

The Ericsson Bulletin

No. 5

JULY, 1933

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Left to Right : Lt.-Col. A. G. Lee (Engineer-in-Chief to the British Post Office), The Marquis of Milford Haven, Mr. J. Engblom (Works Manager, Ericsson's), Sir Kingsley Wood (Postmaster General), Mr. J. W. Jay (Surveyor, P.O. North-Midland District), Major V. R. Kenny (Postmaster, Nottingham), Mr. F. Turner (Postmaster, Beeston), Mr. J. A. Crowe (Sales Manager, Ericsson's), Mr. T. Kirkham (Managing Director, Ericsson's), and Mr. J. H. Reed (Secretary, Ericsson's).

Visit of H.M. Postmaster General

The Postmaster General, the Rt. Hon. Sir H. Kingsley Wood, M.P., accompanied by the Engineer-in-Chief to the Post Office, Lt.-Col. A. G. Lee, O.B.E., M.C., and other Post Office Officials, visited the Works on Wednesday, April 12th. The Marquis of Milford Haven, G.C.V.O., represented Col. Sir H. A. Wernher, K.C.V.O., Chairman of Ericsson Telephones Ltd., and received the visitors on behalf of the Company.

Sir Kingsley Wood was keenly interested in many of the special machines and methods used in the manufacture of telephone exchanges and auxiliary equipment. The mechanism and operation of the new Police Telephone and Signal System and the latest type of Electric Totalisator also attracted his notice.

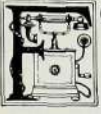
At the conclusion of the tour through the Works, which was conducted by the Works Manager Mr. Engblom, Sir Kingsley Wood referred in complimentary terms to both the excellent arrangements and layout of the Works and expressed his thanks for a very interesting visit.

The photograph above was taken on arrival at the Works' entrance, and that on the left in the Press Shop where Sir Kingsley Wood is seen with the Marquis of Milford Haven, Lt.-Col. A. G. Lee, Mr. T. Kirkham and Mr. J. Engblom.



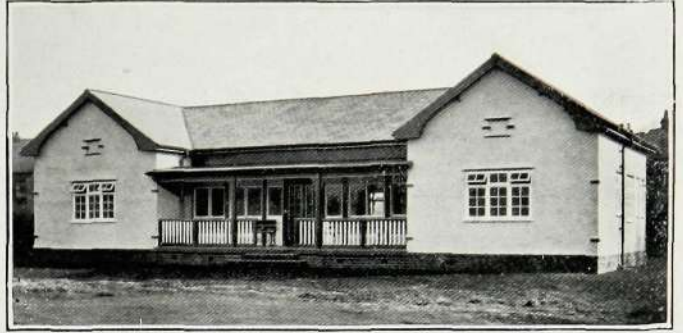
Courtesy of Nottingham Guardian

Ericsson Telephone Works



FOR the welfare, recreation and amusement of the Company's employees, every endeavour is made to provide modern facilities. In this connection a new and greatly enlarged Sports Pavilion was completed early this year. It is pleasantly situated on the Company's cricket ground which is one of the finest privately owned pitches in the Country.

It was on this same ground that the record run-getting match of 1870 was played between Gentlemen of the North v. Gentlemen of the South; a great attraction being the presence of Mr. W. G. Grace in the South eleven. Scores: North 1st inns. 287, 2nd inns. 289; South 1st inns. 482, 2nd inns. 56 for 1. This was



The Sports Pavilion


the first visit of that great cricketer to the vicinity of Nottingham, but again in 1875 he played with the United South of England eleven against eighteen of Beeston Cricket Club.

Below is a view of part of the Engineering Department with the Drawing Office beyond the low partitioning in the left background.



Ericsson Telephone Works—The Engineering Department

Newcastle-on-Tyne Demand Trunk Exchange

 IN order to provide a more efficient and speedy trunk service, and to encourage and increase the use of the telephone for long distance conversations, the British Post Office has adopted what is known as the "Demand" scheme. This service aims at the completion of long distance calls, while the calling subscriber waits on the line.

Under the old "control" or "delay" system it was necessary for the subscriber to order his call over a record line, and then to hang up his receiver and wait until the operator recalled him.

It is claimed that the demand scheme will allow about 72% of calls to be connected on demand within one and a half minutes, and that a further 12% will mature within ten minutes. The remainder, owing to various difficulties, will take longer, and will be handled on a delay basis.

This improvement in service will undoubtedly help to popularize long distance telephony, and it is interesting to note that other telephone authorities have actually experienced a noticeable increase in traffic due to the adoption of demand working.

As a result of a considerable amount of development work on the part of the Post Office Staff, entirely new circuits have been designed to suit the new operating procedure, the main feature of which is the reduction of operating time. To curtail still further the operating time, a new design of switchboard has been evolved, and many interesting technical aids to speedy operating have been introduced.

Great Britain has been divided up into about seventeen "zones" for the purpose of trunk working. Each zone has a centre (e.g. London, Birmingham, Newcastle-on-Tyne, Cardiff, etc.), which may be regarded as a switching centre for an area embodying a number of group centres, which in turn act as minor switching centres or collecting points for their smaller subsidiary exchanges. The average number of group centres in a zone is about eleven, but the actual number varies considerably.

A group centre controls originated trunk traffic from its own and its dependent exchanges, and is equipped with timing devices known as Chargeable Time Indicators. All group centres have lines to their zone centres, and the latter are interconnected by high grade transmission lines.

Ericssons Telephones Ltd. have recently manufactured and installed the exchange equipment for the Newcastle-on-Tyne zone centre. The equipment includes the new design of switchboard incorporating the aids to speedy operating already referred to.

The switchboards are arranged in two suites; one of nine sections being made up of demand and delay positions, and the other of three sections being incoming positions.

Each switchboard section is a seven panel unit of three operators positions. The width of each position is approximately 2 ft. 3 ins., which is wider than normally allowed for ordinary C.B. exchanges. This extra width is provided to accommodate a visible index file on the left-hand side of



Newcastle-on-Tyne Demand Trunk Exchange—Demand and Delay Positions

the keyshelf, and a pneumatic tube valve on the right-hand side.

A glass covered bulletin panel is fitted on each keyshelf, and that part of the section just below the top moulding is arranged as notice boards for routing and rate information.

The capacity of the keyshelf is for 14 cord circuits without time check keys, i.e., for incoming positions, or 7 cord circuits with time check keys, i.e. outgoing positions. Twenty order wire keys can be fitted, but the capacity for cord circuits is thereby reduced to 12 and 6 respectively. There is also provision for 4 common control keys and an instruction circuit key.

