which will command respect and enhance the reputation of the telephone service.

What has been said about the operators and their supervisors applies equally well to all staff engaged on telephone work. The traffic officer can help the exchange supervisor in the same way that the supervisor helps her staff. The attitude of all

supervising officers to their juniors should be sympathetic and inspiring there should be no cramping criticism and the impression should be given that senior officers sympathise and understand the difficulties with which the juniors are faced. This is true of the traffic office staff and indeed of the staff in all sections of the work. The best results will always be obtained when each member of the staff, from the highest to the lowest, feels that he or she is a member of a team, and success can only be obtained if each member pulls his or her full weight.

If the right atmosphere is maintained in the office and the exchange, then the telephone-using public will at once sense the helpful atmosphere which prevails.

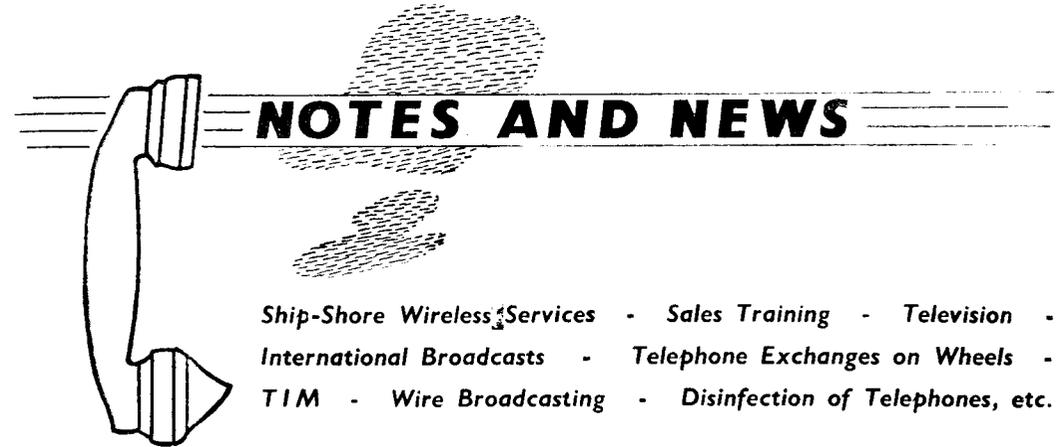
(continued from page 67)

### BOOK REVIEWS

almost the sole representative in this field. The second revised edition, just published, contains practically all the previous material which has given the book its well-deserved popularity, while in order to provide ampler and more up-to-date information on certain items, 80 pages and 20 diagrams have been added. The additional text

includes a section on probabilities, an outline of the trunking features of multi-metering, information on the routing of trunk traffic and the basis of provision of junction and trunk circuits, and several other new features of value to traffic and engineering students of automatic telephony.

H. A. LONGLEY



**Ship-Shore Wireless Services.** During 1948, more than 334,000 ships communicated with Post Office Coast Stations. 741,500 radiotelegrams totalling over 11,700,000 words were exchanged between vessels and coast stations. 10,590 radiotelephone calls were handled and 674 messages were received from aircraft. On the "Safety Service" side of Coast Station activities, 281 distress calls were dealt with and 252 medical messages from ships at sea were handled. Post Office Coast Stations maintain a continuous watch for distress calls from ships at sea and when such a call is received the station immediately ceases all commercial transmitting and directs its attention to establishing communication with the ship concerned.

★ ★ ★

**Over 200 New Suggestions.**—The Post Office, which began making awards, as far back as 1906, to members of its staff for suggestions for improving the services, announced on March 8, 1949, that awards amounting to £451 were made for 205 suggestions during the quarter ended December 31, last. 76 awards ranged from £1 to £25 for adopted suggestions; two interim awards of £3 were made; and 127 encouragement awards ranged from £1 to £5.

The highest award of £25 for the quarter goes to a married woman in Manchester: she is a clerical officer who suggested an improvement in certain telephone account forms. The second highest

award of £20 goes to a skilled workman (now an assistant engineer) in connection with a suggestion for cable joints. Another skilled workman (now a probationary engineer) receives the third highest award of £15. He designed an attachment to screw drivers to facilitate the insertion of screws in awkward situations.

Since the suggestion scheme was begun, nearly 43 years ago, 125,000 suggestions have been received and £41,000 has been paid in awards. Thousands of suggestions have been put into operation and have contributed to the improvement of the many services of the Post Office. Suggestions are welcomed from every grade of the staff—from junior postmen to the highest ranks in the service.

