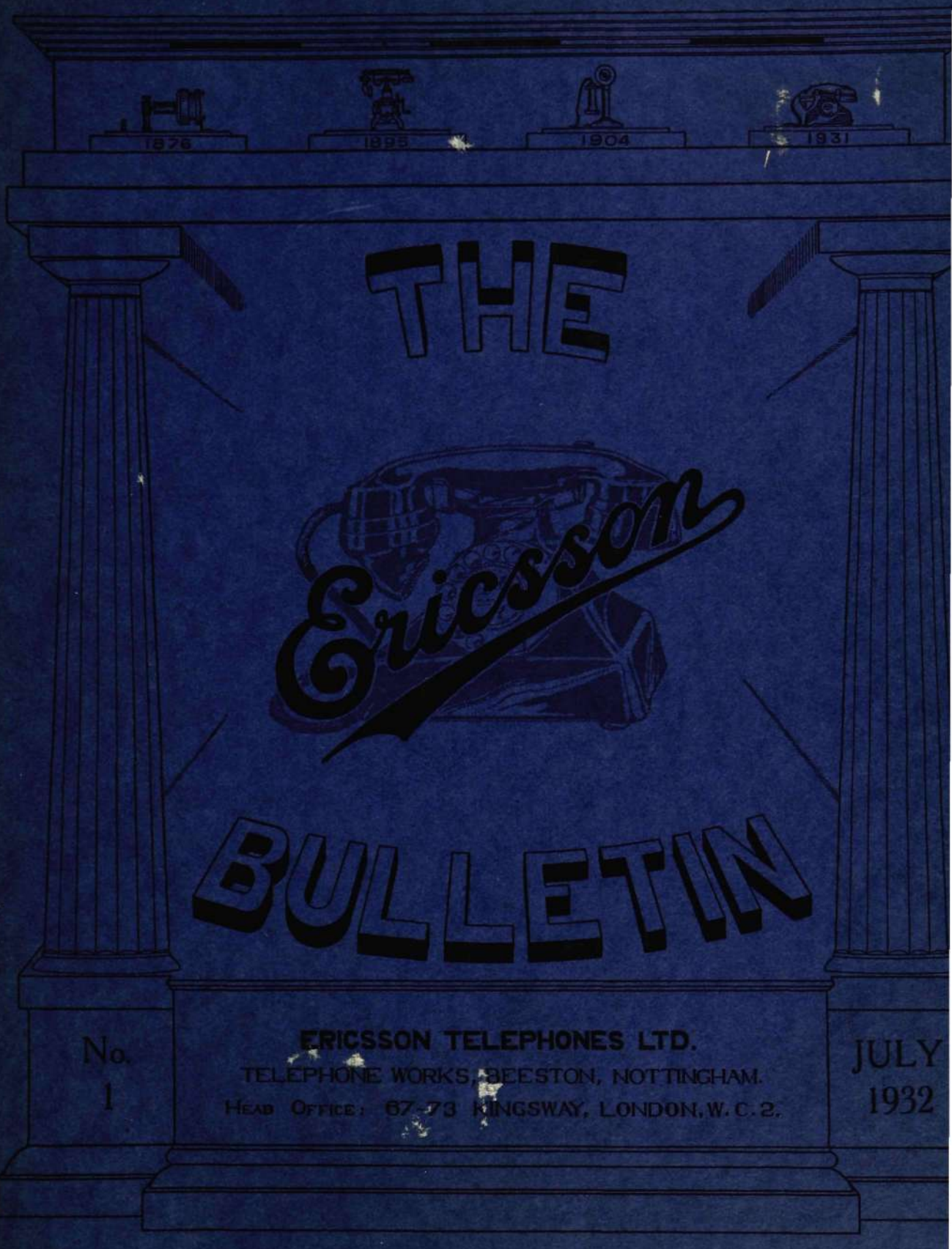



No. 1

ERICSSON TELEPHONES LTD.
TELEPHONE WORKS, BEESTON, NOTTINGHAM.
HEAD OFFICE: 67-73 KINGSWAY, LONDON, W.C.2.