The outgoing trunks and junctions are multiplied every six panels over all positions on both suites; thus all outgoing lines are available to each operator, and not merely to a special control operator. This fuller

availability enables an operator to make a connection either by direct or alternate routing whilst still holding the subscriber, instead of having to recall him. Generally, the circuits are worked on a bothway basis, which ensures the most satisfactory circuit loading.

Visual idle circuit indicating signals (V.I.I.) are fitted in association with outgoing trunks and certain outgoing junctions. These signals consist of lamps which glow to indicate an idle circuit in a group. Strips of twenty lamps are mounted in the panel, immediately above the associated outgoing jack strips, in a similar manner to the visual engaged signal (V.E.S.) lamp strips. For visual idle circuit signals, however, the face of the lamp strip is fitted with a designation strip, which has a 1/16 inch perforation in the label opposite each lamp, and a backing strip of red or green translucent material. When a lamp glows

indicating a free circuit, a small coloured spot appears on the designation strip, and when that circuit is taken by an operator, the spot of light moves to mark the next free outlet. This arrangement is a great improvement on the V.E.S. system.

Since only one lamp per group of trunks glows at any given moment, glare and heating are eliminated and battery consumption is greatly reduced where the exchange battery is used. In some cases, as at Newcastle, these lamps are lighted by 6 volts A.C., transformed down from the public supply, so that no current is drawn from the exchange battery for this purpose. As the designation strip used fits over the lamp strip, there is therefore a corresponding saving of space in the capacity of the outgoing jack field. The relays and connection strips for the V.I.I. signals are mounted on a specially designed rack. To reduce the voltage drop to a minimum it is important that the rack shall be situated as near as possible to the cable turning section.

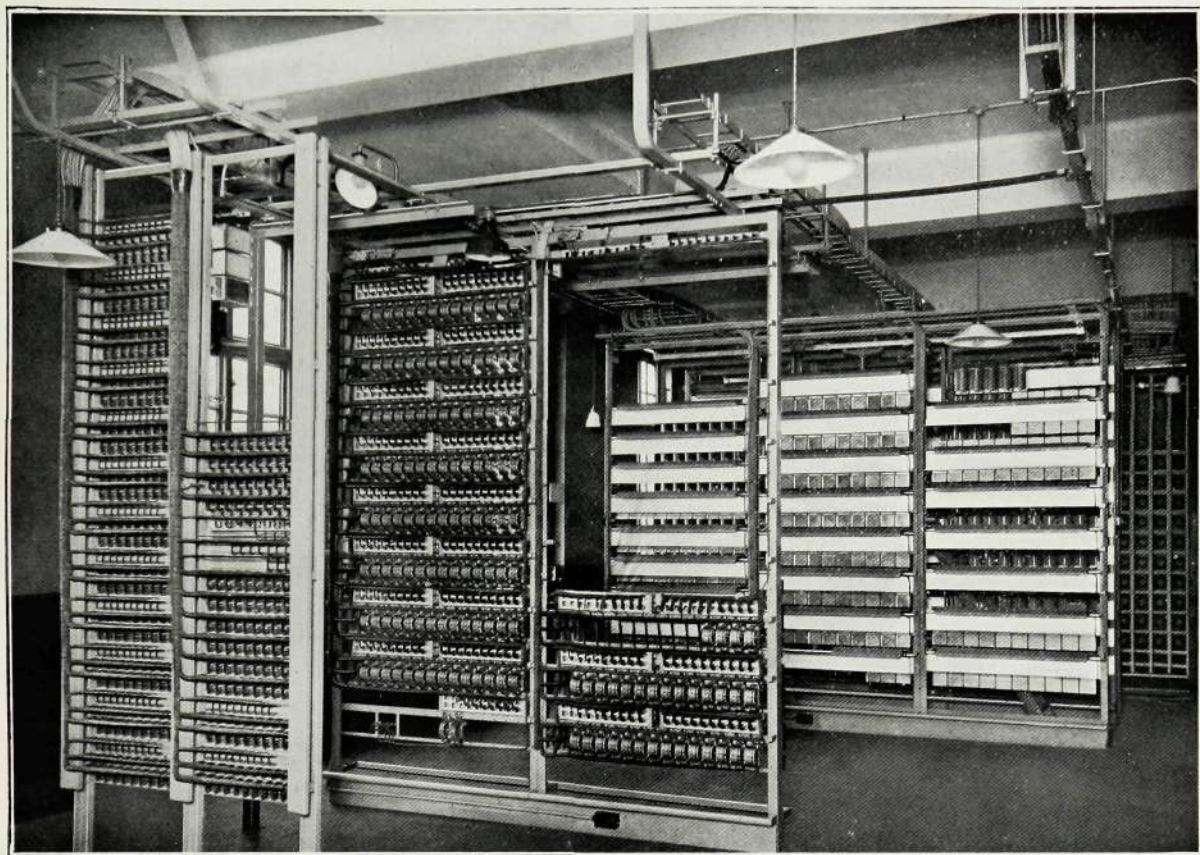
Answering jacks and lamps are multiplied every fourteen panels, but the calls actually appear every seven panels. This condition is produced by an arrangement of tie cables on the intermediate distributing frame. The multiplying of answering equipment makes highly efficient team working possible and allows the most economic use of staff in relation to the traffic; an operator is also enabled to spend all the time necessary in dealing with a difficult call, without detriment to the service given to other callers. The relays associated with the answering lamps are mounted on two racks, one rack per suite, and are situated alongside the V.I.I. rack on the 3rd Floor. A 6-volt tap, of the main 50 volts battery provides the feed for the calling lamps.

The chargeable time indicating equipment places under the control of the operator a means of correctly timing calls. Outward positions are each fitted with a chargeable time display lamp strip, which is mounted in the panel in front of the operator, and each cord circuit has associated with it a time check key and lamp. By the operation of the time check key the operator starts the time check apparatus, which is automatically stopped at the end of the call, i.e. when the calling subscriber's receiver is replaced. On operating the time check key again the elapsed time is displayed on a lamp strip which has in front of it a translucent strip marked to indicate numbers from 1 to 18. The number thus illuminated represents the duration of the conversation and is recorded as chargeable time. As the display is controlled by the key definitely associated with the cord circuit in use, and the ticket referring to the call is in a clip in alignment with the key, the possibility of entering the time on the wrong ticket is very remote.

The apparatus for operating the chargeable time display consists of an arrangement of rotary switches and relays together with connection strips for wiring purposes. This timing equipment is mounted on chargeable time indicator racks installed in the apparatus room on the 1st Floor.

“Sleeve Control” circuits are used, and may be divided into four main categories, (a) the position circuit, (b) the cord circuits, (c) the trunk terminal circuits, associated with which are the answering and outgoing multiples, and (d) miscellaneous circuits.