★ ★ ★

**Telephones.**—Statistics for the financial year 1947/48 show that at the end of March, 1948, there were 5,809 telephone exchanges throughout the country, 52,100 public call offices and 4,652,700 telephones. For comparison, at the end of March, 1939, there were 5,693 exchanges, 49,500 public call offices, and 3,235,500 telephones.

★ ★ ★

**and Telegrams.**—During the year ended March 31, 1948, a total of 47,439,000 inland telegrams were sent. This is nearly 3,000,000 less than the highest pre-war total in 1938/39. On the other hand, the number of overseas and ships

telegrams dealt with in 1947/48 amounted to 10,844,000 as compared with 8,915,000 in 1938/39. In this country, as in others, the inland telegraph service meets competition from the telephone, but it is clear that the facilities provided by the telegraph service are to a very large extent fulfilling a separate public need.

\* \* \*

**Sales Training.** Initial training has now been given to all new entrants to the Sales Representative grade from Part I of the 1948 competition. This part of the training programme, was designed to prepare the students for an introductory period of on-the-spot work in the Areas.

Many have returned to the Centre for the third stage of more detailed training with their enthusiasm undimmed either by their front-line experience or by their first attempts to put over interview technique in class.

The course is in five stages, three of school instruction of eleven weeks in all, and two in the Areas. Each stage is designed to prepare the student for the next and to fill in the detail of the previous one. Test papers are set.

Since the Sales Training Centre was set up in 1946, 383 Sales Representatives have received refresher training, and classes catering for 297 students have been held in Development Studies. 74 Senior Sales Superintendents (including 10 regional officers) and 113 Sales Superintendents have attended courses.

\* \* \*

**Cable and Wireless.** Arbitration proceedings took place during the months of January and February in order to settle the price to be paid by the Government for taking over the share capital of Cable and Wireless Limited. The resultant award was 35½ million pounds. The Commonwealth Telegraphs Bill which paves the way for the integration in this country of the staff and services of Cable and Wireless Limited with those of the Post Office, was given a second reading in the House of Commons on March 22 without opposition. It was referred to a Select Committee with the proviso that if no petitions against the Bill were laid by March 28, it would be considered by a committee of the whole House. No petitions were received and the Bill was taken in Committee of the whole House on April 29. Good progress has been made with the arrange-

ments for the assimilation of Cable and Wireless staff in the United Kingdom into the Post Office organisation, for which the "Appointed Day" in the Bill is April 1, 1950. The work is being co-ordinated by a main committee under the chairmanship of the Director of Overseas Telecommunications. Sub-groups have been set up to investigate problems of staff integration and their reports to the main committee are expected to be issued by the end of May. Officials of the Company are, of course, members of both the main committee and the sub-groups. Detailed points of assimilation are being pursued through normal administrative machinery and much preparatory work has been done.

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#### **New Commonwealth Radiotelephone Link.**

An important part of the work of the Overseas Telecommunications Department is to provide public radiotelephone services between the United Kingdom and the countries of the Commonwealth. Many of these links were of course in operation in 1939, but since 1945, not only have these pre-war links been restored, but many new services have been made available. The latest development is the opening of service between this country and British West Africa. In co-operation with Cable & Wireless Limited, who operate the radio stations at the distant end, service with Nigeria, the Gold Coast and Sierra Leone was opened on March 1, 1949, the first call being made by His Excellency the Governor of the Gold Coast who spoke from Accra to London. The services with Nigeria and Sierra Leone are each operated by a second radio link worked in conjunction with the London-Accra circuit, and a further extension to Bathurst, Gambia, operated in a similar manner, became available on April 11, 1949.

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**Television and the Film Industry.**—After an adjournment since December, discussion between representatives of the Renters', Exhibitors' and Producers' Committee of film industry and the B.B.C., under Post Office chairmanship, was resumed on March 17, 1949. It was found that difficulties on the side of the industry had arisen in regard to putting into effect the agreement in principle previously reached for co-operative experimental arrangements for the showing of selected B.B.C. television items in cinemas, and

for television showing by the B.B.C. of selected films. The discussions will be resumed after further consultation within the industry.

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#### **Withdrawal of Amateur Frequency Band.**

The Postmaster General announced on March 2, 1949, that holders of amateur wireless station licences will not be permitted to use frequencies within the band 58.5 to 60 megacycles after March 31, 1949. Licences have been formally amended by a notice published in the London Gazette on April 1, 1949.

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**Overseas Telegraphs.**—The latest figures for the overseas telegraph services operated by the Post Office show a substantial increase in the traffic handled (an increase of 8.3 per cent for the calendar year 1948 in comparison with the calendar year 1947). On quality of service the statistics are not yet complete, but as far as they go they record a distinct improvement. Telex traffic with the Continent (inward and outward) remains about the same at about 200 calls or 1,200 paid minutes daily; but a considerable increase in traffic is expected shortly when two additional switchboard positions will be ready for service. These additional positions will make it possible to connect all the present applicants in London.