JULY 1932

# LIST OF CONTENTS.

## THE ERICSSON BULLETIN No. 1 TO No. 15.

# LIST OF CONTENTS Cont'd.

## THE ERICSSON BULLETIN No. 1 TO No. 15.



O

# The Ericsson Bulletin

**No. 1** **JULY, 1932**

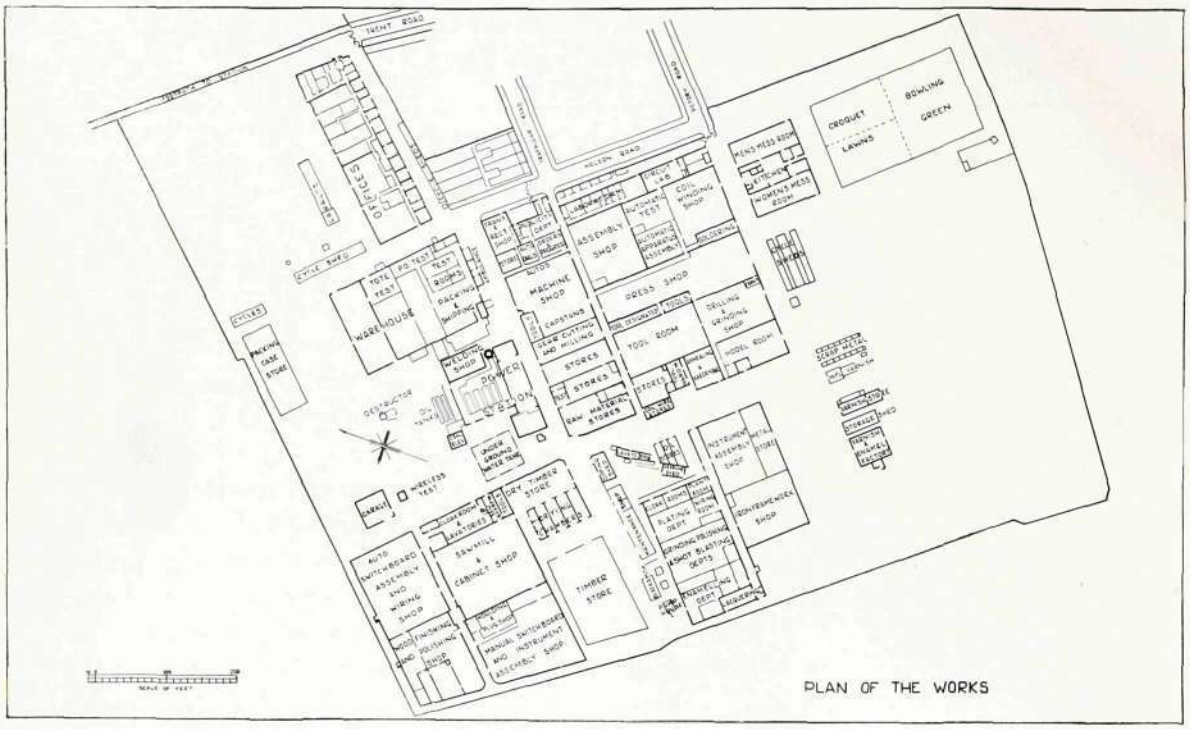
## Contents

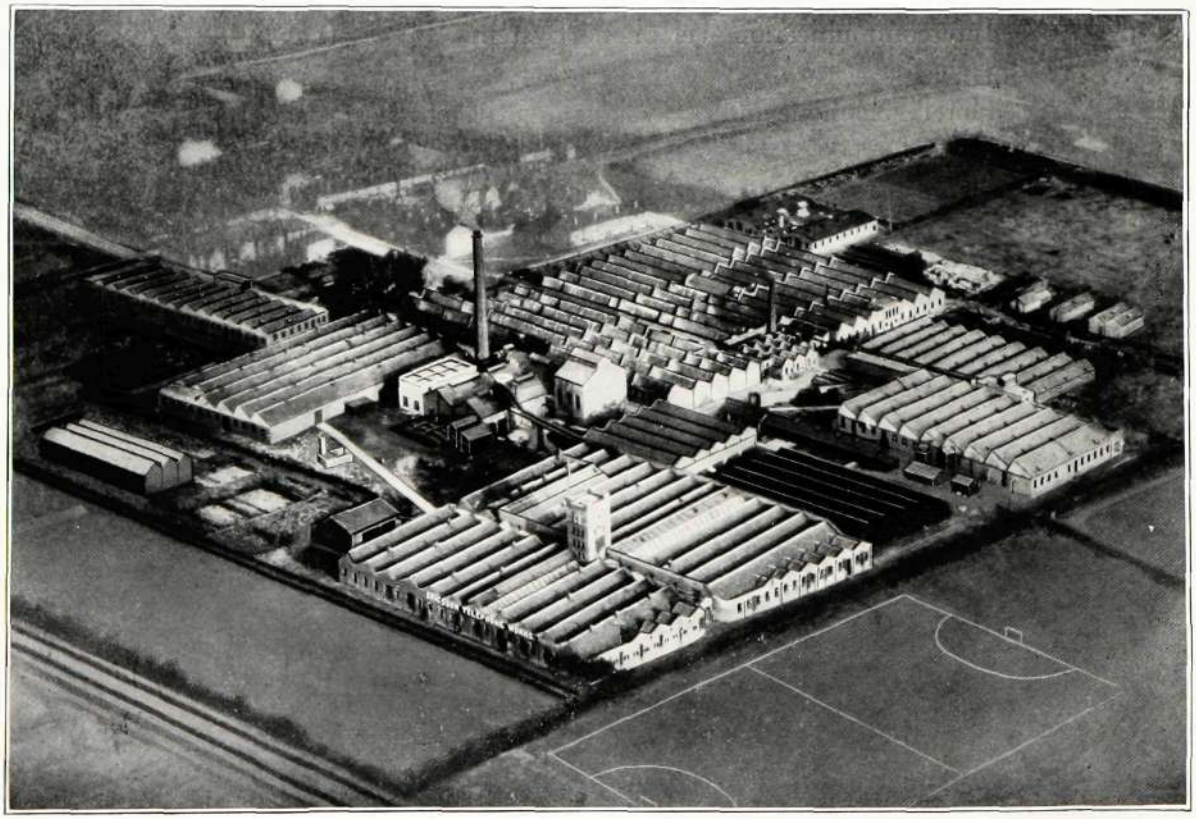


*Published by*

TELEPHONE WORKS,
BEESTON, NOTTINGHAM

Head Office: 67/73, KINGSWAY, LONDON, W.C. 2



**Aerial View of the Works, Beeston, Nottingham**

# Ericsson Telephone Works, Beeston, Nottingham

## INTRODUCTORY

FIFTY-SIX years ago Prof. Graham Bell produced an instrument for the transmission of speech, and for the first time words were spoken over wires run between two rooms in his small laboratory at Boston U.S.A. Half a century later, practically, all inhabited parts of the earth are covered with networks of telephone lines, and in conjunction with the rapid advancement made in wireless, it is now possible to telephone, not only in ones own country but also to other countries and continents, in spite of great intervening space.

The progress in telephony has, therefore, been very rapid and it is not an exaggeration to say that the fame of Ericsson products has spread throughout every country in the world where the telephone is used. The reputation of the early days has been added to year by year, and through the columns of this publication, Ericsson Telephones Limited will provide information, regarding their further activities and work, which may prove both useful and of interest to those associated with the art and its many kindred and allied branches.

## AN INVITATION

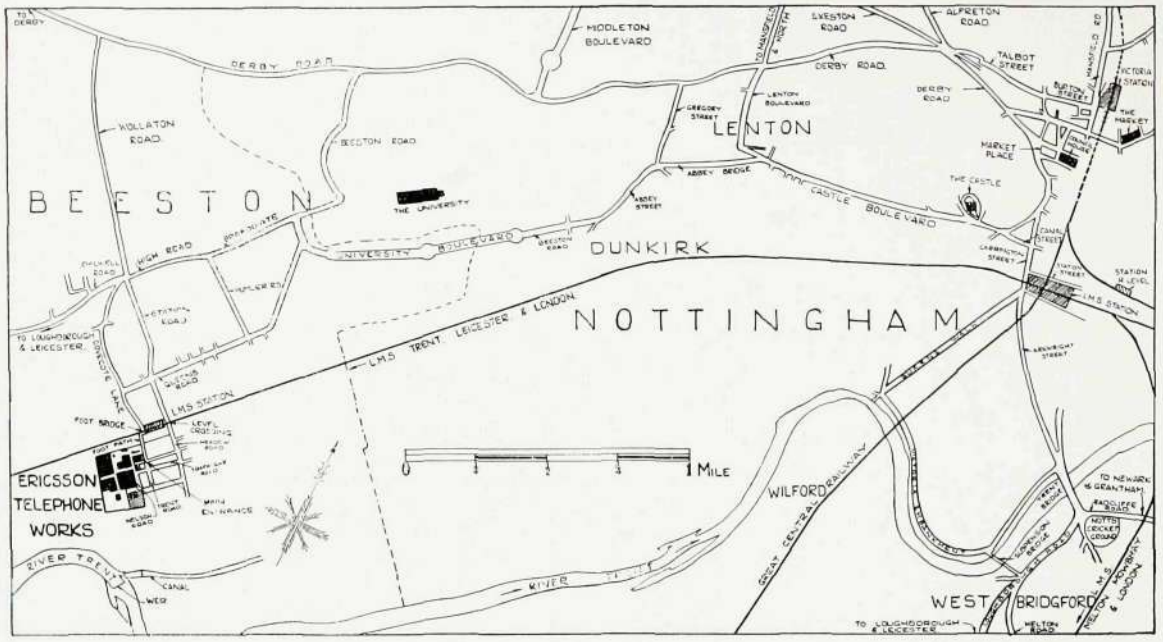
We believe that an inspection of our plant and methods will be interesting to all whose work is in any way related to telephony or remote electrical control. It is with pleasure, therefore, that with the presentation of the first number of The Ericsson Bulletin we extend to them a very cordial invitation to visit our works at Beeston, Nottingham.

Managers and engineers from overseas are especially invited and in particular those from the Dominions and Colonies. Co-operation between administrators of the affairs of operating concerns and the manufacturer provides an opportunity for an exchange of experience which will be mutually beneficial.

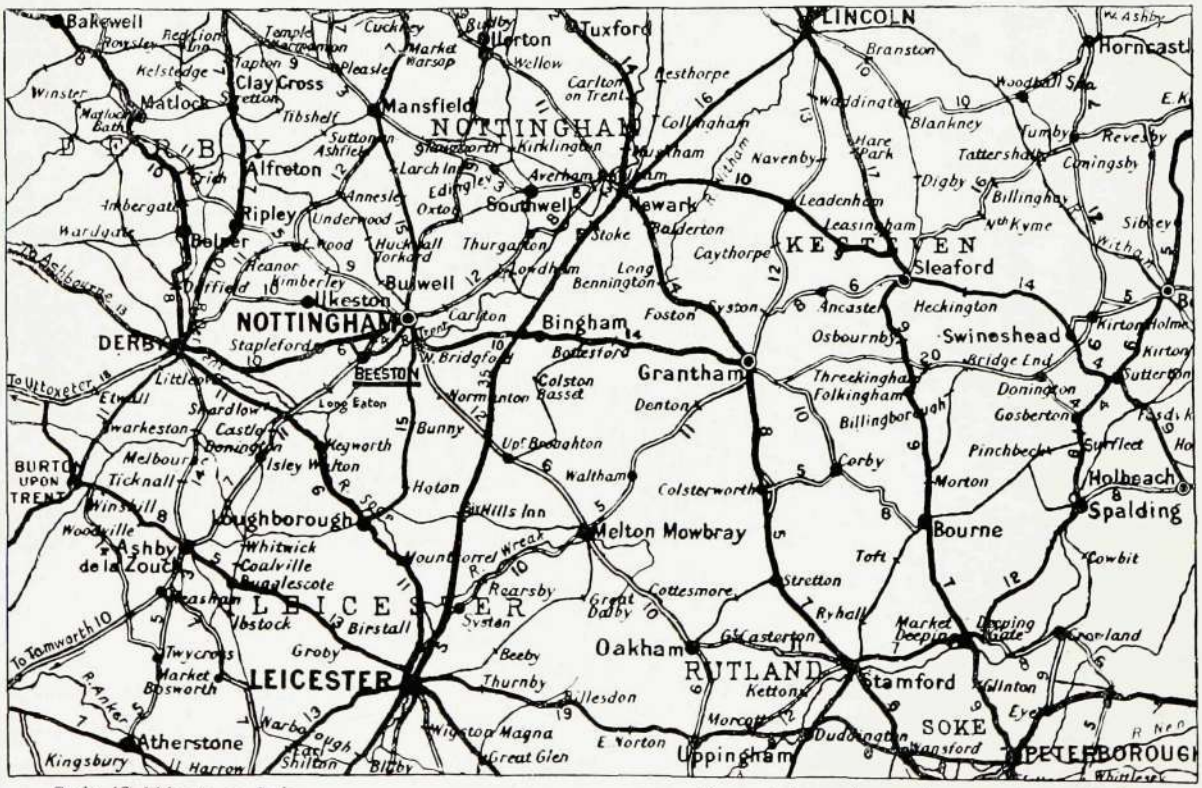
To those abroad who come to this country on leave, while we uphold the time honoured principle of avoiding that which pertains to business while on holiday, may we impress upon them our earnest desire to make their acquaintance and to welcome even a brief visit to inspect modern telephone production, testing and investigation methods.

Progress is achieved by collaboration and we are always ready to consider improvements in apparatus design or finishes.

We shall be pleased to discuss your problems and any suggestions you have to make, and assure you of a very hearty welcome.




**The way to the Works**




Scale 12 Miles to an Inch.