The Position Circuit comprises equipment which allows the operator to speak on the answering or calling cord, dial, challenge,



Newcastle-on-Tyne Demand Trunk Exchange—Apparatus Room Equipment

and test for engaged conditions in the standard manner. In addition provision is made for voice frequency keysending and re-calling a distant operator. The whole of the position circuit equipment is mounted on the switchboard section. The telephone circuit which forms part of the position circuit is specially designed to allow for monitoring, and to ensure high grade transmission. Particular care has been taken to screen this circuit, to prevent overhearing when monitoring.

The Cord Circuits each contain a speak and monitoring key, and, when timing facilities are required, a time check key and lamp. Other constituent parts of the cord circuits are the supervisory relays and lamps.

No transmission or ringing feeds are included in the cord circuits, they form part of the line terminal equipments. The cord circuits are thus very simple, and may be used for all types of connections, since the varying circuit requirements are applied by the line terminal relay sets. The operation of the speak key connects the cord circuit to the operator's telephone. A special relay arrangement prevents more than one cord circuit being connected to the operator at a time, even if two or more speaking keys be thrown.

Line Terminal Equipments are mounted in the form of jack-in relay sets on the relay-sets racks, and give all the necessary circuit conditions for ringing, clearing,

speaking, etc., as required. The relays for the calling lamps and V.I.I. signals are controlled from the relay sets, and are mounted on special racks.

Miscellaneous Circuit equipments such as interposition, instruction, call supervisor, order wire, and section supervisor, are mounted on the switchboard sections or on the special apparatus racks.

Nine bays of relay-set racks accommodate the relay-sets forming the trunk terminal apparatus. These, together with the special apparatus rack and intermediate distributing frame are of standard construction.

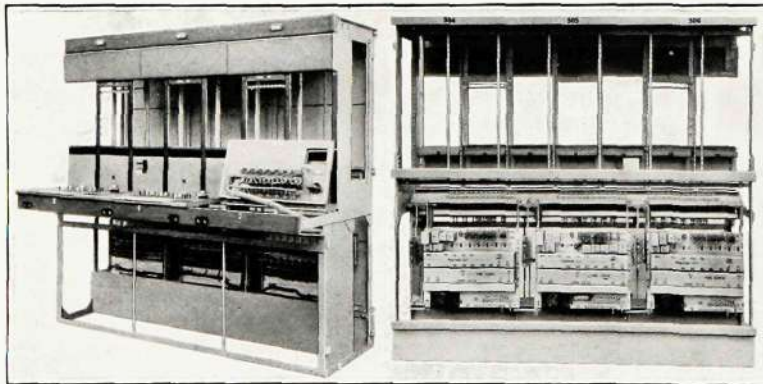
The existing power plant and batteries, serving the local exchange in the same building, are utilised for the new trunk equipment.

The photographs, which form part of this article, illustrate the Demand and Delay Switchboard, give a general view of the Apparatus Room Equipment on the 1st

Floor, and also show the design and construction of a switchboard section. The section here shown (front and rear) has all the equipment and wiring which can be conveniently and economically done in the works and it is shipped to the exchange site in this condition. The remainder of the equipment and cabling is added on site. The hole at the right-hand side of the open keyshelf is the space required for the inlet valve of the outgoing ticket tube.

Ericsson Telephones Ltd., have other important contracts of similar character in hand for the British Post Office. Among these are trunk exchange equipments for the Cardiff trunk zone centre, which is similar to Newcastle, and for Ayr and Crewe automatic exchange trunk group centres.

The installation of the Newcastle-on-Tyne trunk exchange equipment was finished and handed over to the Post Office authorities on December 15th, 1932, and on January 14th, 1933 the transfer was satisfactorily completed.



Front and Rear, Demand Trunk Section

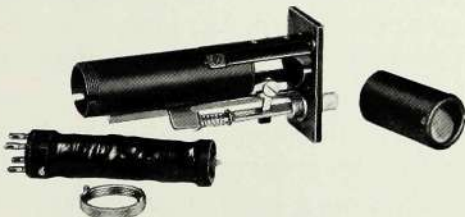
The Ericsson Discriminating Indicator

EXCHANGE line terminations on cordless switchboards are usually equipped with hand-restored indicators for the receipt of incoming calls. These indicators, with suitable condensers in series, are permanently bridged across the line, and operate with ringing current from the main exchange.

Owing to the fact that ordinary hand-restored indicators respond to dial impulses of ten per second as well as ringing current of $16\frac{2}{3}$ cycles per second, a false signal is given at the cordless switchboard when dialling to an automatic exchange.



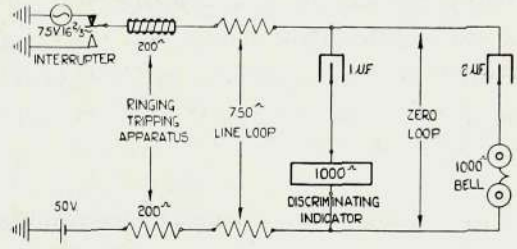
In order to obviate this inconvenience, the Ericsson Discriminating Indicator has been designed for use on cordless and other switchboards where it is necessary for the exchange signal to be bridged across the line. The indicator is used in place of the ordinary hand-restored exchange indicator, and is readily equipped and connected. When used for converting C.B. switchboards for use on automatic exchanges no alteration to existing wiring is required.



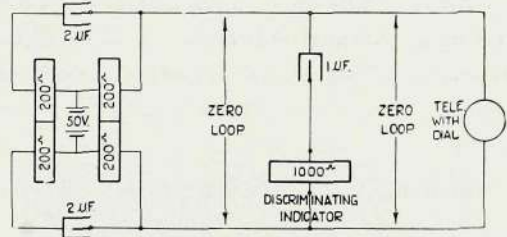
Front Cover and Coil removed

The armature and shutter are protected with a transparent fronted cover, and the coil may be withdrawn by removing a screwed

clamping ring. Upon operation, the shutter mechanically locks, and is restored to normal by pressing the replacement button.



The Indicator operates with Ringing Current



The Indicator does not operate with Dialling Impulses

The upper diagram shows the conditions of test, representing the ringing period from the main exchange. The discriminating indicator will operate with the $16\frac{2}{3}$ cycle ringing current through a maximum line loop of 750Ω , bridged with a $2\mu F$ condenser and 1000Ω bell.

During the period that dial impulses of ten per second are being transmitted from the extension instrument to call the main automatic exchange, the discriminating indicator on the P.B.X. will remain unoperated, even with zero loops as indicated in the lower diagram, and impulse distortion is not apparent.

Owing to the compact and enclosed design, this indicator, with minor modifications, may be used for other purposes than auto line terminations. Many thousands have already been fitted on CB, CBS and magneto switchboards which are in use all over the world, and they are proving exceptionally reliable especially in the tropics.