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**Curiosity.** A little girl named Shirley, aged 11, of her own initiative, wrote the following to the Postmaster General:

"I would like to know how the telephone works, especially when you dial it. In one little circle there are three letters and one number. For instance, in A.B.C. and number 2, when you dial it, how does the machine know which letter is needed from the three, and when it comes to the figures, how does it know that it is the figures needed, and not the letters. Could you please explain it for me."

As a result of that letter a high official of the London Telecommunications Region wrote to Shirley explaining in simple language how the machine works. At the end of the letter, the official concluded with these words, "Well Shirley, I think you are very observant to ask such an interesting question—many grown-ups never think of it—and I hope you will go on examining things

and finding how they work, because it is in that way improvements are thought of." Then there was a P.S. to the letter, "We will take you round a telephone exchange if you like."

The little girl was very quick to answer. After expressing thanks she said she would like to visit the Eltham Telephone Exchange so that she could watch the dialling system operating, and this has been arranged—with tea.

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**International Broadcasts.**—Broadcasting organisations are using the Overseas Telephone Services to an increasing extent for the exchange of broadcast programmes. During 1948 approximately 4,650 broadcast transmissions were relayed over the Continental landline and International radiotelephone circuits, compared with about 950 in 1938. The figures for 1948 were considerably increased by the fact that some 1,000 broadcasts (some of three or four hours' duration) were handled during the period of the Olympic Games; but the present monthly average is about 300. Most of these transmissions are simple relays such as the B.B.C.'s "American Commentary" from the U.S.A., an opera from "La Scala", Milan, or light music from, say, Hilversum; but on special occasions more involved arrangements have to be made. For example, on New Year's Eve arrangements were made at the request of the B.B.C. for a programme which only lasted for 60 minutes, but it involved the transmission of items from seventeen different European countries, including places as far apart as Helsinki, Budapest and Reykjavik.

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**Call Valuation Review.**—The Board of Trade Special Research Unit, working in collaboration with the Cabinet Productivity (Official) Committee, is undertaking an examination of Time Study Practice, particularly as regards "effort rating". In industry, the Time Study officer is normally required, not only to measure the time taken by a worker to carry out specified operations, but also to assess, relative to some arbitrary standard, the "effort rating" or "efficiency" at which the job is being performed. Published data on the reliability with which this rating can be estimated, suggest that the accuracy compares unfavourably with that of other aspects of Time Study measurements.

The Post Office has considerable experience in these fields and this has been passed on to the Board of Trade. At the outset of the present telephone call valuation review an effort was made to define an arbitrary co-efficient of "speed, accuracy and experience" and so to correlate each series of timed observations against the estimated "efficiency" of the operator to whom they referred. It quickly became apparent, however, that the observation personnel would need careful training and some months of experience in this work before accuracy and consistency could be expected, and it was concluded with some reluctance that much more detailed study would be necessary before individual effort rating could be made an integral part of Post Office practice. The problem as applied to the staffing of telephone exchange switchboards is rather more complicated than that normally met with in industry, because some margin of waiting time must be provided for if satisfactory time-to-answer calling signals are to be maintained. The solution has been to spread the observations over a large number of operators, each of whom has reached a minimum efficiency, and to specify that the call values so derived refer to a "trained operator of average experience."

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**Telephone Exchanges on Wheels.**—Small automatic exchanges on wheels were introduced experimentally many years ago and have been of very great use, particularly in the expeditious restoration of service in cases of damage to existing exchanges.

By the end of the war the Post Office had a fleet of twelve of these units, each carried in a specially constructed van and capable of providing service for approximately 100 subscribers. The success of these units was such that it was decided to increase their number, and the availability of ex-service vehicles of a type which could be adapted was a great help, though special strengthening and lining with insulating material to reduce temperature variations were of course necessary. A larger mobile exchange capable of providing service for 200 subscribers has now been designed and one of these was brought into use recently. Several more are under construction, and it is of interest to note that for this type, two separate vehicles capable of being joined together to form one unit are used.

Installation of one of these units is a purely tem-

porary expedient to meet emergency requirements where replacement of the switching equipment only is necessary.

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**Broadcasting Receiving Licences.** 11,753,150 broadcast receiving licences were current in Great Britain and Northern Ireland at the end of March, 1949. This total includes 126,500 television licences— an increase of 6,400 on then February, 1949, figures.

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#### Post Office Telecommunications Statistics Booklet.