**The Main Roads around Beeston**

## *HISTORICAL*

Ericsson Telephones Limited was incorporated in December, 1903, as the British L.M. Ericsson Manufacturing Company Limited, the change to the present name being made in April, 1926. At the outset a factory was purchased from the National Telephone Company whose operating concessions in the United Kingdom, were subsequently taken over by the state in 1911. When acquired, the factory covered one acre out of about two acres of ground, which has been increased by the purchase of adjoining land until the site now occupies 25 acres.

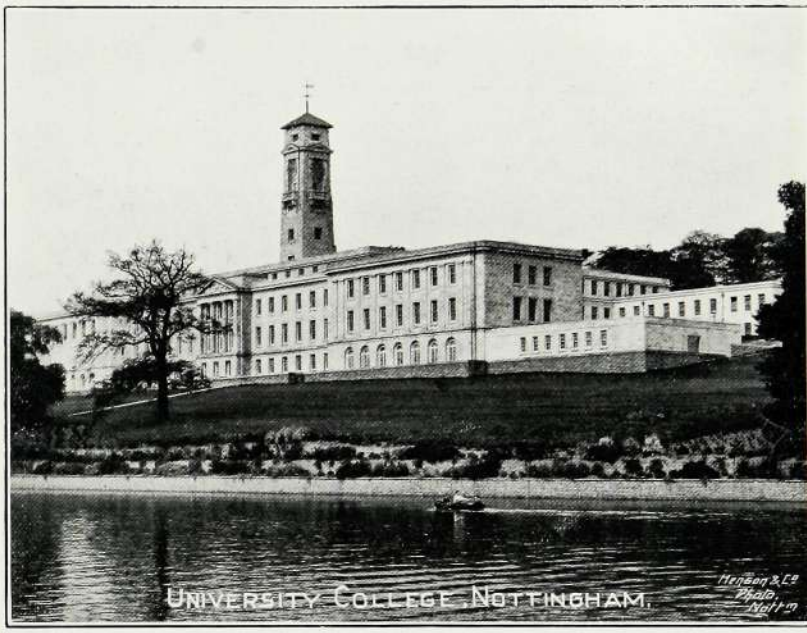
Just prior to the transfer most of the old factory was destroyed by fire, and in the rebuilding, the Ericsson Company had it modernized and greatly enlarged.

To meet constant development and rapid progress, important extensions have been made, and numerous additional buildings of varying size and purpose have been erected from time to time, with the result that 15 acres are now covered by buildings leaving 10 acres available for further extensions.

## *SITUATION*

The Ericsson Telephone Works are situated at Beeston about three and a half miles south-west of Nottingham and adjoining Beeston Station but visitors arriving at the Nottingham Stations will be met by the works car on request.

Visitors coming by car through Nottingham have alternate routes, one via University Boulevard and the other via Derby Road. The former provides an opportunity of seeing the new University with its magnificently laid-out grounds, lake and many acres of playing fields for all kinds of out-door sports.



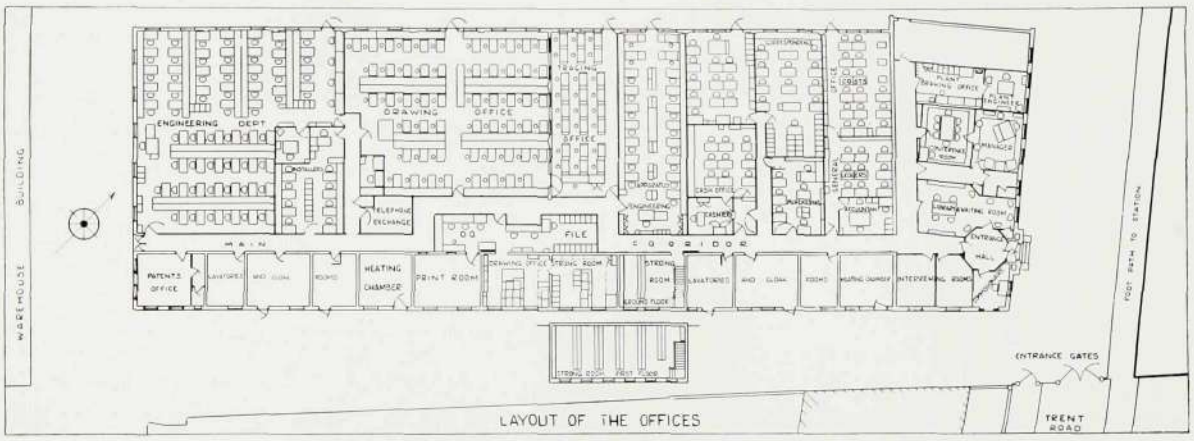

**Automatic Communication System Produced and Installed by Ericssons**

At this juncture it may be said how justly proud the Company is of having manufactured and installed the Automatic communication system for this imposing building.

From other directions visitors should drive to the centre of the town, proceed along Station Road, over the level crossing where signs indicating the work's entrance will be seen.

The site of the works is to a certain extent secluded, and many motoring in the vicinity would have paid a visit had they known its position and way of approach. In order to remove any such misapprehension, two road plans are provided ; one of which gives the situation of the works and the roads leading thereto, while the other shows the roads to and around Beeston and also the latter's proximity to the main highways such as the Great North and Fosse Roads.

It is, therefore, hoped that this information will be specially noted for the future and that we may have the pleasure of making many acquaintances as occasions arise.




## *OFFICES*

The main entrance is in Trent Road, and although the Offices may be somewhat unconventional in design, they are, externally, in harmony with the other buildings. They consist of a large single storey building, lighted mainly from above where the steady north light pours through the sloping glass roof and lights up the interior evenly, so that every worker has the maximum amount of daylight for his work. They are heated on the "Plenum" system by blowing in filtered hot air in winter and cold air in summer, and ventilated by means of apertures in the saw-tooth shaped roof and also by independently controlled window openings around the sides.

The building accommodates the clerical, engineering and allied departments, separated by means of low glazed partitioning and readily accessible to each other.

Near the centre of the east side are situated the blue printing department and the drawing office file and strong room where all tracings and drawings are kept in a fire-proof compartment. In order to make doubly sure of preserving records a facsimile of all tracings in the form of a blue print is filed in a separate part of the works.

There are so many drawings required in modern telephone manufacture that our blue printing department has to produce over 2,000 prints of varying sizes per day.

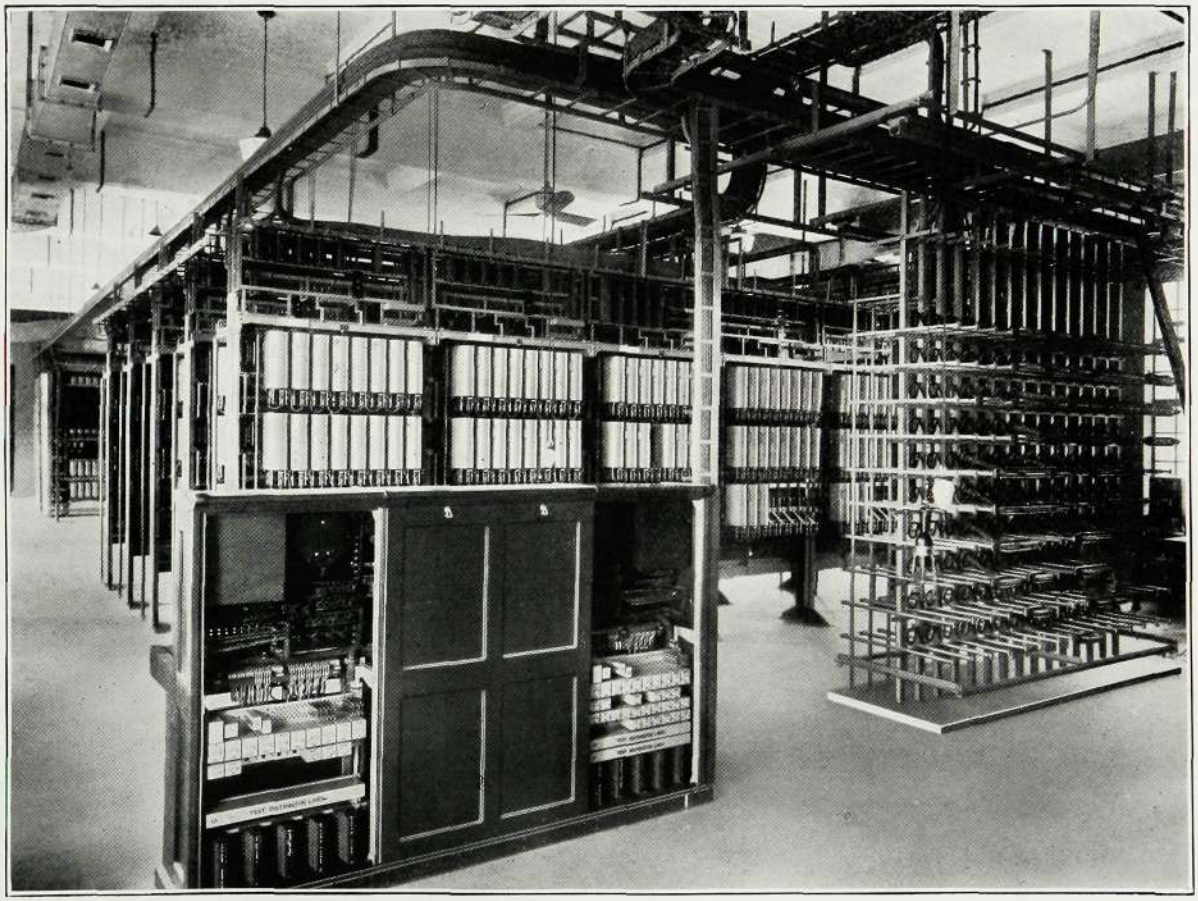
In future issues of the Bulletin, glimpses of other parts of the works will be given from time to time.