Planning of Police Communications

IN our last issue the general features of the Ericsson Police-Telephone System were described in a brief way, and it may now be useful if some consideration be given to factors which have to be taken into account in planning for application of the system to a police area.

In the first place we wish to clear up a misapprehension which appears to exist in some quarters. The adoption of the Ericsson police-telephone system does not replace the "box system," but rather renders it much more efficient than when

worked with an ordinary telephone system, as is the practice in many areas to-day. On the other hand, the employment of the Ericsson police-telephone system in an area not having the box system does not involve the introduction of the latter.

Compared with ordinary telephone systems the Ericsson system offers many advantageous facilities, and where properly applied to an area it affords some useful economies in annual expenditure.

In order that the fullest benefits may be reaped from its adoption, a careful study of the police area is essential, and for this purpose Ericsson Telephones Limited offer, to interested chief constables, the free services of an expert in police communication matters so that the most efficient scheme may be planned and the greatest economy effected.

In planning an installation, the first requirement is that the nature of the Ericsson system and the facilities it affords should be fully understood. This is best attained by inspection of one of the installations already in operation in the service of a Police Authority. At the time of going to press, installations are already in use at many centres including Edinburgh, Glasgow, Blackburn, St. Helens, Seaforth, etc. Alternatively, a demonstration equipment may be inspected at the Ericsson Works at Beeston, near Nottingham. Thereafter, an ordnance survey map of the police area, on a scale of six inches to the mile, should be obtained, and the most effective distribution of telephone communication points plotted on it. At this stage it should be considered whether any



Courtesy of the Scotsman, Edinburgh

Police Street Telephone Pillar, showing police microtelephone in use

Note the compartment in the column for "First Aid" Equipment

existing police stations can be dispensed with as a result of the provision of efficient wire communications, as the economies thereby effected are usually of considerable proportions. In this connection it is interesting to note what has been achieved at Edinburgh, as mentioned in the article following.

In plotting the telephone communication points, special regard should be paid to making it easy for the general public to get into quick touch with the police station. If this is given its due weight there will be a definite end to the old-time reproach that "a policeman is never there when he is wanted." Too much attention appears to be attached, at present, to disposing the telephone equipments on sites selected purely from considerations of the control and direction of the beat officers from the police station. Such considerations are, of course, essential, but it is of equal importance that information, which is the beginning of all police action, should be easily and rapidly acquired, and this cannot be fully achieved if the person with information to impart is under the necessity of first knowing where to find a police telephone and then having to travel perhaps half-a-mile to make use of it.

The speedy collection and distribution of information is the basis of all effective police attack on crime, and the day is not

far distant when it will be regarded as essential that a police communication point should exist at practically every street corner.

Communication on a basis of one box per beat, as is general at present is definitely wasteful and inefficient. The cost of police boxes varies within the wide limits of £25 to £100 or £150, and for such sums, telephone points in the form of street pillars can be greatly increased in density, and communication efficiency thereby improved. We commend to the consideration of chief constables, who are planning to use "box system" working, the employment of section boxes rather than beat boxes, and, with the savings thereby effected, the provision of a greater number of communication points may be achieved.

When the question of the disposition of the telephone points has been settled, there must then be determined the grouping of the various points to be worked on each party line. This is of the utmost importance as it is the annual rental for the line wires that weighs most heavily in the costs of police communications. In this matter our police communications experts can be of some assistance, and we would press chief constables to call upon our services in this connection in the earliest stages of consideration of any scheme.

Police Progress at Edinburgh



EDINBURGH; city and royal burgh, Capital of Scotland, with a population of over 427,000, and an area of over 32,000 acres, the largest urban police area in Scotland; brought into use, in the month of May, the new police organisation, planned by Roderick Ross, Esq., C.B.E., M.V.O., Chief Constable of the city. The force now operates on the "box system" with its communications provided by an installation of the Ericsson Police-Telephone and Signal System. Very great annual savings will result from this change in the organisation of the force, and the Chief Constable is to be congratulated upon bringing to a successful conclusion the many months of arduous preparatory work which ensured that, at zero hour, the new system came into operation without a hitch.

In the Edinburgh box system the Ericsson police-telephone and signal system has been provided through the General Post Office on annual rental terms, and in the course of installation over 500 miles of underground and overhead circuits have been provided by the Sectional Engineer, J. Y. Ryder, Esq., and his staff. A task of this magnitude does not fall to the lot of the engineering staff in a section every day of the week, and considering that the work was undertaken in addition to the normal work



Courtesy of Ian Smith, Edinburgh.

(1) Bailie Rutherford Fortune inaugurating the Police System at Edinburgh.

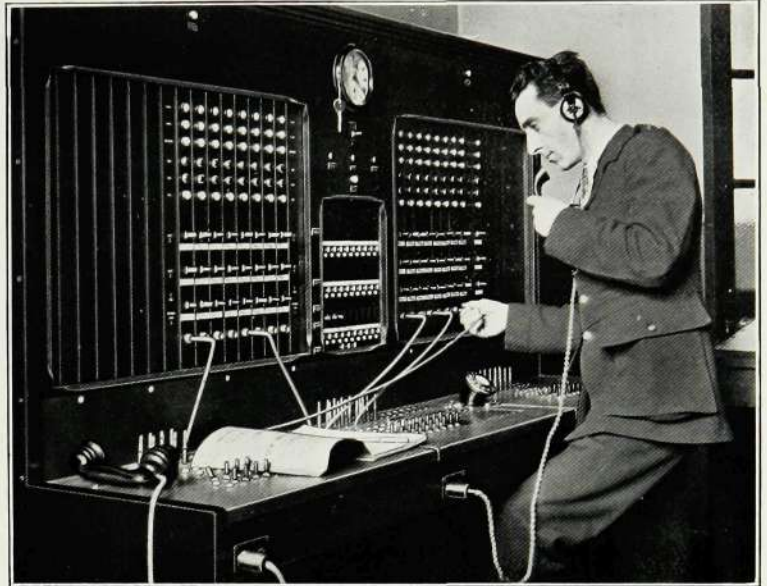
also (2) F. H. S. Grant, Esq., Assistant Secretary G.P.O. (3) Roderick Ross, Esq., C.B.E., M.V.O., Chief Constable of Edinburgh, (4) F. G. Milne, Esq., Secretary to G.P.O. for Scotland, (5) H. Kitchen, Esq., M.I.E.E., Superintending Engineer G.P.O., Scotland, East, (6) J. R. Hembrough, Esq., Eng-in-Chiefs Office, G.P.O. (7) F. J. Crawley, Esq., Chief Constable, Newcastle-on-Tyne.

of the section, it reflects to the credit of the installation staff.