—This recently issued booklet is the post-war successor to the Post Office Telephone Statistics Booklet (colloquially known as the "Orange Book"), which was last issued as long ago as 1935, although a subsequent draft was produced but abandoned in 1939.

The new and enlarged edition, as its name implies, covers the telegraph as well as the telephone service. National totals of the basic telephone units—stations, exchange lines and installations—existing at the end of each financial year (March 31) are given from the earliest dates at which comprehensive records are available. Records of telephone stations date from 1912, when the National Telephone Company exchanges were transferred to the Post Office; telegraph data are given from 1938 onwards.

In addition to showing the annual growth in equipment, traffic, revenue, etc., the booklet records, in schedule form, the principal changes in Inland Telephone and Telegraph tariffs since 1919, and includes a historical survey of the development of both services since 1837.

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#### Direct Telephone Service between Jersey (Channel Islands) and France.

—The direct telephone service between Jersey and France, which was suspended soon after the outbreak of war, was re-opened on April 25, 1949. The service is provided by means of the direct cable between Fliquet Bay and Pirov which was cut on the occupation of the Channel Islands by German military forces in 1940 and which has now been repaired. The direct route is supplementary to the existing route via London, which will continue to be used for all calls to countries other than France, and when necessary as an alternative route for calls between

the Channel Islands and France.

The new route is intended primarily to provide a quick service to places in the vicinity of the French coast which have a community of interest with Jersey. Calls are controlled on the French side by the Rennes Exchange, and call charges are the same as in the existing Anglo-French telephone service.

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**TIM.**—At present the Speaking Clock time announcements are transmitted over the main distribution rings from master clock installations at London and Liverpool.

The Liverpool clock has been renewed after damage by fire in 1944. Amplifiers and relay sets are to be provided to give the service to Liverpool local subscribers.

Improved fusing, alarm and monitoring arrangements have been provided in conjunction with a recent overhaul of the Holborn clock. This overhaul brought the Holborn clock into line with the renewed installation at Liverpool and ensured satisfactory operation for the next three years. Within this period new clock mechanisms now being developed, which have crystal-controlled oscillator drive instead of the present pendulum control, should become available. The Australian Administration, and other Administrations in countries where an hourly correcting signal is not available, are interested in this development. When the new crystal drive clocks are eventually installed, in new and more spacious accommodations, it is expected that the "TIM" announcements at any point in the distribution network will be accurate to about  $\pm$  10 milliseconds.

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**B.B.C. in the Far East.** For many years the B.B.C. has transmitted its Overseas Services from this country. Now, for the first time, the Corporation has undertaken to broadcast from a station overseas. Under the terms of an agreement between the Postmaster General and the B.B.C., which was approved by the House of Commons on January 20, 1949 (Command Paper 7584), the B.B.C. will conduct a broadcasting service from Malaya. For the time being, the Corporation will use an existing low-power station in Singapore, but the agreement provides also for the construction and operation of a high-power short-wave station at Tebrau, in Johore Province, and for

studios at Singapore. This new station is expected to cover a much larger area and to make B.B.C. overseas programmes available to many more listeners in Far Eastern countries than is now possible either by direct broadcasting from this country or by means of the low-power station at Singapore.

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**Telephones for Farmers.**—During 1948, nearly 12,800 farmers were provided with telephone service in the United Kingdom as a whole. Supply appears to stimulate even more fresh demand and the waiting list of farmers is still rising. In the autumn of 1947 it was 11,600; at the end of 1948 it was 12,400. Although many of those who applied last year were served within six months there is a hard core, constantly growing, of those who are held up by lack of spare equipment at the exchange or of spare wires in the underground cable serving their neighbourhood, or for whom very long individual lines must be specially constructed.

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**Shared Service.**—In reply to a recent Question in the House from Mr. Gammans, M.P. for Hornsey, the Postmaster General said "I cannot at present foresee when new and removing residential subscribers will no longer be required to accept liability to share their lines. Shared service is enabling us to provide a telephone for many people whose applications could not otherwise be met". At the beginning of the year there were nearly 115,000 shared service subscribers, 35,000 of whom were using their telephones for business purposes.

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**Wire Broadcasting.** The Postmaster General made the following statement on the future of the wireless relay industry in the House of Commons on February 24:

"The future of wire broadcasting is closely bound up with that of various technical means now available for distributing broadcast programmes. It will therefore be remitted for consideration to the forthcoming Committee of Inquiry on the B.B.C.'s Charter referred to by my Right Hon. Friend, the Lord President, on January 31. All the licences held by wireless relay operators can now be terminated at any time subject to twelve months' notice, but the holders are being informed