# *Kuala Lumpur (F.M.S.) Automatic Exchange*

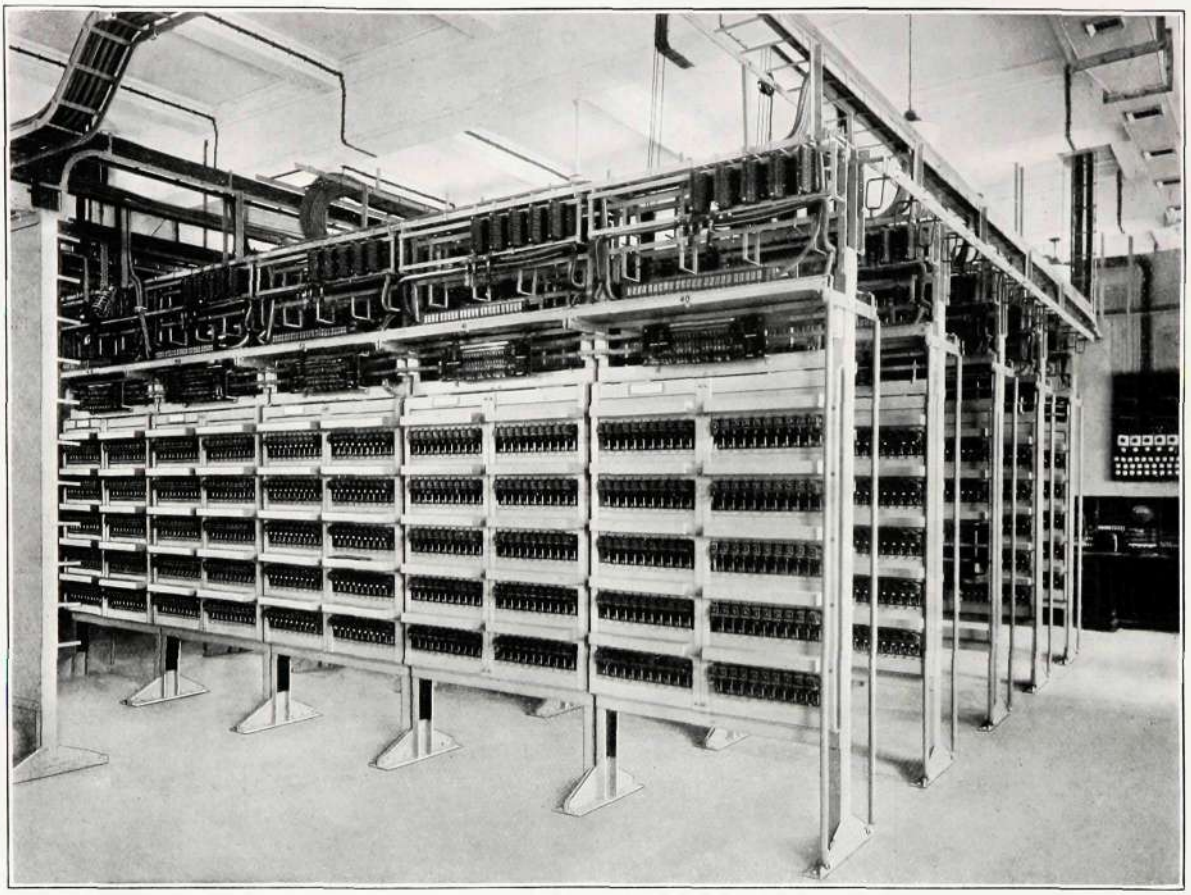
THE manufacture of telephone equipments for tropical climates is of such an exacting nature that it demands special study, not only of the materials used but in every phase and process during manufacture. When these equipments are of the automatic switching type a wide experience in this class of work is even more essential.

The Crown Agents for the Colonies, whose knowledge of tropical requirements is of the highest order, entrusted to Ericsson Telephones Ltd. the manufacture of the complete automatic exchange equipment for Kuala Lumpur, the Capital of the Federated Malay States.

Prior to the introduction of the automatic system, the town, an important centre of the rubber industry, was served by a C.B. manual switchboard of about 1,700 lines. As in many other eastern places, when extensions or new exchanges have to be considered, the "variety of languages" difficulty becomes a prominent factor in favour of automatic switching.



**Kuala Lumpur Exchange—General View**



**Kuala Lumpur Exchange—Line Switch and Final Units**

The new equipment provides for 2,475 lines but is designed and laid out for an ultimate of 5,300 lines. A four-digit numbering scheme is adopted, and at present outgoing calls, to existing manual exchanges in the area, are dealt with by a manual switchboard which is reached by dialling " O." There are, however, spare levels available to accommodate satellite working of these exchanges at a future date.

Preselectors, also first, second and final selectors are employed. The preselectors are the well-known rotary line switch type, and of the 2,475 provided, 2,400 serve ordinary subscribers while the remaining 75 are for subscribers who do not require trunk facilities i.e., " barred trunks."

Calls are extended by the preselectors to first selectors, 100-point type, of which there are 204 equipped and divided into three groups to deal, respectively, with ordinary local calls, incoming calls from dialling-in exchanges and those from " barred trunks."

Second selectors, also of the 100-point type, receive and pass on calls to the respective final selectors which are fitted in the proportion of seventeen per hundred group of ordinary subscribers and ninteeen per group of P.B.X. subscribers. To provide for line testing and the offering of trunk calls to engaged subscribers, one final selector for each purpose is fitted per hundred group, making a total of 413 final selectors.

**Kuala Lumpur Exchange—Trunk Positions**

Other equipment includes, rotary line switches for lines from the manual switchboard and from dialling-in exchanges, a 2-position test desk with the usual subscribers' line testing facilities and a one-position test desk solely for trunk testing. Overflow, congestion and statistical meters are provided and the layout is arranged for the inclusion of subscribers' meters, to be operated over the 3rd or private wire by booster battery, when a measured rate service is adopted.

The whole of the automatic equipment together with the main and intermediate distributing frames, test desks and power distribution panels are housed in one large room on the ground floor.

The manual equipment is accommodated in a room on the first floor and comprises 7 'A' position sections, 15 trunk position sections, supervisor's desk, four-position monitor's desk and a service observation desk, all capable of extension for future requirements.

The 'A' position switchboard, which has primary and ancillary answering facilities, deals with all 'O' level calls for enquiries, junctions, trunks, etc. In the case of trunk calls, tickets are made out and passed to the trunk positions where all such connections are made. The time checks on the trunk positions are operated from an electric master clock which also controls the 'slow-set' alarms of the automatic equipment. The desks are provided with the usual supervision equipment and circuits.

In order to facilitate maintenance, the fault signal and alarm arrangements are very

comprehensive and so designed that the location of a fault can be readily traced.

There are the customary duplicate batteries with C.E.M.F. cells for P.B.X. feeding, motor generators and ringing dynamotors, the controlling switches, meters and recorders being mounted on a marble powerboard. In addition there is a petrol electric generating set for running the other machines in case of emergency such as failure of the town's electricity supply.

The desiccating plant for cable drying purposes has a special dehumidifying arrangement which cools the compressed air and extracts therefrom about 75% of the moisture before it reaches the calcium chloride cylinders. The apparatus is capable of delivering 27 cubic feet of free air per minute at a working pressure of 35 pounds per square inch.

The exchange equipment is cleaned by means of a vacuum cleaning plant designed to give 8 to 10 inches of vacuum and to pass about 50 cubic feet of free air per minute. The plant is capable of working three points at the same time. For blower cleaning, air produced by the desiccator is used.

In tropical climates one of the great problems that confronts the telephone engineer is the deleterious effects of excess of moisture in the atmosphere in which the plant would normally have to operate. In dealing with this problem for Kuala Lumpur exchange, the whole of the air in the rooms is treated by dehydrating, and as the automatic equipment is mounted on the usual open type frameworks the air is allowed to circulate freely. About 110,000 cubic feet of air is involved and the dehydrating plant can deal with each floor separately giving one change of air in two hours, or both floors simultaneously giving one change in three to four hours. The humidity of the apparatus room can be brought down to 62%, during bad outside conditions, in four to five hours, and with recirculation the rooms can be maintained at 55/60% humidity with a drop of 5°F below the outside temperature. Both visible and audible alarms are provided to indicate harmful conditions of the atmosphere in the rooms.

To instruct and familarize the staff with the operating procedure, an instructional equipment was supplied, comprising duplicate units of both automatic and manual sections of the exchange, together with an instructors desk for setting up conditions similar to those obtained in actual practice.