The introduction of the new system has permitted the re-organisation of the City of Edinburgh police area into 5 districts, and has made it possible to close down no less than 25 police offices. The savings which will result from this, year by year, as may well be imagined, amount to an appreciable sum.

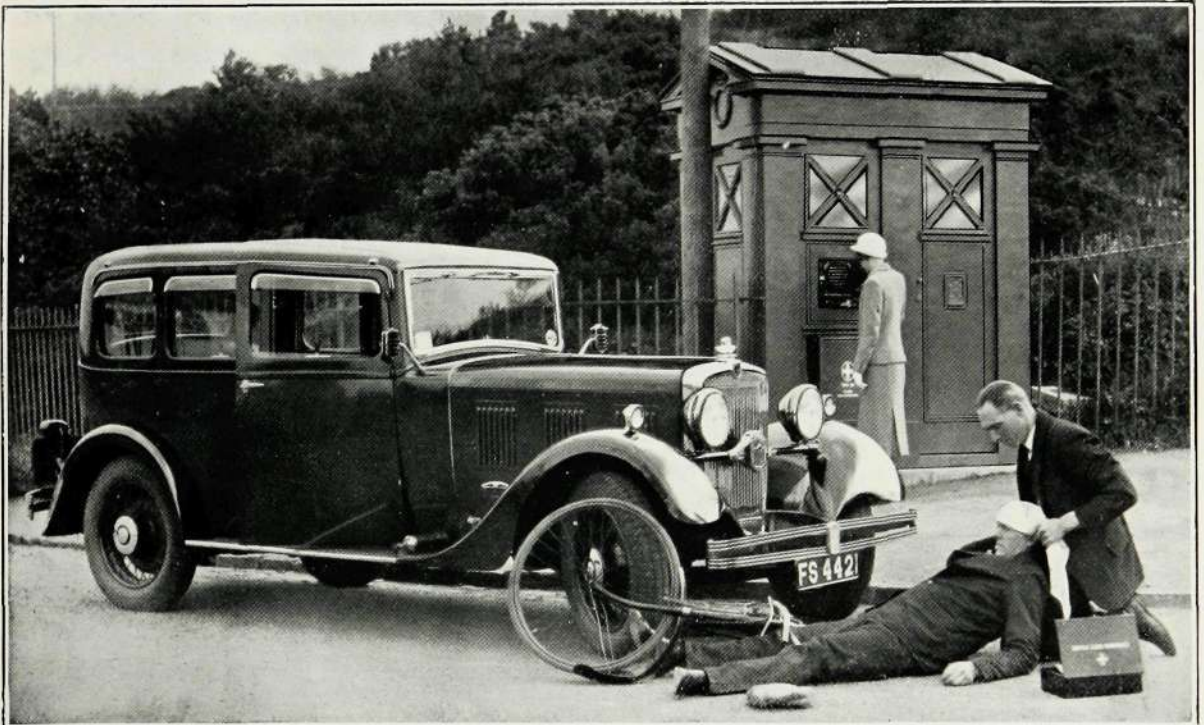
At the civic luncheon in connection with the inauguration of the Edinburgh system, the Lord Provost and other speakers paid very high tribute to the progressiveness and

outstanding ability of the Chief Constable and his staff. F. J. Crawley, Esq., Chief Constable of Newcastle-on-Tyne, pioneer of police box organisation, was present as an honoured guest, and unstinted acknowledgement of the help and advice he had afforded in the development of the scheme in Edinburgh was voiced by the Chief Constable of Edinburgh, and suitably acclaimed by the assembled company.



Courtesy of the Scotsman, Edinburgh

Edinburgh City Police—Switchboard Operator at work



Courtesy of the Scotsman, Edinburgh

An "Accident" at Edinburgh. First aid equipment available to the public at the police box has been brought into use, and the car passenger is telephoning to the Police Station for an ambulance

Loud Speaking Intercom. Telephones

PRESENT day progress demands that persons holding important executive positions should not be required to waste valuable time doing needless operations, and at all times they should have full access to records, files or important papers. The inter-departmental type of telephone has done much to improve the administration of a business and has proved itself an indispensable item in an up-to-date office. Unfortunately, however, the use of the ordinary telephone limits the movements of the user. It necessitates the use of one hand at least and so prevents quick and easy access to papers and at the same time the making of notes.

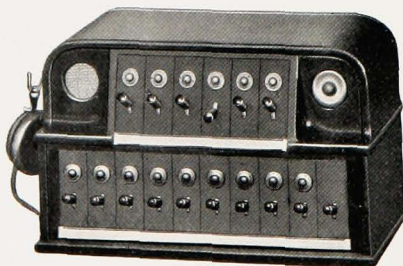
In order to improve such conditions, the Ericsson Company has placed on the market loud speaking telephones by means of which a person is not required to engage either hand while telephoning, incoming speech being received on a loud speaker and outgoing speech picked up by means of a sensitive microphone. This means that after the single operation of a key it is possible to move about in any average sized office and carry on a complete conversation with any desired extension. The essential qualities of such a scheme are, that the received speech shall be both loud and clear,

and the microphone shall be capable of picking up normal conversation from any part of the office. By very careful design of the circuits and components this has been made possible to a degree which is considered superior to any similar system on the market. In a quiet office the cone type speaker (noted for its clearness) can be heard 30 to 40 feet away, and the microphone will pick up at this distance without difficulty.

From the point of view of initial cost and future maintenance it is not desirable to use any type of valve amplifier, and the Ericsson system requires only the usual type of dry batteries for the signalling part of the system, and either a 6-volt accumulator or high capacity dry cells for the speaking part.

The following three systems are standardised :—

- a. A system consisting of a master station and a number of side stations with communication only between master and side stations.
- b. A system consisting of a master station and a number of side stations with full inter-communication facilities between the side stations.



Typical Master Station Sets



The Loudspeaker

- c. A system consisting of two or more master stations and a number of side stations with full intercommunication facilities between the side stations.

It should be noted that "master station" denotes a station with a loud speaker and microphone, and "side station" one with a standard bakelite micro-telephone.



Side-Station Telephones with Intercommunication

System (a) consists of a master station similar to those shown in the illustration and may be equipped up to 20 lines. A side station consists of an Ericsson bakelite table telephone fitted with a neat push button for calling up the master station. A small cable is run from the master station to each of the side stations.

In system (b), which is the most popular arrangement, the master station is the same as for (a) but the side stations are equipped with instruments of the types illustrated for 5 and 15 lines. These are similar in appearance to the standard Ericsson intercommunication telephones but are fitted with a press button and lamp for working in conjunction with the master station. Direct communication is given between all the side stations by means of the local intercom buttons. The operation of a master station button gives direct communication with that master station, and other side stations cannot overhear.

In system (c) the same remarks apply as for system (b) but each side station must have a button and lamp fitted for each master station, as in the right hand illustration of side-station telephones with intercommunication facilities which shows an instrument having 15 local buttons and two master-station buttons.

An extra condition which must be catered for is that of communication between the two master stations. There are many ways of doing this, but the particular requirements of each installation have to be carefully considered as it is not possible to give good loud speaker reception at one station when speaking at a distance from the microphone at the other station.

The following facilities are therefore provided:—

1. One master station is equipped with a hand-micro which can be used when speaking to the other master station.
2. All master stations are fitted with hand-micros, and arrangements being made that in all cases the station originating the call shall use the hand micro.
3. Arrange that when "master" communicates with "master" each shall use the small watch receiver attached to the master station key-box.

DESCRIPTION AND OPERATION OF THE INSTRUMENTS.

The master station consists of a polished mahogany case-work, as shown in the

illustration, the front of which is equipped with the necessary number of keys and lamps.

When a side station calls up, the lamp associated with it lights and indicates the number of the station calling. The lever key mounted immediately below this lamp is then operated and the speaking circuit is completed. An audible call is also given by a low pitched buzzer in order to attract attention.

The sensitive microphone is mounted in the top left hand corner and a warning lamp in the right hand corner. To guard against the leaving of a key in the operated position after the completion of a conversation, the warning lamp remains lit during the time that any key is in the operated position. A side station is called by depressing the appropriate key to its full extent or ringing position. On release the key takes up a middle or speaking position. If necessary, repeat rings can be given by further pressure on the key. When required, the loud speaker can be cut off by using the watch receiver provided.

For those who desire a really neat and inconspicuous arrangement, a three unit master station has been designed with the microphone and warning lamp fitted into a neat and pleasing inkstand, which is finished in oxidised-silver and is both useful and ornamental. The key box may then be fitted in any convenient position within reach.

In all cases the loud speaker may be placed in any position in the room, the



A Simple Side-Station Set

volume being such that it will be audible from all positions.

The intercommunication part of the side station instruments follows the standard practise which has been described in a previous issue of the

bulletin. When a call is received from the master station, the buzzer is operated in the usual way and a lamp is also lit in order to indicate that it is the master station calling. The removal of the hand-micro and pressing the master station button establishes the connection. Similarly, to call the master station the hand-micro is removed and the master station button depressed to its fullest extent. Should a side station be engaged when called by the master station the lamp at the side station will light and attract the attention of the user.

Conference facilities may be obtained by the master station throwing the appropriate keys. The stations thus selected can then speak and also hear what the other stations are saying.

As illustrated, two sizes of master stations are made, with a capacity of 11 and 20 keys respectively.

The side stations will generally be equipped with

| | | | | |
|----|------|---|---|-----------------|
| 5 | side | + | 1 | master station. |
| 10 | „ | + | 1 | „ „ |
| 15 | „ | + | 1 | „ „ |

with provision for extending to two master stations on each size.

Ericsson Equipment at Broadcasting House



Broadcasting House, London



EARLY in 1926 the B.B.C. decided that their premises at Savoy Hill were inadequate for their rapidly increasing activities, and commenced to search for larger headquarters which would accommodate a sufficient number of studios and house the whole of their staff of approximately seven hundred. It was originally intended to adapt an existing building, but after consideration of a number of possible properties it was realised that the many special requirements would necessitate new premises.

In 1928 a site was acquired at the corner of Portland Place and Langham Street which appealed to the B.B.C. as being ideally situated and easily accessible from all parts

of London. Building work commenced immediately after the architects plans had been approved, and eventually the final result is the magnificent structure shewn in the accompanying illustration.

It will be appreciated that an important factor in the complete co-operation between the various sections in a building of this size is an efficient telephone system, and this was given early consideration by the B.B.C. authorities. It was decided that the main requirements could best be served by an automatic exchange, while certain of the executives would also require additional facilities such as given by a combined auto and inter-communication system.

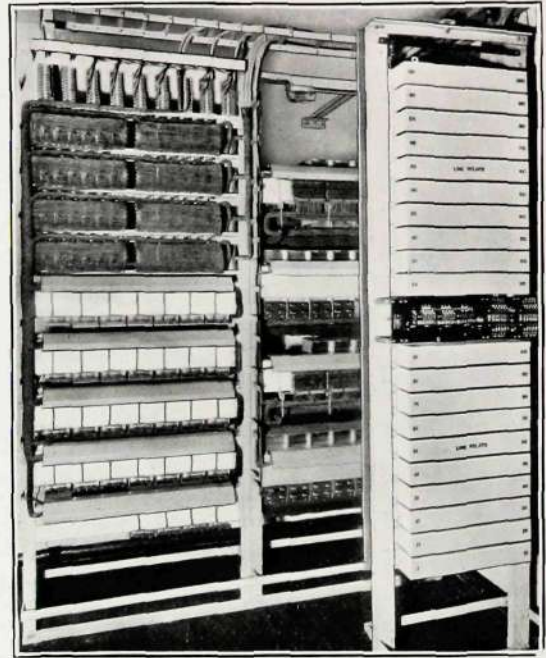
It was accepted as a compliment that Ericsson Telephone Equipment was chosen for this outstanding building.

A three-digit automatic system was provided, operating on step-by-step principles, using British Post Office pattern single and two-motion type switches. Twin contacts are fitted on all relays to minimise trouble that may be caused by dust. The equipment of the exchange was originally 200 lines but has since been increased to 270 lines. Rack capacity is available for a maximum of 300 lines. The present numbering scheme is 200-469 inclusive.

In accordance with modern practice, line finders are provided to effect an economy in space and apparatus. Fifty point single-motion type finders are employed, therefore the equipment is split into groups of 50 lines; five complete 50 line groups and one incomplete group of 20 lines making the total 270 lines. Directly connected to each finder is a selector, so that the five complete 50 line groups are each served by six finders and selectors, while the sixth and incomplete groups of 20 lines is served by three finders and selectors. The final selectors are of the 100-line two-motion type, twelve being allocated for each of the 200 and 300 groups and nine for the 400 group.

The switching equipment is mounted on 8' 6" standard open-type racks with channel-type shelves. The line relay equipments are accommodated on a framework similar to that used for the special apparatus rack in public exchanges. All equipment, other than the line relays and miscellaneous alarm apparatus, is "jacked-in" and can be readily removed for localizing faults, etc.