Nine manual exchanges in the Kuala Lumpur area were altered to enable the operators to dial to the automatic subscribers.

The complete equipment was brought into service on the 23rd May, 1931, with highly satisfactory results.

**Kuala Lumpur Exchange—Front Entrance**

# *Enamel and Lacquer Finishes in the Telephone Industry*

DURING the last few years enormous progress has been made in the art of finishing, particularly in connection with enamels and lacquers.

The name of Ericsson has always been associated with the highest quality finish, and this reputation, of which the Company is rightly proud, is held as a result of continuous research and development. Wherever possible practical tests as well as laboratory investigations have been carried out, and this policy has proved of particular value and materially assisted in the perfecting of enamels and lacquers especially suitable for tropical conditions. Many hundreds of samples have been sent out for exposure in countries where climatic conditions are severe, and engineers abroad have given wholehearted assistance and valuable suggestions which have considerably added to the progress made.

In view of the highly specialized nature of the requirements of the telephone industry and after considerable investigations extending over a number of years, the Ericsson Company installed a modern and highly efficient plant for the manufacture of enamels, lacquers, varnishes, etc. The enterprise has been a success and large quantities are now supplied to other firms.

Much space would be required to give full details of the various classes of finishing materials used, but a general description of the most important will no doubt be of interest.

WOOD FINISHES. It will be admitted that from the point of view of appearance, well finished woodwork cannot be equalled. The materials used may be divided roughly into two classes, i.e. stains and fillers for the preparatory processes and varnishes for producing the smooth protective film over the surface.

Stains are grouped as follows: —

1. *Water Soluble Stains.* These include chemicals such as potassium bichromate or permanganate, extract of logwood, ammonia solution and of greater importance aniline dyestuffs. The resulting colours are very fast to light and do not fade perceptibly on continued exposure. The great disadvantage is that the water swells the wood and additional sand-papering is therefore necessary before further operations. There is also a danger of warping unless the liquids are applied carefully, so that this class of stain is rapidly going out of favour. The purely chemical stains are unpleasant to handle and the range of available colours is small.

2. *Pigment Stains.* It is possible to grind certain normally opaque pigments to a very fine powder, which when suspended in a suitable liquid medium may be applied to wood in a very thin film so that a semi-transparent effect is given. The colours are very fast to light but there is a tendency somewhat to obscure the grain of the wood. Considerable skill is necessary to apply them successfully and this limits their use to a great extent.

3. *Spirit and Naphtha Stains.* The simplicity of application combined with the

wide range of available colours has resulted in the widespread use of these stains which consist of dyes in various solvents such as alcohols and coal tar distillates. They may be applied by a cloth, brush or spray and dry rapidly without swelling the grain of the wood. The fastness to light is, generally, comparatively poor so that these stains should be selected with great care. Much progress however, has been made recently and it is now possible to obtain a range of colours which are equal in non-fading properties to the water soluble variety.

As a general rule staining is the first step in wood finishing and although spirit and naphtha stains may be applied after the filler, water stains must be applied before. The art of selecting and applying a suitable colour and depth of shade controls the final effect to a large extent. The next step is the filling process, the object of which is to fill up the pores or grain of the wood and thus produce a smoother effect when the varnish is applied.

Woodfillers are made in the form of a paste and contain a high proportion of solid matter finely ground in various liquids. The latter are usually of the linseed oil type because the application is simple and smooth for the operators. They are applied to the wood with cotton waste using a circular motion, and the excess is wiped off in a direction opposite to the grain, leaving the pores filled with the paste. They are generally coloured with pigments which assist the staining process and form an excellent base colour. A useful range is light oak, dark oak, walnut and mahogany.

A cellulose medium may be used in place of oil if rapid drying is desired. The former will dry within an hour or so, but cannot be applied with the ease of the latter which should be left overnight to harden.

The final and no doubt the most interesting step is the varnishing and finishing-off processes. These may be considered in their historical order and the first and best known is " french polishing." This consists of pure shellac in denatured or wood alcohol, with small quantities of other gums added to improve the gloss and flexibility. It is applied with a rubber, i.e. a cotton-wool pad moistened in the liquid and enclosed in cloth or chamois leather. This is rubbed over the surface in a circular motion and numerous applications with constant, skilled labour are necessary to obtain a first class finish. A little linseed oil is added to the pad to facilitate working and to impart flexibility to the film when fully dried. The process is not used to any great extent for mass production work owing to the high cost and time required, furthermore it is tedious and needs much experience.

A modification is now taking its place in which the shellac varnish is first applied by a brush or spray and the final operations only are carried out by the true french polishing method. The resulting finishes in either case are generally excellent but are costly, lack resistance to moist heat and if no oil is used there is a tendency towards brittleness.

A later developement and one which has been widely used during the present century is the oil rubbing varnish or piano type finish. In this case a varnish made from linseed oil combined with gums of the copal type forms the basis. These are thinned with turpentine to a working consistency and applied by a brush or spray. Two or three coats are required and a drying period between the coats of up to two days is necessary. The appearance at this stage is far from attractive so that the surface is

made smooth by hand finishing and flatting processes, the most common method being to rub the varnish with a flat felt pad to which a mild abrasive such as wet pumice powder is applied. A high polish may be attained by following the pumice powder with milder abrasives such as rottenstone or special polishing liquids. Providing a first class varnish is used the finish is extremely durable and has the advantage that it can be carried out with little or no equipment. Also, the risk of fire is remote so that this method is ideal for the repair shop where the labour is mostly unskilled. This process is more rapid than might be imagined and gives a very fine effect.

During the last few years a type of varnish has been developed which is comparatively rapid in drying and at the same time produces hard and flexible films. It is dry to the touch within an hour or so after application and may be flatted after from four to twelve hours. The main advantage of this process is the freedom from sinking as the film hardens. This is because the oil dries by oxidation and has more tendency to expand than contract. Due to this fact and also the high degree of moisture resistance, the process is still used by many manufacturers.

A still more recent developement and now the most important class of finish is the cellulose type. It can safely be said that provided high grade and suitable materials are used, results can be obtained which are fully equal to those given by any of the other methods. The features of cellulose films are the high degree of hardness and flexibility with excellent resistance to wear. Water, acids and common solvents such as alcohol or turpentine do not affect the finish.

The basis of this varnish is nitro cellulose which is combined with gums, plasticizers and other products to improve or modify the effects given. A wide range of solvents is available, which differ as regards drying speed, flashpoint, odour, flowing out properties and toxicity, and are selected to meet the conditions of application.

Very little cellulose varnishing is done by brush owing to the difficulty in applying more than one coat by this method. Spraying is in general use and most woodwork is now finished in this manner.

There are two general processes used in cellulose finishing. The most inexpensive and rapid is the direct method whereby two or three coats are applied and allowed to dry for an hour or so between coats. This is suitable for internal work or where protection is desired without high class finish.

The more expensive and extremely fine results are obtained by spraying on two to four coats which when thoroughly hardened are flatted with a pad and the usual abrasives and finally burnished to the required degree by polishing compounds. Mirror-like finishes may be obtained by this means. Another interesting method is that known as the " bodying-up process." For this a special liquid is used which softens cellulose without actually dissolving it. The liquid is applied to the dry varnish in a manner similar to french polishing so that the varnish is softened and forced into the grain of the wood, producing a smooth lustrous surface.

Many other methods of cellulose wood polishing are in regular use. To those who desire a range of finishes suitable for various types of wood and qualities of work, the cellulose processes are indispensable.

# Intercommunication Telephone System

THE title although equally applicable to all telephone systems is generally known to apply to one in particular, and implies a means of communication between the various departments of an office, a factory or any similar restricted area.

The increasing popularity of the telephone proves it to be an acquisition of primary importance to any establishment, and the choice of a system is therefore, a matter for very careful consideration.

When selecting a system the choice lies principally between three, viz., the manual which requires an operator for making the necessary connections, the automatic with mechanical and electrical connecting devices and the one to which the title particularly applies, whereby the user makes all the necessary switching manipulations.

The manual system is undoubtedly convenient from the users point of view and especially where unusual conditions absolutely necessitates the services of an operator, but it becomes too costly and generally out of the question where a day and night service is required.

**Intercommunication Telephone arranged for table use**

**Intercommunication Telephone arranged for wall use**

The automatic system eliminates the disadvantages of the manual in so far that it will make connections at all times without the use of an operator, and where the distances between the various instruments are fairly long it is an excellent proposition.

Where however, the distances between the telephones are comparatively short and the number of instruments required is small, say up to 20, the intercommunication system, to which this article particularly refers, is economical. For many other reasons its adoption as being the ideal for such cases cannot be overlooked, but in fact should be given primary consideration. It provides the most rapid service of any system yet devised and when secrecy is not of importance the design of these modern Intercommunication Telephones with push-button selectors, has reached the acme of perfection and simplicity. They are rightly described as an automatic system without electrical switching devices.

The Ericsson instruments are designed and manufactured for prolonged service and incorporate a unique design and arrangement of push-button mechanisms which comprise a minimum number of parts of substantial proportions and reliable in operation. These mechanisms, probably better described as auto-reset push button selectors, are mounted in units of five, thereby providing greater utility for inspection and replacements, and even extension should this be anticipated as being ultimately required.