The system operates from a 50 volt supply, and duplicate batteries, each consisting of 25 cells and having a capacity of 200 ampere-hours at the 10-hour rate, were supplied. A motor-generator having an



Part of the Automatic Equipment

output of 40 amperes at 57 volts is provided for charging purposes. Ringing and tones are generated by a dynamotor operating from the 50 volt supply. Duplicate machines are fitted and arranged so that in the event of machine No. 1 failing, machine No. 2 is automatically brought into service. The dynamotor runs continuously during the day but at night the automatic operation of a time switch causes circuit changes, and the dynamotor runs only during the progress of calls.

Briefly, the switching operations during the progress of a call are as follows:—When a receiver is removed from the switch-hook a line finder, associated with the group in which the call is originated, searches for the calling line. When the calling line is found, dial tone is transmitted to the calling party, by the group selector associated with the finder in use, to indicate that dialling may commence. The first train of dialled impulses steps the group selector to the desired hundreds group, and automatic

search then takes place for a free final selector in that group. Subsequent impulse trains step the final selector to the desired line in the selected hundreds group in the usual manner, ringing tone or busy tone being transmitted to the calling party to indicate the condition of the called party's line.

"First-party" release is provided in the final selector circuit, so that the called party's line is not held busy in the event of the calling party failing to replace the receiver at the termination of a call.

To ensure that common equipment is not held unnecessarily, permanent loops due to receivers being left off, etc. are automatically disconnected from the switching equipment after a period of between 30-60 seconds, by a special fault relay. The removal of the loop from the line after a forced disconnection has occurred, automatically releases the line circuit and allows further calls to proceed in a regular manner.

Visual and audible alarms are provided to indicate blown fuses, ringing failure, and switches which fail to release after the termination of a call. The fuse alarm and ringing failure alarm are immediate, but release alarm is retarded for a period of between 9-18 seconds.

As already stated, some of the executive offices required certain peculiar communication facilities which were satisfactorily met by means of a special intercommunication system arranged to work in conjunction with the automatic exchange. There are seven master stations each of which can communicate directly with the others, with five associated side stations and one exchange line. When communicating

on an exchange line a "hold exchange" feature is incorporated enabling a master station to call any other station even if the latter is engaged, while under other conditions an engaged line would give an "engaged test."

A side station is a simple extension from a master station and can only reply to its particular master station, i.e., it cannot originate a call on the intercommunication system. It can, however, originate and reply to exchange calls. The side station instruments are ordinary automatic bakelite table telephones with a means of switching from the exchange to the master line and vice versa.

The master station instrument comprises an automatic table telephone mounted on a special base containing the necessary auto-reset keys for the various lines. The

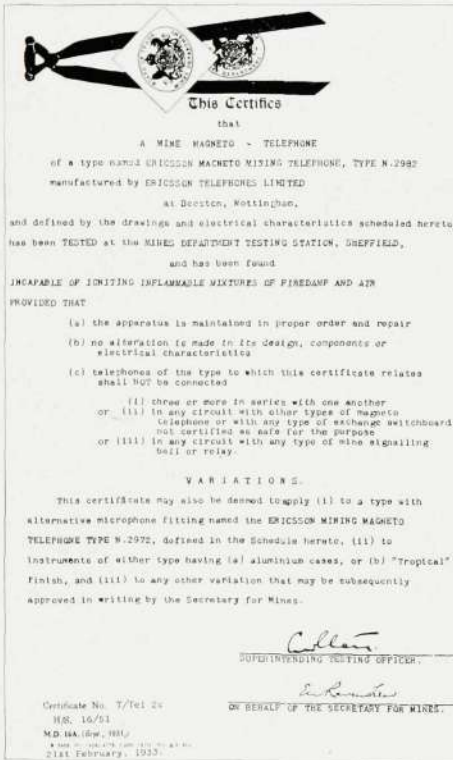


The Master Station Instrument

flexible cable from the instrument terminates on a plug which, when in position, totally encloses all connections, as may be seen from the illustration.

The telephone equipment was successfully brought into service at the latter end of 1931 but was not subjected to heavy traffic, however, until the whole of the B.B.C. staff was transferred from the old headquarters at Savoy Hill in 1932.

Mining Telephones, Switchboards and Apparatus



mining bell with a short-circuited winding above and below each active winding as safety device, introduced over 20 years ago and certified in 1920, was almost as safe as the most modern bells.

Early in 1924 certification was obtained for an improved design of bell, and immediately afterwards a new certified relay was introduced which replaced the previous relay.

Ericsson telephone instruments were the first to obtain a certificate for magneto working and again for use on the battery call system, also at the present time their switchboards are the only ones for which a certificate has been issued.

Telephone installations in mines have to conform to the appropriate sections of the Coal Mines Regulations. Until a few years ago the mining industry had to rely almost entirely on the manufacturer to ensure that signalling apparatus was safe. It will be readily understood that even where a manufacturer had the requisite equipment and personnel for safety tests such as were provided in the Ericsson laboratories, there was no generally recognised standard of safety. In 1919 the Mines Department commenced the test and certification of D.C. bells and relays for bare wire working, and in 1926 opened the Sheffield Testing Station for investigation of signalling problems and the test of commercial apparatus. Thus they

PIONEERS in the field of telephone and signalling apparatus designed for use in the Coal Mining Industry, Ericsson Telephones Ltd. have been well to the fore in the considerable advances of the past twenty years in this field. They have produced a complete range of equipment which is safe, fulfils its function with efficiency and convenience, is robust, and proof against malicious tampering.

As an instance of attention to safety, it is interesting to note that the original D.C.

have been enabled to formulate testing methods and indicate desirable features in apparatus. Ericsson Telephones Ltd. realised at the outset the value of this work and as testing facilities became available they applied for test and certification of their apparatus, so that they now have a full range of equipment certified safe for use in fiery mines.

Apparatus may be divided into two groups, (1) flameproof, (2) intrinsically safe.

Flameproof apparatus depends upon its design and construction to ensure that if ignition of a mixture inside the case occurs, the resulting flame is so cooled on its passage to the exterior that it cannot produce any ignition of the surrounding methane atmosphere, however explosible the latter may be. The usual methods are, to provide wide machined flanges for cooling, to limit the unoccupied internal space and to pay special attention to strength of materials and construction. All apparatus associated must be flameproof and the lines fully insulated and well maintained, as a line fault immediately introduces the element of risk.

The alternative method is to design the electrical circuit so that if an electric spark occurs, inside or outside the apparatus, whether in normal working or as a result of any fault in the wiring system, such a spark shall be incapable of igniting the most sensitive methane mixture. This "intrinsic safety" is doubtless the most satisfactory, as purely flameproof apparatus has always to contend with the ultimate possibility of a dangerous fault in the wiring.

Good maintenance may make this improbable, it can never make it impossible.