**Call and Reply Telephone Wall Pattern**

The casework is made of drawn steel finished with a durable black enamel, and wall and table instruments are alike, the cradle being so arranged that it can easily be converted from one position to the other, thus providing yet another instance of utility in design.

One of the most modern and interesting refinements is the moulded bakelite micro-telephone. It is fitted with the latest type of inset transmitter which is widely recognized as of superior transmission efficiency and articulation, and a current polarized inset receiver. This combination enables the users of small private systems to enjoy the same high quality service as that obtainable on the larger public installations.

These wall or table telephones are available in 5-, 10-, 15- and 20-line sizes.

The circuit is single line with a central battery, usually of seven cells (3 ringing, 4 speaking) fitted near the centre of the system which, if carefully and correctly installed will give a prolonged and trouble-free service.

When one or two stations are situated at some considerable distance from the main area of installation the cost of cable and instruments, to provide full intercommunication facilities for these stations, may be considered prohibitive. The Call and Reply Telephones however, are useful and economical and it is generally found that they amply fulfill the necessary service required by such stations; for instance, they can be called by and reply to any other station and can call the station with which they are associated.

**Call and Reply Telephone Table Pattern**

The Company undertakes to supply and instal completely all types of telephone installations under the following terms:—

(*a*) Cash; (*b*) Hire Purchase; (*c*) Rental.

Full particulars and terms will gladly be given on application.

# Hotel Telephone and Staff Signalling System

A branch of telephone communication which involves specialized treatment, and which has not received until recently the attention it deserved is a telephone system combined with staff signalling and time distribution, also with facilities, if desired, of communication with the public telephone service.

This subject, however, has received the serious attention of the Ericsson Company, the outcome of which is a system particularly adaptable to establishments such as, hotels, hospitals, ships and large business houses.

The system is flexible and can be arranged to meet the specialized requirements of the establishment, with either purely internal communication, or so that a limited number or all of the stations can be allowed to communicate over the public telephone system. One, two, three or more staff services can be given and in its simplest form the system can be adapted to small establishments at reasonable cost.

The facilities afforded are as follows:—

1. Telephone communication with any other room in the building or any subscriber on the outside public system.
2. Telephone communication with the staffs quarters direct.
3. Coloured light signalling to summons the various servants direct to the room calling.
4. Time distribution by means of silent electric clocks.

An interesting and typical example of an hotel system, supplied by the Ericsson Company, is the Dorchester, which comprises nine floors of fifty rooms per floor. The floors are divided into a number of groups of rooms or sections to each of which is allocated a maid, a waiter, and a valet having centralized quarters which simplify the grouping together of the sections during slack periods. The electric clock system is conveniently divided into floor groups of fifty clocks, each group being controlled by a relay set which is operated from the central master clock.

The system operates as follows:—

Lamps of different colours are used for signalling the staff, the colours being blue for the waiter, green for the maid and red for the valet. The buttons on the instrument are also coloured correspondingly.

To call, say, the waiter, the blue button is pressed. This lights a blue lamp in the room lamp set situated over the door, the necessary corridor pilots and also one on the staff call panel in the servants quarters.

To answer the call the waiter proceeds along the various corridors as denoted by the lighted pilots, and so to the room as indicated by the room lamp. On entering the room he inserts a plug into the blue coloured jack on the reset panel, thereby cancelling the call.

The telephone is used in the usual way, i.e. the micro-telephone is removed to answer or originate a call on the private exchange in the building. To speak to the servants quarters direct, the white button on the telephone is depressed and the micro-telephone removed.

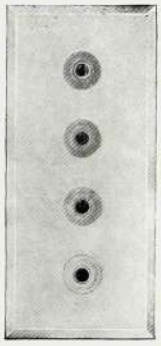
At the servants quarters a lamp lights corresponding to the number of the room calling, and remains lit until the caller replaces the micro-telephone.

A brief description of the various essential parts of the system will make the foregoing operations more clear.

*The Telephone* is complete with push buttons and an electric clock which is fitted in the dial aperture. Each push button is differently coloured to indicate the services, and in order to cater for all nationalities there is a symbolic figure of the service, under each button.

To allow the complete instrument to be removed for maintenance purposes a plug and jack is used.

*The Reset Panel* provides the means for a servant to cancel a call after the room calling has been entered to attend the call.

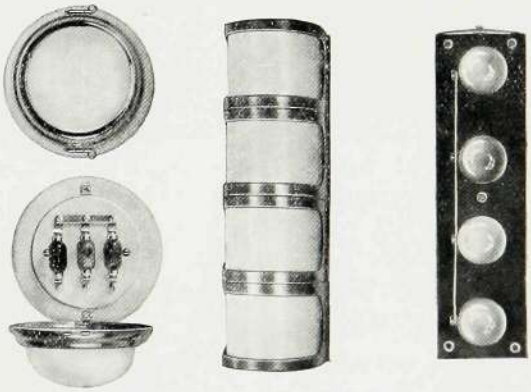


Reset Panel

Inside the panel are three relays and a buzzer. The relays are associated with the various services, one for each. By operating a push button on the instrument the appropriate relay is actuated and held mechanically, the contacts completing the circuits for lighting the various signal lamps. The introduction of a plug into the appropriate jack mechanically releases the relay armature and so cancels the call. The buzzer is used to notify a servant, engaged for some length of time in a room, that another room is calling.

**The Telephone**

*The Room Lamps* are for indicating the room calling and the particular service required. They are comprised of different lamps to match the push buttons on the telephone and are mounted in the corridors in a prominent position over each door. Alternative mountings are available, one having a circular base and a dome shaped cover of frosted glass, the other being of unit construction, having each lamp in a separate compartment so that the light of one lamp cannot interfere with that of the adjacent one.

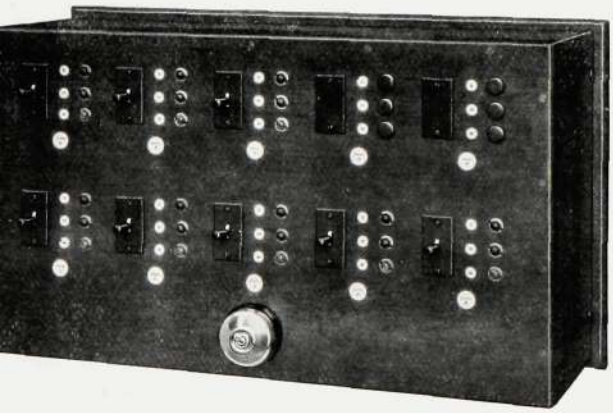


**Room Lamp Mountings—Covers "on" and "off"**

*Pilot Lamps* are fitted in corridors which are long or branching in order to guide the servants to the room calling.

**Service Call Panel**

*The Service Call Panel* is mounted in or near the servants' quarters and when a call is made from a room a coloured lamp corresponding to the service required is lit on the panel and an audible alarm operated. It may be arranged to indicate calls from any desired number of groups of rooms and if convenient the various services can be incorporated in one common panel. It should be understood that a number of rooms are grouped together, and one lamp allocated per group per service.



**Service Supervision Panel**

*The Service Supervision Panel.* It is sometimes desirable to supervise the services in order to investigate complaints concerning the answering of calls. For this purpose the supervision panel is situated at some convenient point, and by the operation of the appropriate key any service can readily be supervised. To do this it is arranged that when a call is made from any group or floor a correspondingly coloured lamp is illuminated on the panel. By watching this lamp the delay in answering the call is easily noted.

An alternative scheme may be employed whereby the lamp is only lit after a predetermined time subsequent to the call being made, for instance it could be easily arranged to light the lamp, say, one minute after the call originates. This method will then only indicate calls which are not answered after a reasonable lapse of time.

*The Night Service Panel* is similar to the supervision panel and is used to concentrate the services for night attendance. It indicates the floor from which a call eminates and also the service required. On proceeding to the floor indicated, the pilot lights will direct the servant to the room calling.

**Service Telephone Panel**

*The Service Telephone Panel* is located near to the service call panel at the servants' quarters and provides facilities whereby direct communication can be made from a

room to give instructions when a servant is not actually required to go to a room or to save time by preventing a double journey having to be made by a servant. The white button on the telephone is depressed while the micro-telephone is being removed, thus causing a lamp on the service telephone panel to light and show the number of the room requiring attention. The call is answered in the usual manner and the lamp is not extinguished until the micro-telephone in the room calling is replaced.

*Buzzer Re-call Service.* It is often necessary for a servant to be engaged for a period in one of the rooms,e.g., the maid or valet.

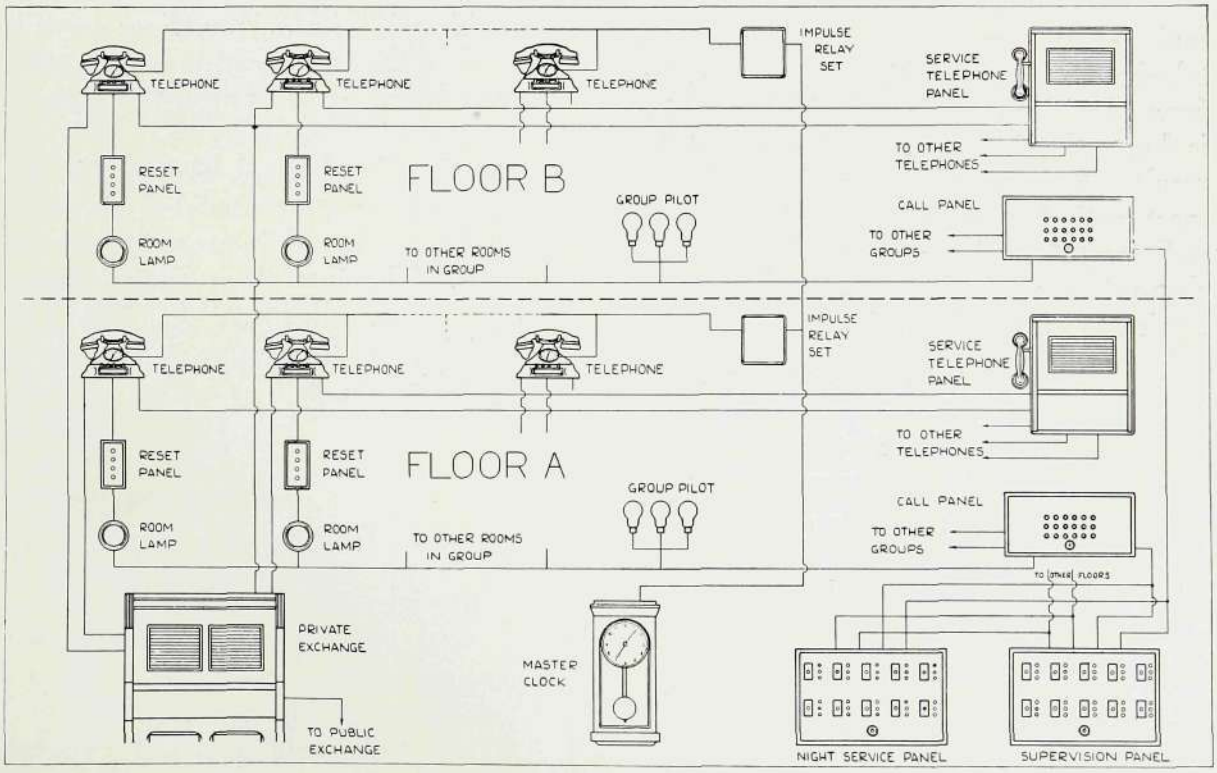
In such cases a plug is inserted into the buzzer jack on the reset panel so that if a call be made from another room in that group the buzzer operates and thus notifies the servant.

*Grouped Services.* During slack periods similar services can be grouped together so that a servant may attend to more than one group.

*Suite of Rooms.* By a suitable arrangement of room lamps it is clearly indicated which room of a suite is calling.

*Bath Room Calls.* Push buttons or pull switches are fitted in bath rooms and if desired special coloured lamps may be used to deal exclusively with this service.

*Electric Clock System.* The secondary clocks fitted in the instruments are silent in operation. They are connected in parallel and those on each floor are grouped and operated by a relay set which receives the impulses from a central master clock. The number of clocks per relay set should not exceed fifty.




**Explanatory Diagram of the System**

# Hampstead Automatic Exchange London Director Area

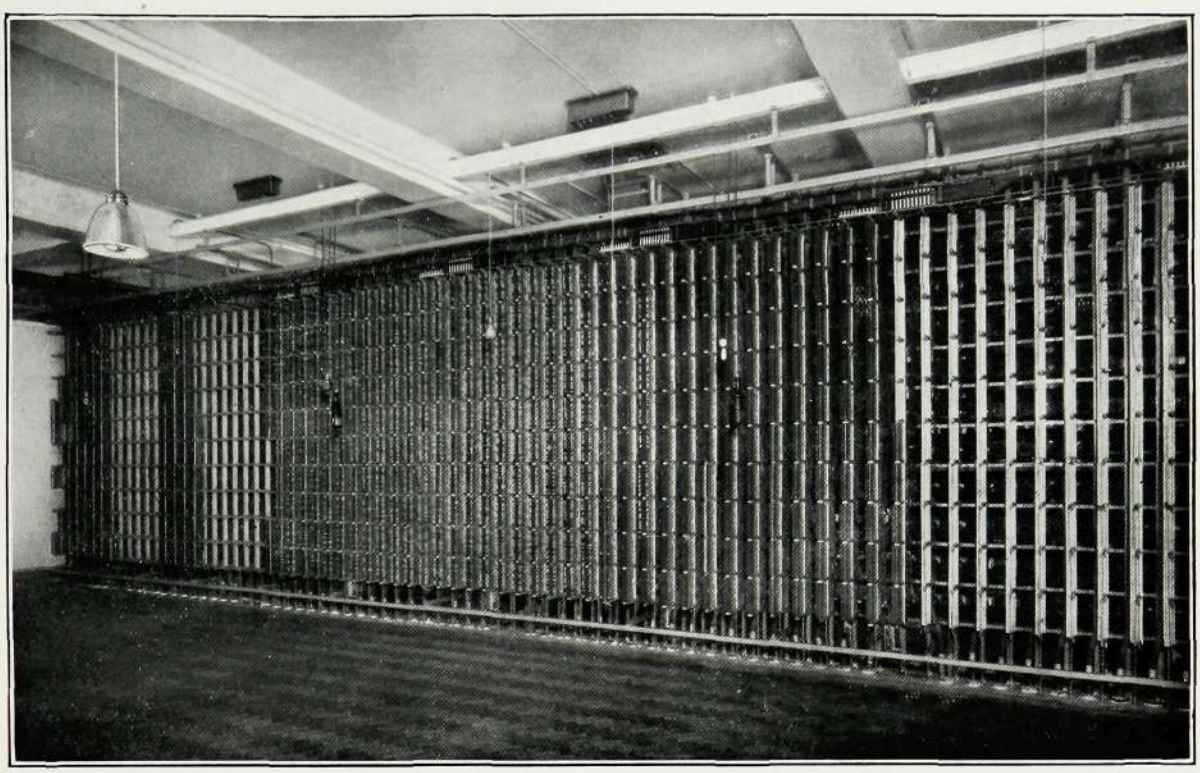
THE thousandth mark in public automatic exchanges working in this country has recently been passed, and many of the contracts have been carried out by the Ericsson Company. The great majority of these exchanges is of a type which adequately fulfills the requirements of most towns but when considered for application to congested areas such as London it has many limitations.

The British Post Office realized that it would not be an economical or practical proposition to apply the Strowger system in its original form to an area such as London, in fact the problem of the automatization of this densely populated area presented one of the most formidable undertakings ever attempted by any telephone administration. In going forward with the project the highest praise is due to the Post Office Engineers, and the results of the progress already made are most gratifying, so that the outlook augurs well for the final success of the complete change over of the London telephone service to automatic working.

One of the primary considerations in the determination of a suitable scheme for London was the junction question. Junctions between each exchange obviously could not be considered, manually operated junctions are costly and increase the possibility of errors and delays due to repetition of numbers when passing calls through other exchanges, so that a method of automatically routing junction calls became a necessity in order to make it practical and economical to apply automatic switching in thickly populated areas. This latter was made possible by the introduction of a combination of apparatuses capable of receiving, storing, translating and routing calls and which was given the name " Director."

Hampstead, with a population of approximately 90,000, is one of the principal residential districts of north London, and has early this year had its telephone subscribers changed over from the manual to the automatic system. This exchange, one of the largest in the London " director " area, has capacity for an ultimate of 10,000 lines and is initially equipped so as to be capable of providing a service for 7,100 subscribers. The four-storey building is substantially designed and built to harmonize with its surroundings and is arranged for the convenient and economical accommodation of the complete exchange equipment.

The subscribers' telephones, working to director exchanges, are provided with dials having letters in addition to the usual numerals. The first three letters of the exchange name, called the " A," " B " and " C " digits, and four numerals are dialled when making a call. A digit selector receives the first or " A " train of impulses and selects a director which in turn receives the " B " and " C " and the four numerals. The director translates the " B " and " C " digits into a pre-determined code of from one to six digits, thus enabling the call to be directed via a selected route to the required exchange, and then transmits the four numerals of the called subscribers' number, to operate the necessary switches in that exchange.



**Hampstead Exchange—Main Distribution Frame**

The routing of calls is determined by the jumpering on the "translation field" associated with each director. It is thus possible, by a simple alteration of the connections on this field, to change the junction route in the event of a break-down in the normal path.

The code and numerical switches are of the two-motion type, each absorbing one digit in vertically stepping to any level, and then automatically rotating to select a free outlet.

If the B and C digits are translated by the director into a code of say three digits or sets of impulses, it usually implies that the call is routed through an intermediate or tandem exchange which absorbs one set of impulses, the first two sets being taken up by the 1st and 2nd code selectors in the originating exchange. A call is therefore, routed via one or more exchanges according to the number of digits in the translated code.