Magneto telephones have a considerable application in mines and during the past fifteen years the original Ericsson design has received those additions and modifications which experience and research have shown to be of service. The present



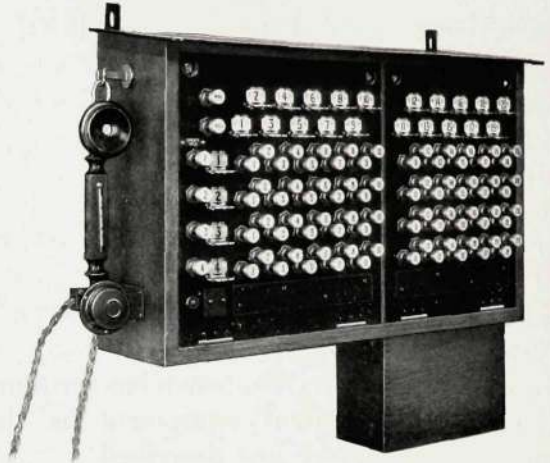
Type N2982 open for use

instruments, certified for parallel working, are available in two types. Type N2982 shown with door open for use, has a stout cast case with inner door on which are mounted the speaking equipment and generator. The ringer gongs are protected from damage by a cowling, and access to the interior is by special key. The inner door is waterproof including the generator crank gland. A protected water-proof transmitter inset is used. The outer door fastens with a slam catch and the rounded corners of the set are another feature of design. The case may be obtained cast in iron or aluminium. When the speaking unit is swung out for use the battery circuit for the transmitter is automatically switched on.



Type N2972 open for use

The other type N2972 is of similar design but is fitted with a hand micro-telephone instead of the swing-out unit. Both instruments have the same electrical characteristics and are intrinsically safe for any number in parallel, and when used with Ericsson mining switchboards types N510, N515 and N550. These switchboards, certified for use with the telephones mentioned,



Type N550

and calling equipment, it being usual to fix the board adjacent to a telephone at which attendance is regular, thus there is no need to have duplicate equipment. Drop shutter indicators are used on these switchboards unless indicators with individual dust covers are desired, when a flap indicator, of the type illustrated in page 9 is provided, which has a restoring button mounted under the indicator disc to release the mechanical holding device on the shutter. This latter indicator in a wood case and provided with contacts is available as an indicator-relay for providing a visual signal as additional to the telephone ringer.



Type N510

are of very robust construction and simple to operate. Types N510 and N515 are "pyramid" boards for up to 5 circuits, while the connecting keys in the case of the N550 type are arranged in horizontal rows and a hand micro-telephone and calling generator are provided for the operator. These keys are of plunger type with engraved metal tops. The smaller, pyramid boards have no integral speaking



Type N2504

Where a telephone, situated above ground, at the bank, in the winding house, in the offices, etc., is connected, or may be connected by switchboard, to an underground circuit it is essential that it should be safe also. It is important that this point be appreciated. The same equipment can, of course, be used, but where a wood cased instrument is preferred, an instrument certified for surface use under cover is available in type N2504, which has the same electrical circuit and equipment as the magneto telephones just described.

Battery operated bells, relays and telephones form another important section of communications in mines.



Type N1150

The Ericsson battery call mining telephone type N1150 is certified as intrinsically safe. The simple and robust cast case is waterproof and carries the waterproof inset transmitter inside the front, protected by a metal grid. A loud-speaking type of receiver is housed inside also; a flexible metallic tube with earpiece serves as listening tube and a thumb operated switch of substantial proportions controls the ringing and speaking. An external certified bell is used for calling and where a bare

wire system is used the signalling battery must, of course, be of a certified type and common to all the telephones on the system.

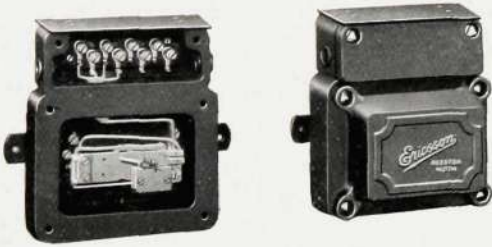
By the addition of a condenser in the speaking circuit, any number of these instruments can be connected in parallel on a three-wire signalling circuit with a common battery. The condenser with strap is not normally fitted but can be readily added by a maintenance man, the drillings for the strap being provided.



Type N3030

The Ericsson D.C. bell type N3030 used for haulage roads, with telephones, or wherever a certified bell is required, is supplied in two resistances—20 ohms and 30 ohms. The 20^Ω bell finds favour for local working with say up to 12 volts, while the 30^Ω bell is more used for the longer circuits with up to 25 volts. Either is, of course, approved for use with any number in parallel up to the full 25 volts permissible by regulations.

Where long distances have to be encountered or local battery working is preferable or more economical, relays are used, closing the contact of a local bell circuit.



Type N7236 with Cover off and on

A new magneto-telephone relay type N7236, has been developed and is now available, which will operate in connection with Ericsson mining magneto telephones and switchboards, and provides one, two or three make contacts as desired. This relay, of unusual but highly efficient design, is housed in a stout cast case with both the relay and the terminal cover secured by tamper-proof screws.

The Ericsson D.C. Relay N7237A, certified in 1924, replaced the original certified relay, then discontinued. This relay, 100ⁿ with an anti-spark winding of 500ⁿ, and giving one make contact, is housed in a cast case with flanged cover of the same general design as the bell.



Type N7240 with covers off and on

In addition a new type of D.C. relay is now introduced, type N7240, available with one, two or three make contacts as required, in a case of the same construction as the new magneto-telephone relay. This multi-contact relay represents all that is most modern and desirable in a relay of this nature, incorporating as it does those features which have been proved in arduous service in telephone equipment all over the

country, retaining for each purpose only the best in materials and design.

All D.C. bells, relays, etc., when used for parallel working on a bare wire system must use a common battery of certified type as a source of energy. The Mines Department have made this ruling because, whatever the apparatus in circuit, it is highly desirable to limit the energy available to a safe maximum. In the case of a battery this can be effected by selecting a type which has an inherent internal resistance which is maintained at a suitable value under load, such as the 3-pint Leclanché cell. It will be seen that accumulator batteries are unsuitable by reason of their low internal resistance.

In connection with signalling systems a safety push and a pull are available, both being certified by the Mines Department.

The certified push contains morse key contacts operated by a special drop handle, making accidental operation impossible. The stout cast case has a separate terminal chamber.

The certified pull, for such use as on haulage roads where wet or other conditions interfere with the satisfactory working of bare wire signalling, provides contacts in a cast case with separate terminal chamber, the contacts being operated by pulling on stranded wire attached to the eye of the pull and carried on pulleys along the road to an anchorage at the end of the run.

No mention of coal mines equipment would be complete without reference to rescue work, and we are pleased to announce that, in co-operation with the leading manufacturer of rescue apparatus, we have designed and are commencing production of portable signalling equipment for this purpose.