The director is one of the most important mechanisms in an exchange of this type, and it may be of interest to note that the layout provides for an ultimate of 200. The number equipped at any time is controlled by the traffic requirements, there being 98 initially in operation at Hampstead.

The main Distribution Frame illustrated above provides an excellent example of the immensity of the primary connecting field between the many underground cables which converge from all directions, and the internal equipment. The view shows 69 verticals, this being approximately two-thirds of the total capacity. Many of the verticals are required for junctions and miscellaneous circuits. The frame is situated on the ground floor and is provided with the usual protective devices, also travelling ladders.

**Hampstead Exchange—Test Jack Frame and Test Positions**

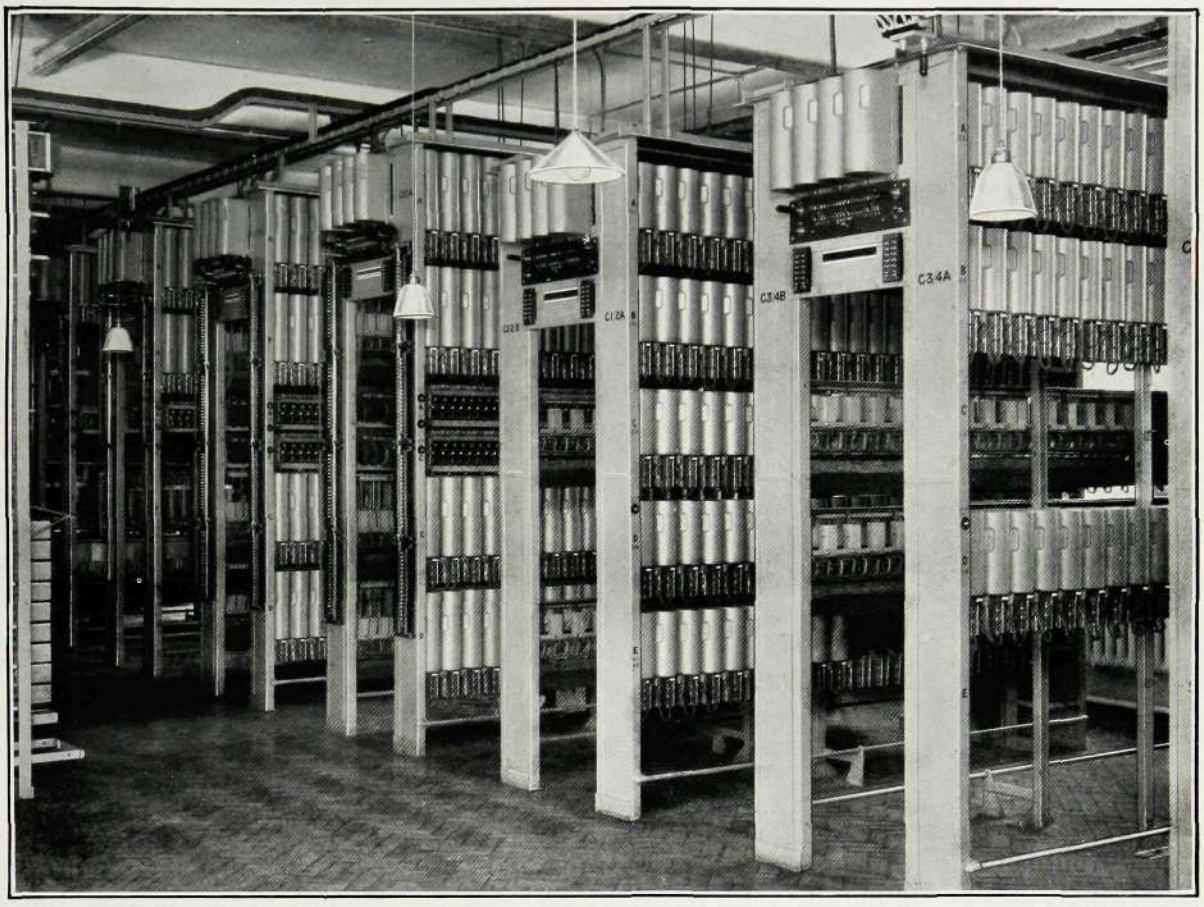
The size of plant required to supply power for operating an automatic exchange of this capacity provides another interesting example of the magnitude of modern communication equipments.

The batteries and motor generating sets are in duplicate. Each battery has capacity for an ultimate of 3,525 ampere-hours and the generating sets are each capable of an output of 550 amperes at 57 volts. As Hampstead is chiefly a residential district the traffic is comparatively light and fairly evenly distributed throughout the day, so that these figures may be more than doubled for another exchange having the same subscriber's capacity but very heavy traffic periods and many private branch exchanges to feed.

Close by the 6-position test desk are the junction test jack frames each with a capacity for 800 junctions and 10 test cords.

In order to maintain an uninterrupted and reliable service all junctions are systematically and regularly tested and it is therefore very convenient to terminate them on jacks within easy reach of the testing staff.

The tesk desk is primarily equipped for diagnosing and locating line and telephone faults by the voltmeter testing method and it has many other facilities provided to ensure that the whole equipment is kept in perfect working order. It is placed adjacent to the main distribution frame where any line can be readily intercepted for observation and test.




**Hampstead Exchange—1st and 2nd Code Selector Racks**

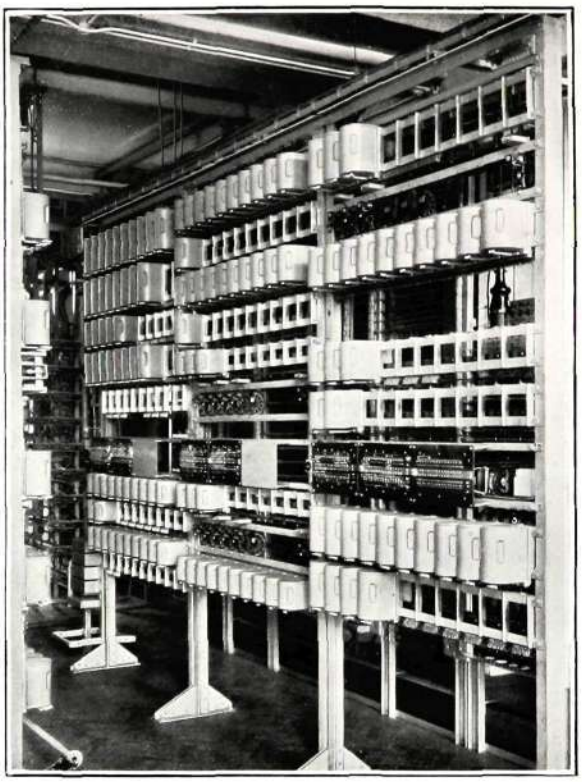
Although, from the point of view of efficiency and endurance, present-day telephone apparatus more than holds its own with any other product utilized under similar strenuous and exacting conditions it is nevertheless necessary to provide further means of indicating and locating faults which may arise in any part of the many intricate mechanisms.

For this purpose there is installed a very complete visual and audible fault alarm scheme which ensures that the controlling officer is advised of a fault and its approximate location without loss of time.

As the equipment is not confined to one floor and in order to avoid having a large maintenance staff the alarm signals are reproduced on all floors, which are furthermore divided into sections and sub-sections each having its particular group of signals so that the tracing of a fault is confined to a relatively small area, and as there is an individual alarm lamp provided on each rack in a sub-section the faulty switch or circuit can readily be located.

To still further increase the efficiency of the exchange apparatus, a speedy and systematic method of testing the automatic equipment is employed. This is accomplished by means of automatic routiners which are capable of applying stringent tests and locating faults which would be most difficult to find in the ordinary manner.

Hampstead Exchange—Coder and Sender Racks



Hampstead Exchange—Relay Set Racks

The routiners are contained on narrow racks fitted at the end of the apparatus racks, there being one routiner for each class of equipment.

They are provided for testing the following :—

[illegible], numerical and final selectors; [illegible]ectors; outlet, voice frequency and junction relay sets; senders; coders; C.C.I. relay sets and outgoing junctions.

By operating keys the routiners are set in motion and automatically apply tests, either " through " or " continuous " according to the key operated. The progress of the tests is indicated by lamps and when a fault is found the routiner stops, but, after noting the fault, may be stepped on to continue testing.

Facilities are also provided for testing the routiners to ensure that they are in good working order.

Quite apart from the manufacturing period an exchange of this size requires a considerable amount of installation time, during which there are many problems to be solved by the Post Office engineers before it can be brought into service, e.g., junction routes, translations, etc. Installation began in January 1931 and a most successful change-over was made in January 1932.

Several other director exchanges have also been completed in the London Area by the Ericsson Company, the principal being Gladstone, Sheperds Bush, Colindale and Merton Abbey, while two recent contracts, Stamford Hill and Larkswood are at present in progress at the works.

In the Birmingham director area, Smethwick has already been brought into use and Acocks Green, Priory and Stechford are nearing completion, also one exchange, Swinton, is in progress for the Manchester area.